PROJECT MANUAL

CITY OF PORTERVILLE

COMMUNITY CENTER & PARK PROJECT

PROJECT NUMBER: 89-9411-88

BID NUMBER: 24/25 – CP1977

OCTOBER 2024

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CITY OF PORTERVILLE
PROJECT MANUAL
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NOTICE INVITING SEALED BIDS
COMMUNITY CENTER & PARK PROJECT
PROJECT NO: 89-9411-88
BID NO.: 24/25 - CP1977

SEALED PROPOSALS will be received by the Purchasing Agent in the City Hall, 29l N. Main Street, Porterville, California, 93257, until 2:30 pm on Wednesday, December 4, 2024, and promptly thereafter all proposals that have been duly received will be publicly opened and read aloud for furnishing to said City all labor, materials, equipment, transportation, and services for the construction of a new community center, park, and related appurtenances per plans and specifications on Henderson Avenue just east of Fourth Street.

Instructions to Bidders, plans, project manual, and proposal forms may be inspected at City Hall, 29l N. Main Street, Porterville, California. Proposal forms may be inspected and electronically downloaded with no cost, at the Public Purchase website, https://www.publicpurchase.com. No copies of said documents will be provided by the City. All addenda and correspondence during the bid process will be handled electronically through the Public Purchase website. ***No bid shall be received from a non-official Bidder who has not registered and accessed the proposal documents from the Public Purchase website.***

A Certified Check, Cashier's Check, or Bidder's Bond in the amount of ten percent (10%) of the bid made payable to the City of Porterville will be required to accompany each proposal.

Any contract entered into pursuant to this notice will incorporate the provisions of the State Labor Code. Compliance with the prevailing rates of wages and apprenticeship employment standards established by the State Director of Industrial Relations will be required.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at City of Porterville address and available from the California Department of Industrial Relations' Internet web site at http://www.dir.ca.gov/DLSR/PWD. Future effective general prevailing wage rates, which have been predetermined and are on file with the California Department of Industrial Relations, are referenced but not printed in the general prevailing wage rates.

Contractor is required to be in compliance with the Labor Code including sections 1771, 1774-1776, 1777.5, 1813, and 1815.

As per SB854, passed by California State Senate on June 20, 2014, contractors and subcontractors will now be required to register with the California Department of Industrial Relations (DIR) per Section 1725.5 of the Labor Code.

Special attention is directed to Section 1720.9 of the Labor Code which now provides that the hauling and delivery of ready-mix concrete for a Public Works project is subject to prevailing wage rates and other related requirements.

Affirmative action to ensure against discrimination in employment practices on the basis of race, color, national origin, ancestry, disability, gender, age, sexual orientation, or religion will also be required. No qualified disabled person shall, on the basis of disability, be excluded from participating in, be denied the benefits of, or otherwise be subject to discrimination.

The City hereby affirmatively ensures that minority business enterprises will be afforded full opportunity to submit bids in response to this notice and will not be discriminated against on the basis of race, color, national origin, ancestry, disability, gender, sexual orientation, or religion in any consideration leading to the award of contract.

The participation of Disadvantaged Business Enterprise's (DBE) is highly encouraged but a minimum participation level is not required for this project.

No bid will be accepted from a Contractor who is not duly licensed in accordance with the provisions of Chapter 9, Division III, of the Business and Professions Code, and has a current "B" General Building Contractor license.

The right is reserved by the City of Porterville to reject any or all bids, to evaluate the bids submitted and to award the contract according to the proposal which best serves the interests of said City.

The successful bidder will be required to furnish the City of Porterville with a "Performance Bond" in the amount of one hundred percent (100%) of the contract and a "Labor and Materials Bond" in the amount of one hundred percent (100%) of the contract amount.

Upon receiving the "NOTICE OF AWARD," the successful bidder has TEN (10) DAYS to submit the signed contract together with all required bonds, insurance and licenses to the Project Manager, and meet with the City in a PRE-CONSTRUCTION MEETING to discuss any problems or questions pertaining to this project. It is the Contractor's responsibility to contact the City's Project Manager immediately, to arrange for the PRE-CONSTRUCTION MEETING during the TEN (10) DAY PERIOD.

The Contractor shall have three hundred ninety (390) working days from the effective date of the NOTICE TO PROCEED to complete the required work.

The Contractor shall pay the City LIQUIDATED DAMAGES in the amount of $4000 a day for each calendar day the project is delayed beyond the "TIME OF COMPLETION DATE."

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available 24 hours 7 days a week and is confidential and anonymous. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report these activities. All information will be treated confidentially and caller anonymity will be respected.

The City will withhold five percent (5%) retention from payments due the Contractor until thirty-five (35) days after date of recordation of the Notice of Completion. The Contractor may elect to receive one hundred percent (100%) of payments due under the contract by depositing securities of equivalent value with the City in accordance with the provisions of the California Public Contract Code Section 22300. Such securities, if deposited by the Contractor, shall be valued by the City, whose decision on valuation of the securities shall be final. Securities eligible for investment under this provision shall be limited to those listed in Section 22300 and Section 16430 of the California Government Code.

Dated at Porterville, California, this 29th day of October, 2024.

By_____
Janie Rodriguez, Purchasing Agent
City of Porterville, California

First Publication: October 29, 2024
Second Publication: November 5, 2024

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INSTRUCTIONS TO BIDDERS

COMMUNITY CENTER & PARK PROJECT
PROJECT NO: 89-9411-88
BID NO.: 24/25 - CP1977

PROPOSAL REQUIREMENTS AND CONDITIONS

APPROXIMATE ESTIMATE - The quantities given on the bid proposal form, the plans and contract documents are approximate only, being given as a basis for the comparison of bids, and the City of Porterville does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, or to omit portions of the work, as may be deemed necessary or advisable by the engineer at prices bid.

EXAMINATION OF PLANS, PROJECT MANUAL, CONTRACTS, AND WORK SITE - The bidder shall examine carefully the site of the work contemplated, the plans and project manual, and the proposal and contract forms. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of the proposal, plans, project manual, and the contract.

PROPOSAL FORMS - The City has furnished to each bidder a duplicate standard proposal form, which, when filled out and executed, may be submitted as its bid. Bids not presented on the furnished forms will be disregarded.

All proposals shall give the prices proposed in figures in the space provided and shall be signed by the bidder who shall fill out all blanks in the proposal form as required.

All proposals shall be submitted as directed in the "Notice Inviting Sealed Bids" under sealed cover plainly marked as a proposal and identifying the project to which the proposal relates and the date of the bid opening. Proposals, which are not properly marked, may be disregarded.

REJECTION OF PROPOSALS - Proposals may be rejected if they show any alteration of form, additions not called for, conditional bids, incomplete bids, erasures, use of non-official bid form, or irregularities of any kind.

When proposals are signed by an agent, other than the officer or officers of a corporation authorized to sign contracts on its behalf or a member of a partnership, a "Power of Attorney" must be on file with the City of Porterville prior to opening bids or shall be submitted with the proposal; otherwise, the proposal will be rejected as irregular and unauthorized.

PROPOSAL GUARANTY - All bids shall be presented under sealed cover and accompanied by one of the following forms of bidder's security:

> Cash, a cashier's check, a certified check, a bank money order of any national or state bank, or a bidder's bond executed by an admitted surety insurer, made payable to the City of Porterville.

The security shall be in an amount equal to at least ten percent (10%) of the amount bid, as payment by the Contractor to the City of Porterville. A bid will not be considered unless one of the forms of bidder's security is enclosed with it. A bidder's bond will not be accepted unless it contains all information and signatures as required by the City and is properly filled out and executed.

WITHDRAWAL OF PROPOSALS - Any bid may be withdrawn at any time prior to the time fixed in the public notice for the opening of bids only by written request for the withdrawal of the bid filed with the City Manager. The request shall be executed by the bidder or his duly authorized representative. The withdrawal of a bid does not prejudice the right of the bidder to file a new bid. No bid may be withdrawn after the time fixed in the public notice for the opening of bids.

PUBLIC OPENING OF PROPOSALS - Proposals will be opened and read publicly at the time and place indicated in the "Notice Inviting Sealed Bids." Bidders or their authorized agents are invited to be present.

DISQUALIFICATION OF BIDDERS - More than one proposal from an individual, firm, partnership, corporation, or combination thereof under the same or different names will not be considered. Reasonable grounds for believing that any individual, firm, partnership, corporation, or combination thereof is interested in more than one proposal for the work contemplated may cause the rejection of all proposals in which that individual, firm, partnership, corporation, or combination thereof is interested. If there is reason for believing that collusion exists among the bidders, any or all proposals may be rejected. Proposals in which the prices obviously are unbalanced may be rejected.

REJECTION OF BIDS – Any bid may be rejected by the City of Porterville City Council or City officials if they show any alterations of form, additions not called for, conditional or alternative bids, incomplete bids, erasures or irregularities of any kind.

The City may reject a bid proposal as non-responsive if the unit prices are unbalanced in such a way as to create reasonable doubt that the unbalanced bid would result in the lowest ultimate cost to the City or front loaded in such a way that would result in the City paying more than the value of the work delivered by the Contractor at the time payment application are submitted, in violation with Public Contract Code 9203.

LICENSING OF BIDDERS - All bidders/and Contractors shall be licensed in accordance with the laws of this state, and any bidder or Contractor not so licensed is subject to the penalties imposed by such laws.

MATERIAL GUARANTY - Before any contract is awarded, the bidder may be required to furnish a complete statement of the origin, composition, and manufacture of any or all materials to be used in the construction of the work, together with samples, which samples may be subjected to the tests provided for in this project manual or in the special provisions to determine their quality and fitness for the work.

The successful bidder, who will execute the work, will warrant to the City of Porterville all materials and workmanship against any failures for a period of one year (l) from the date of acceptance of the work.

The two contract bonds required will continue in full force and effect for the duration of the warranty period unless a maintenance bond has been substituted for them.

INSURANCE REQUIREMENTS - Attention is directed to Part l of Special Provisions.

PERMITS AND LICENSES - Attention is directed to "Responsibilities of the Contractor," in the Special Provisions. The Contractor and all Subcontractors shall possess a valid City of Porterville business license at the time of beginning of construction (a fee schedule is available from the Department of Finance), together with any applicable county permits from the County of Tulare and from the State of California for the duration of the contract.

TAXES - No mention shall be made in the proposal of Sales Tax, Use Tax, or any other tax, as all amounts bid will be deemed and held to include any such taxes, which may be applicable.

DISCREPANCIES AND MISUNDERSTANDINGS - Bidders must satisfy themselves by personal examination of the work site, plans, project manual, and other contract documents and by any other means as they may believe necessary, as to the actual physical conditions, requirements, and difficulties under which the work must be performed. No bidder shall at any time after submission of a proposal make any claim or assertion that there was any misunderstanding or lack of information regarding the nature or amount of work necessary for the satisfactory completion of the job. Any errors, omissions, or discrepancies found in the plans, project manual, or other contract documents shall be called to the attention of the City and clarified prior to the submission of proposals.

The proposal form, contract, project manual, and addenda shall constitute the full contract for this project. Should the Contractor feel there has been a supplemental or oral modification, it shall be his responsibility to verify said modification in writing prior to submission of the proposal.

EQUIVALENT MATERIALS - Approval of equipment and materials offered as equivalents to those specified must be obtained not less than one week prior to the opening of bids. Requests for consideration of equivalents must be submitted in writing allowing sufficient time for complete consideration of all the project manual requirements for samples, references, tests, and other details to the full satisfaction of the City.

LEGAL RESPONSIBILITIES - All proposals must be submitted, filed, made, and executed in accordance with State and Federal laws relating to bids for contracts of this nature whether the same or expressly referred to herein or not.

AWARD OF CONTRACT - The right is reserved to reject any and all proposals. The award of the contract, if awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed. Such award, if made, will be made within 60 days after the opening of the proposals. If the lowest responsible bidder refuses or fails to execute the contract, the City Council may award the contract to the second lowest responsible bidder. If the second

lowest responsible bidder refuses or fails to execute the contract, the City Council may award the contract to the third lowest responsible bidder.

In the event a single proposal includes more than one item, the award of the contract will be made to the lowest bidder on the total of all items.

The City may make such investigation as it deems necessary to determine the ability of a proposer to furnish the required services, and the proposer will furnish to the City all such information and data for this purpose as the City may request. The City reserves the right to reject any quote if the evidence submitted by or investigation of such proposer fails to satisfy the City that such proposer is qualified to carry out the obligations of a contract and to deliver the services contemplated herein.

BASIS OF BID AWARD - Award of bid shall be made to the responsive, responsible bidder meeting the specification and requirements of the bid, having the lowest bid and satisfactory qualifications and performance record.

A. Total bid price for project, in accordance with the requirements of the request for proposals and the ability to satisfy those requirements.

B. Company's reputation and financial status.

C. Past experience.

SELF PERFORMANCE – The Contractor shall perform, with its own organization, Contract work amounting to at least 30 percent (30%) of the contract price except that any designated "Specialty Items" may be performed by subcontract and the amount of any "Specialty Items" so performed will be deducted from the Contract Price before computing the amount required to be performed by the Contractor with its own organization. "Specialty Items" will be identified by the Agency in the bid or in the Special Provisions. When the entire item is subcontracted, the value of work subcontracted will be based on the Contract Unit Price. When a portion of an item is subcontracted, the value of the work subcontracted will be based on the estimated percentage of the Contract Unit Price. This will be determined from information submitted by the Contractor, and subject to approval by the Engineer.

CONTRACT BONDS - The successful bidder shall furnish the City of Porterville with a satisfactory "Performance Bond" in the amount of one hundred percent (100%) of the contract amount and a "Labor and Material Bond" in the amount of one hundred percent (100%) of the contract amount.

The successful bidder shall have as a surety for all bonds, a corporate surety authorized to act as a surety in California. The Performance Bond and the Labor and Materials Bond are solely for the benefit of the City of Porterville and create no cause of action by Subcontractors or suppliers against the Contractor or surety. The City does not guarantee the validity of such bonds or the solvency of the Contractor.

All alterations, extensions of time, extra and additional work, and other changes authorized by this project manual or any part of the contract may be made without securing the consent of the surety or sureties on the contract bonds.

Bonds are subject to action per the Contract Agreement section of this project manual.

FAILURE TO EXECUTE CONTRACT - Failure of the lowest responsible bidder, the second lowest responsible, or the third lowest responsible bidder to execute the contract and file acceptable bonds as provided herein within ten (l0) days, not including Sundays and legal holidays, after such bidder has received notice that the contract has been awarded to him will be just cause for the annulment of the award and the forfeiture of the proposal guaranty. If the successful bidder or his authorized representative files a notice specifying that the bidder will refuse to execute the contract if presented to him, the filing of such notice shall have the same force and effect as the failure of the bidder to execute the contract and furnish acceptable bonds within the time hereinbefore prescribed.

The remedies provided for under this provision shall not be construed to limit, waive or otherwise abrogate any other remedy that the City shall be entitled to under other terms and conditions of this contract

EXECUTION OF CONTRACT - The contract shall be signed by the successful bidder and returned to the Project Manager, together with the contract bonds, insurance certificates, insurance endorsements, etc. within ten (l0) days, not including Sundays and legal holidays, after the bidder has received notice that the contract has been awarded.

RETURN OF PROPOSAL GUARANTIES - Within ten (l0) days after the award of the contract to the lowest responsible bidder, the City of Porterville will return the proposal guaranties, other than bidder's bonds, accompanying the proposals that are not to be further considered in making the award. Retained proposal guaranties will be held until the contract has been finally executed, after which all proposal guaranties, except bidder's bonds and any guaranties which have been forfeited, will be returned to the respective bidders whose proposals they accompany.

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BID PROPOSAL

COMMUNITY CENTER & PARK PROJECT
PROJECT NO: 89-9411-88
BID NO.: 24/25 - CP1977

TO: THE CITY OF PORTERVILLE

In accordance with City's Notice Inviting Sealed Bids, the undersigned BIDDER hereby proposes to furnish all materials, equipment, tools, labor, and incidentals required for the above stated project as set forth in the Plans, Project Manual, and Contract Documents therefore, and to perform all work in the manner and time prescribed therein.

BIDDER declares that this proposal is based upon careful examination of the work site, Plans, Project Manual, Instructions to Bidders, and all other Contract Documents. If this proposal is accepted for award, BIDDER agrees to enter into a contract with CITY at the unit and/or lump sum prices set forth in the following Bid Schedule. BIDDER understands that failure to enter into a contract in the manner and time prescribed will result in forfeiture to CITY of the guarantee accompanying this proposal.

BIDDER understands that a bid is required for the entire work that the estimated quantities set forth in the Bid Schedule are solely for the purpose of comparing bids, and that final compensation under the contract will be based upon the actual quantities of work satisfactorily completed. It is agreed that the unit and/or lump sum prices bid include all appurtenant expenses, taxes, royalties and fees. In the case of discrepancies in the amounts bid, unit prices shall govern over extended amounts and words shall govern over figures.

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COMMUNITY CENTER & PARK PROJECT
PROJECT NO: 89-9411-88
BID NO.: 24/25 - CP1977

TO THE PURCHASING AGENT
City of Porterville
29l N. Main Street
Porterville, CA 93257

We, the undersigned bidder, having carefully examined the location of hereinafter described work and the plans and project manual thereof, thereby propose to furnish, all in strict accordance with said plans and project manual, all the materials, labor and equipment necessary for the completion of this project for the price set forth in the following bid, to wit:

BASE BID					
Item	**Description of Work**	**Qty**	**Unit**	**Unit Price ($)**	**Amount ($)**
1	Mobilization & Demobilization	LUMP SUM		$	$
2	Dust Control & Project Site Maintenance Per Specifications (Strictly Enforced)	LUMP SUM		$	$
3	Furnish and implement Traffic Control Plan (Maintaining Traffic)	LUMP SUM		$	$
4	Perform Utility Potholing/Locating	LUMP SUM		$	$
5	Provide Demolition, Clearing, and Grubbing as necessary including removal of existing asphalt by milling. Asphalt millings delivered to City per Specifications. (On-site and Off-Site as required per plans.)	LUMP SUM		$	$
6	SWPPP, Stormwater Pollution Prevention Plan	LUMP SUM		$	$
7	Construction Notification Sign	LUMP SUM		$	$
8	Fugitive Dust Control Permit/s and/or Clearance				
9	Fill dirt and compaction testing per plans	LUMP SUM			
10	Construction of Community Center Per Plans & Specifications (including, but not limit to, utility connections)	LUMP SUM		$	$
11	Construction of Park per Plans & Specifications (including, but not limit to, landscape material, irrigation, park furniture, park equipment, and sport field/s). (Not including prefabricated structures)	LUMP SUM		$	$
12	Construction of Parking log per plans & specifications	LUMP SUM		$	$

13	Provide and install all solar components and EV charger per plans and specifications (Specialty Trade)	LUMP SUM	$	$
14	Provide and install fire sprinklers and related systems per plans and specifications (Specialty Trade)	LUMP SUM	$	$
15	Provide and install splash pad per plans and specifications (Specialty Trade)	LUMP SUM	$	$
16	Provide and install pump track per plans and specifications (Specialty Trade)	LUMP SUM	$	$
17	Provide and install prefabricated structures for park. (Specialty Trade).	LUMP SUM	$	$
			Bid Total	$

Total amount of **BID is (in words):** _____

_____Dollars and _____ Cents

(Amount to be shown in both words and figures. In case of discrepancy between words and figures, the words shall prevail.)

We, the undersigned, as bidder, declare that we have thoroughly examined all the Contract documents herein contained and that this proposal is made without collusion with any other person, firm or corporation.

And we agree, if this proposal is accepted, that we will contract with the City of Porterville in the form of the Articles of Agreement to provide all labor and materials and all other expenses of whatever nature necessary to comply with the drawings and Contract provisions contained herein or reasonably implied thereby or as necessary to complete the work in the manner and within the time specified and according to the requirements and to the reasonable satisfaction of the Engineer; to pay all charges of freight, taxes, transportation and hauling; to indemnify the City and the Engineer against any loss or damage arising from any act of the undersigned as Contractor; and that we will take in full payment therefore the sums as shown on the Bid Proposal and made a part hereof.

And we further agree, if this Proposal is accepted, to sign the Articles of Agreement and to furnish the required bonds of a surety satisfactory to the City within ten (l0) calendar days from the date notified by the City Clerk of award of contract; and if the undersigned shall fail to contract as aforesaid, it shall be understood that he/she has abandoned the Contract, and that, therefore, this Proposal shall be null and void and the certified check or bond accompanying this Proposal becomes the property of the City.
The undersigned certifies that he/she has a valid license as Contractor in the State of California, the classification and number of which are _____. The license expiration date is _____. The representations made herein are made under penalty of perjury.
Witness our hands this _____ day of _____, 20___.

Signature of bidder, with business name, address and telephone number:

(l)_____ (2)_____
BIDDING FIRM Corp, Individual, Partner, Other

(3)_____ _____
Business Address Area Code and Telephone Number

_____
City, State and Zip Code

(4)_____ _____
Signature of Authorized Person Type/Print Authorized Person Name

(PLEASE SEE THE FOLLOWING INSTRUCTIONS REGARDING SIGNATURE)

(1) If bidder is an individual, enter name here in style used in business; if a joint venture, exact names of entities joining in the venture; if a partnership, the correct trade style of partnership if a corporation, the exact name of the corporation under which it is incorporated.

(2) If bidder is other than an individual, identify here its character, i.e. joint venture, partnership, corporation (including state of incorporation) etc. If bidder is an individual operating under a trade name, state "an individual dba" (trade name in full).

(3) State on this line the address to which all communications and notices regarding the Bid proposal and any contract awarded hereunder are to be addressed.

(4) If bidder is a joint venture, signature must be by one of the joint ventures and if one or both of the joint venture's is a partnership or a corporation each participating partnership must sign by a general partner, and each corporation by an authorized officer or employee; if a partnership, by a general partner; if a corporation, by an authorized officer or employee. The title of the person signing must appear after his signature. Where bidder is a partnership or a corporation, the names of all other general partners, or the names of the president and secretary of the corporation and their business addresses must be shown below:

NOTE: All signatures must be typewritten under written signature.

NOTE: All addresses must be complete with Street number, City and State.

SUBCONTRACTORS: Pursuant to the provisions of Sections 4100 to 4113 inclusive, of the Public Contract Code of the State of California, the undersigned hereby designates below, for the project, opposite various portions of the work, the names and locations of the places of business of each subcontractor who will perform work or labor in the amount in excess of one-half of one percent (½ of l%) of the amount of the total bid. All work not listed below shall be performed by the undersigned bidder. It is understood that the bidder, if awarded the contract, shall not substitute any subcontractor in place of the subcontractors herein designated subcontractor, or sublet or subcontract any of the work as to which a subcontractor is not herein designated without the consent of the City and approval of the Engineer. The subletting or subcontracting of any work for which there was no subcontractor designated in the original bid may be permitted upon written consent of the City Engineer. (List one firm only for each portion of work.)

Name & Address	License #	**Bid Item & Description of Work Assigned to Sub**	**Percent of Bid Item**

TOTAL PERCENTAGE OF WORK ASSIGNED TO SUBCONTRACTORS: **_____%**

_____
Signature of Bidder

_____
Title

REFERENCES

The following are the names, addresses, and phone numbers for three public agencies for which BIDDER has performed similar work within the past two years:

DESIGNATION OF SURETIES

The following are the names, addresses, and phone numbers for all brokers and sureties from whom BIDDER intends to procure insurance and bonds:

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NON-COLLUSION AFFIDAVIT

TO THE CITY OF PORTERVILLE:

The undersigned, in submitting a bid for performing the following work by contract, being duly sworn, deposes and says:

That he/she has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contract.

Work to be Done: Furnish to the City all labor, materials, equipment, transportation, and services for the construction of a new community center, park, and related appurtenances per plans and specifications on Henderson Avenue just east of Fourth Street.

_____
Bidder's Name

_____
Signature of Bidder

_____
Title

_____
Business Address

_____
Place of Residence

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Tulare

Subscribed and sworn to before me this _____ day of _____, 20__ by

_____ Proved to me on the basis of satisfactory

evidence to be the person who appears before me.

_____
Signature of Notary Public
(Note: this is a Jurat)

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WAIVER OF PROVISIONS FOR SUBSTITUTION OF SECURITIES
UNDER SECTION 22300, PUBLIC CONTRACT CODE

Under Section 3513 of the California Civil Code, the undersigned Contractor hereby acknowledges having read the following provisions of Section 22300 of the Public Contract Code:

> SECTION 22300. PERFORMANCE RETENTIONS: PROVISION FOR SUBSTITUTION OF SECURITIES: DURATION OF CHAPTER.
>
> Provisions shall be included in any invitation for bid and in any contract documents to permit the substitution of securities for any money withheld by a public agency to ensure performance under a contract. At the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the public agency, or with the state or federally chartered bank as the escrow agent, who shall pay such moneys to the Contractor upon satisfactory completion of the contract.
>
> Securities eligible for investment under this section shall include those listed in Section 16430 or bank or savings and loan certificates of deposit.
>
> The Contractor shall be the beneficial owner of any securities substituted for money withheld and shall receive any interest thereon.
>
> Failure to include these provisions in bid and contract documents shall void any provisions for performance retentions in a public agency contract.

Contractor further acknowledges that since financing for the project is provided in whole or in part by the United States of America, the Contractor is requested to execute a waiver under Section 3513 of the California Civil Code waiving the foregoing provisions of Section 22300 of the California Public Contract Code.

Therefore, based upon the foregoing, the undersigned hereby waives the foregoing provisions of Section 22300 of the California Public Contract Code for the purposes of this contract.

CONTRACTOR_____ Dated _____

By:_____

Signature

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CONTRACT AGREEMENT

COMMUNITY CENTER & PARK PROJECT
PROJECT NO: 89-9411-88
BID NO.: 24/25 - CP1977

THIS AGREEMENT, made and entered into this_____day of_, 2024, by and between the City of Porterville, a Municipal Corporation of the State of California, duly organized, existing and acting pursuant to the laws thereof with its principal place of business in the City of Porterville, California, hereinafter designated as the City, party of the first part, and

_____

_____ hereinafter designated as the Contractor, party of the second part,

WITNESSETH: That the parties hereto do mutually agree as follows:

ARTICLE I. The contract documents for the aforementioned project shall consist of the Notice Inviting Sealed Bids, Proposal, Standard Specifications, Special Provisions, Plans and all referenced specifications, details, standard drawings, and appendices; together with this Contract Agreement and all affidavits; and also including any and all addenda or supplemental agreements clarifying, amending, or extending the work contemplated as may be required to insure its completion in an acceptable manner. All of the provisions of said contract documents are made a part hereof as though fully set forth herein.

ARTICLE II. For and in consideration of the payments and agreements to be made and performed by the City, the Contractor agrees with the City to furnish all materials, equipment, tools and labor and construct facilities for the City; to perform and complete in a good and workmanlike manner all the work shown on the plans and described in the specifications; and to fulfill all other obligations as set forth in the contract documents.

Said awarded contract amount:

_____

ARTICLE III. Contractor agrees to receive and accept the prices set forth in the Proposal as full compensation for furnishing all materials, performing all work, and fulfilling all obligations hereunder. Said compensation shall cover all expenses, losses, damages, and consequences arising out of the nature of the work during its progress or prior to its acceptance including those for well and faithfully completing the work and the whole thereof in the manner and time specified in the aforesaid contract documents; and also including those arising from actions of the elements, unforeseen difficulties or obstructions encountered in the prosecution of the work, suspension or discontinuance of the work, and all other unknowns or risks of any description connected with the work.

ARTICLE IV. The City hereby promises and agrees to employ said Contractor to provide the materials to do the work according to the terms and conditions herein contained and referred to, for the prices aforesaid, and hereby contracts to pay the same at the time, in the manner and upon the conditions set forth in the specifications; and the said parties for themselves, their heirs, executors, administrators, successors, and assigns, do hereby agree to full performance of the covenants herein contained.

ARTICLE V. The Contractor shall have **Three Hundred Ninety (390) working days** from the date of receipt of the NOTICE TO PROCEED to complete the required work. The Contractor shall provide the means necessary to complete the required work within the allotted time frame. Should the Contractor fail to complete this contract, and the work provided therein within the time fixed for such completion, the Contractor shall become liable to the City for all loss and damage which the latter may suffer on account thereof; and it is hereby agreed and understood that it is and will be difficult and impossible to ascertain and determine the actual damage which the City will sustain in the event of, and by reason of, such delay. It is therefore agreed that said Contractor will pay to the City the sum of Three Thousand Dollars **($4,000) per day** for each and every day of delay beyond the time herein prescribed in finishing said work as liquidated damages, as herein provided, and in case the same is not paid, agrees that said City may deduct the amount thereof from any money due or that may become due said Contractor under this contract. All deductions from any money due the Contractor are considered to be liquidated damages and not a penalty. This paragraph does not exclude the recovery of damages under other provisions of the Contract Documents.

The Contractor shall not be charged with resulting damage if:

(1) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the City, acts of another contractor in the performance of a contract with the City, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers and;

(2) The Contractor, within 10 days from the beginning of any such delay, (unless the Engineer grants a further period of time before the date of final payment under the contract) notifies the Engineer in writing of the cause of delay. The Engineer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, the findings of fact justify such an extension, and his findings of facts shall be final and conclusive on the parties.

Should the contractor fail to begin work or halt work for a period of time equal to one-half (½) the original or amended contract completion time, the City shall call the contract bonds so the work can be completed by the City. Working days shall not include weather days, Saturdays, Sundays, or legal Federal holidays.

ARTICLE VI. Contractor acknowledges the provisions of the State Labor Code requiring 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 certifies compliance with such provisions.

ARTICLE VII. Contractor agrees to indemnify and hold harmless City and all of its officers, agents, employees, and assigns from any and all claims, demands, or causes of action, including related expenses, attorney's fees, and costs based on, arising out of, or in any way related to the work undertaken by Contractor hereunder, regardless of the existence of passive concurrent negligence on the part of the City or anyone acting under its direction or control or on its behalf. It is further the intent of the parties that this indemnification requirement is not intended to relieve City from liability for the active negligence of City, its officers, agents and employees.

ARTICLE VIII. Contractor affirms that the signatures, titles, and seals set forth hereinafter in execution of this Contract Agreement represent all individuals, firm members, partners, joint ventures, and/or corporate officers having a principal interest herein.

ARTICLE IX. The Notice Inviting Sealed Bids, Instructions to Bidders, Bid Proposal, Non Collusion Affidavit, Bidder's Bond, Bond for Faithful Performance, Bond for Material men and Laborers, Contract Agreement, Project Manual, and the Plans mentioned therein together with all appendices, all of which are hereto attached, are hereby incorporated in and made part of this Agreement.

ARTICLE X. Any controversy or claim arising out of or relating to this contract, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgement upon the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof.

IN WITNESS WHEREOF: The parties hereto have caused this Contract to be executed the day and year first above written.

CITY OF PORTERVILLE

(City Seal)

By _____
Martha A. Flores, Mayor

ATTEST:

_____
Patrice Hildreth, City Clerk

_____
Contractor

By _____

Title _____

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UNDERWRITER/BROKER CERTIFICATION

Entity: CITY OF PORTERVILLE, 291 N. Main Street, Porterville, CA 93257

Entity project identification:

_____

Entity providing contractual services:

_____

Insurer(s):

_____

Best rating(s):

_____

_____

___

Name and title of underwriter, broker, or agent completing certification:

_____

_____

____

I, the undersigned insurance underwriter, insurance broker, or agent do hereby certify that I have examined the insurance specifications prepared by the CITY for the above referenced project and have attached herewith certificates or insurance and all endorsements specified in the insurance specifications provided by the CITY.

I further certify that the coverage's provided to the CONTRACTOR/CONSULTANT and described in the certificates of insurance conform in all respects to the requirements set forth in the insurance specifications, including, but not limited to the following considerations:

1. The scope of insurance is at least as broad as the minimum requirements identified in the insurance specifications;

2. The minimum occurrence limits and aggregate limits of insurance are consistent with those set forth in the insurance specifications;

3. All deductibles and/or self-insured retentions have been declared;

4. All required endorsements identified in the insurance specifications have been provided and copies have been attached to the appropriate certificate of insurance;

5. All policies of insurance have been placed with insurers with a current rating from the A.M. Best Company of not less than A:VII;

6. All endorsements have been signed by a person authorized by the insurer to bind coverage on its behalf.

If the coverage's provided to the CONTRACTOR/CONSULTANT do not conform in all respects to the requirements set forth in the insurance specifications, an explanation of each and every variance from the specifications and an evaluation of the relative risk exposures and protections to the CITY and the CONTRACTOR/CONSULTANT are attached.

I understand that the CITY will not authorize the CONTRACTOR/CONSULTANT to initiate work on behalf of the CITY until this certification has been fully executed and returned to the CITY.

_____
Signature

_____
Date

_____
Name of Company

_____
Business Address

_____
Business Phone Number

SPECIAL PROVISIONS

PART 1 - SUPPLEMENTARY GENERAL PROVISIONS

STANDARD SPECIFICATIONS

The standard specifications of the City for all public works projects are contained in the latest edition, adopted by the City of Porterville of the 2018 Edition of the Standard Specifications for Public Works Construction ("The Greenbook"), including all supplements, as written and promulgated by the Joint Cooperative Committee of the Southern California Chapter of the American Public Works Association and the Southern California District of the Associated General Contractors of California. Copies of these standard specifications are available from the publisher, BNI Building News, Incorporated, 1612 South Clementine Street, Anaheim, CA 92802 phone 800/873-6397.

The Cal-Trans Standard Specifications are the State of California, Department of Transportation Standard Specifications, latest edition.

The Standard Specifications for Public Works Construction set forth above will control the general provisions, construction materials, and construction methods for this contract except as amended by the Plans, Special Provisions, or other Contract Documents.

The section numbers of the following Special Provisions coincide with those of the said Standard Specifications. Only those sections requiring amendment or elaboration, or specifying options, are called out.

DEFINITIONS

Whenever in the Standard Specifications the following terms are used, they shall be understood to mean the following:

AGENCY (State or Department) - The City of Porterville

ENGINEER - The City Engineer of the City of Porterville acting either directly or through properly authorized agents.

HIGHWAY RIGHT OF WAY - City Street/County/State Right of Way

PROJECT MANAGER - City employee assigned to manage the project.

ENGINEER-CITY-CONTRACTOR RELATIONS

A. Engineer's Responsibility and Authority. All work shall be done under the general supervision of the Engineer or the Engineer's designee(s). The Contractor shall bear all responsibility for, and have all control over, the construction means, methods,

techniques, sequences, procedures and safety precautions or programs; and the Engineer shall not have control over, nor bear responsibility for same. Nor will the Engineer have control over nor bear responsibility for the acts or omissions of the Contractor, Subcontractors, their agents or employees, or for failure of any of these to carry out the work in accordance with the contract documents. The Engineer has the right to reject work which does not conform to the contract documents. The Engineer has the authority to make and/or approve minor changes in the work. For more substantial changes, the Engineer will prepare and issue Change Orders. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, rate of progress of work, interpretation of Plans and Project Manual and all questions as to the acceptable fulfillment of the Contract on the part of the Contractor.

B. Engineer's Decisions. All claims of the City or the Contractor shall be presented to the Engineer for decision which shall be made in writing per the procedures listed in Section 5-1.43, "Potential Claims and Dispute Resolution," in the Standard Specifications. All decisions of the Engineer shall be final except in case which time and/or financial considerations are involved, which may be subject to ruling from the City Attorney.

C. Suspension of Work. The Engineer shall have the authority to suspend the work, wholly or in part, for such period or periods as may be deemed necessary, due to unsuitable weather or other such conditions as are considered unfavorable for the prosecution of work, or failure on the part of the Contractor to carry out the provisions of the Contract or to supply materials conforming to the requirements of the Project Manual. The Contractor shall not suspend operation without the Engineer's permission.

D. Contractor's Superintendent. A qualified superintendent, who is acceptable to the Engineer, shall be maintained on the work and give efficient supervision to the work to its completion. The Superintendent shall have full authority to act on behalf of the Contractor, and all direction given to the superintendent shall be considered given to the Contractor. In general, the Engineer's instructions shall be confirmed in writing and always upon written request from the Contractor.

E. Public/Private Property. The Contractor shall not enter upon private property for any purpose without obtaining permission; shall be responsible for the preservation of all public property, trees, monuments, etc., along and adjacent to the street and/or right-of-way; shall use every precaution necessary to prevent damage to pipes, conduits and other underground structures; and shall protect carefully from disturbance or damage all monuments and property marks. Any damage to properties resulting from work under contract shall be repaired or replaced to the satisfaction of the owner(s) of such properties. The Contractor shall not be entitled to additional payment for such repair or replacement of damaged property.

F. Separate Contracts. The City may let other contracts in connection with the work

of the Contractor. The Contractor shall cooperate with other Contractors with regard to the storage of materials and execution of their work. It shall be the Contractor's responsibility to inspect all work by other Contractors affecting the

work and report any irregularities which will not permit the work to be completed in a satisfactory manner. Failure to notify the Engineer of such irregularities shall indicate the work of the other Contractor has been satisfactorily completed to be compatible with this contract. The Contractor shall not be responsible for defects of which could not be known which develop in the work of others after the work is complete.

G. Subcontracts. At the time specified by the contract documents, or when requested by the Engineer, the Contractor shall submit in writing to the City, for approval of the Engineer, the names of the Subcontractors proposed for the work. Subcontractors may not be changed except at the request, and with the approval, of the Engineer. The Contractor is responsible to the City for the acts and omissions of Subcontractors, and of their direct and indirect employees, to the same extent as the Contractor is responsible for the acts and omissions of employees. The contract documents shall not be construed as creating any contractual relationship between any Subcontractor and the City. The Contractor shall bind every Subcontractor by the terms of the contract documents.

H. City's Right to Correct Deficiencies. Upon failure of the Contractor to perform the work in accordance with the contract documents, including any requirements with respect to the Schedule of Completion, and after five (5) days written notice to the Contractor and written receipt of approval from the Engineer, the City may, without prejudice to any other remedy it may have, correct such deficiencies from the Contractor. The expense so charged shall be deducted and paid by the City out of such monies as are, or may become, due under this contract, or if such monies are not sufficient to meet said expense, the additional monies shall be furnished by the Contractor, and if the Contractor refuses or neglects to provide the necessary monies, they shall be provided by the Contractor's surety.

I. City's Right to Terminate Contract and Complete the Work. The City shall have the right to terminate the employment of the Contractor upon receiving written notice from the Engineer stating cause for such action. In the event of such termination, the City may take possession of the work and of the materials, tools and equipment thereon and may finish the work by whatever means they select. It shall be considered a default by the Contractor whenever he shall:

1. Declare bankruptcy, become insolvent or assign his assets for the benefit of his creditors.

2. Disregard or violate important provisions of the contract documents or Engineer's instruction or fail to prosecute the work according to the agreed schedule of completion, including extensions thereof.

3. Fail to provide a qualified superintendent, competent workmen or Subcontractors, proper materials or fail to make prompt payment thereof.

Upon termination of the contract under this section, the City shall have the right to recover any excess or additional costs of completion above the contract price from the Contractor or his Performance Bond.

J. Oral Agreements. No oral order, objections, claim or notice by any party to the other shall affect or modify any of the terms or obligations contained in any of the contract documents; and none of the provisions of the contract documents shall be held to be waived or modified by reason of any act whatsoever, other than by a definitely agreed waiver, or modification thereof, in writing; and no evidence shall be introduced in any proceeding of any other waiver or modification.

ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

The contract documents are complimentary; what is called for in one is as binding as if called for in all. If the Contractor finds a conflict, error, or discrepancy in the contract documents, it shall be called to the attention of the engineer in writing before proceeding with the work affected thereby. In resolving such conflicts, errors, and discrepancies, the documents shall be given preference in the following order:

1. Contract Agreement
2. Plans
3. Project Manual

Within the Project Manual, the order of precedence is as follows:

1. Addenda
2. Supplementary General Provisions
3. Instruction to Bidders
4. General Provisions
5. City Standard Plans and Specifications for Public Works Construction
6. Standard Specifications

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

1. Figures govern over scaled dimensions
2. Detail plans govern over general plans
3. Change order plans govern over contract plans
4. Contract plans govern over standard plans
5. Contract plans govern over shop drawings

The submission of shop drawings that deviate substantially from the requirements of the contract documents must be accompanied by a written request for a change order.

SCOPE OF WORK

The work to be done consists of furnishing all labor, materials, equipment, transportation, and services for the construction of a new community center, park, and related appurtenances per plans and specifications on Henderson Avenue just east of Fourth Street.

LOCATION OF WORK

The general locations and limits of the work are on Henderson Avenue just east of Fourth Street (APN 253-050-093 & 253-050-089).

INSURANCE

The Contractor shall procure, and maintain for the duration of the contract, insurance against claims for injuries to persons or damages to property, which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees, or Subcontractors.

MINIMUM SCOPE OF INSURANCE

Coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage (occurrence form CG 00 01 11 88).

2. Insurance Services Office form number CA 00 01 06 92 covering Automobile Liability, code 1 (any auto).

3. Workers' Compensation Insurance as required by the State of California and Employer's Liability Insurance.

MINIMUM LIMITS OF INSURANCE

The Consultant shall maintain limits no less than:

1. General Liability: $1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

2. Automobile Liability: $1,000,000 per accident for bodily injury and property damage.

3. Employer's Liability: $1,000,000 per accident for bodily injury or disease.

DEDUCTIBLES AND SELF-INSURED RETENTIONS

Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the CITY, either: the insured shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers; or the Contractor shall provide a financial guarantee satisfactory to the City guaranteeing payment of losses and related investigations, claim administration and defense expenses.

OTHER INSURANCE PROVISIONS

The commercial general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

1. The City, its officers, officials, employees and volunteers are to be covered as insureds as respects: liability arising out of work or operations performed by or on behalf of the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor.

2. For any claims related to this project, the Contractor's insurance coverage shall be primary insurance as respects the City, its officers, officials, employees and volunteers. Any insurance or self-insurance maintained by the CITY, its officers, officials, employees or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

3. The Contractor shall provide an insurance certificate for each policy that states "CANCELLATION - SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER".

ACCEPTABILITY OF INSURERS

Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII, unless otherwise acceptable to the City.

VERIFICATION OF COVERAGE

Contractor shall furnish the City with a completed Underwriter/Broker Certification form along with original certificates and amendatory endorsements affecting coverage required by this clause. The endorsements shall conform to City requirements and, at the option of City, the endorsements shall be provided on forms provided by City. All certificates and endorsements are to be received and approved by the City before work commences. The City reserves the right to require complete, certified copies of all required insurance policies, including endorsements affecting the coverage required by this Project Manual at any time.

SUBCONTRACTORS

Contractor shall include all Subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each Subcontractor. All coverages for Subcontractors shall be subject to all the requirements stated herein.

This insuring provision and the one contained in the Standard Specifications, insofar as it may be adjudged to be against public policy or in violation of Insurance Code Section 11580.04, shall be void and unenforceable only to the minimum extent necessary so that the remaining terms of the insuring provisions, contained therein, may be within public policy and enforceable.

PRE-CONSTRUCTION MEETING

The Contractor shall meet with the Project Manager prior to the start of work to discuss any problems or questions that may come up. At this time the Contractor shall furnish a schedule, in either Microsoft Excel or Projects format, showing the tentative starting and completion dates and traffic control plan. The Contractor shall be responsible for contacting the City for arranging the pre-construction meeting in the l0 day period between notice of award and filing of contract document. Arrangements shall be made by contacting (559) 782-7462.

CONTRACT BONDS

The Faithful Performance Bond and the Material and Labor Bond shall each be for not less than one hundred percent (100%) of the total contract amount. The Material and Labor Bond shall remain in force until thirty-five (35) days after the date of recordation of the Notice of Completion. The Faithful Performance Bond will not be released until one year after said date. The Contractor is advised to read Article V of the contract relative to bonds.

All surety shall be in compliance with the requirements of the Code of Civil Procedure (Section 995.120).

AS BUILT PLANS

The Contractor shall maintain a control set of Plans and Project Manual on the project site at all times. All final locations determined in the field, and any deviations from the Plans and Project Manual shall be marked in red on this control set to show the as-built conditions. Upon completion of all work, the Contractor shall return the control set to the Project Manager. Final payment will not be made until this requirement is met.

GUARANTEE PERIOD

Besides guarantees required elsewhere, the Contractor shall and hereby does guarantee the work for a period of one (1) year after the date of acceptance of the work by the City. The

Contractor shall repair or remove and replace any and all work, together with any other work which may be displaced in so doing, that is found to be defective in workmanship

and/or materials within said one year periods, without expense whatsoever to the City, ordinary wear and tear and unusual abuse or neglect excepted. In the event of failure to comply with the above-mentioned conditions within one week after being notified in writing, the City is hereby authorized to proceed to have the defects remedied and made good at the expense of the Contractor, who hereby agrees to pay the cost and charges therefore immediately on demand. Such action by the City will not relieve the Contractor of the guarantees required by this article or elsewhere in the contract documents.

The performance bond, or a maintenance bond, shall continue in full force and effect for the guarantee period.

If, in the opinion of the City, defective work creates a dangerous condition or required immediate correction or attention to prevent further loss to the City or to prevent interruption of operation of the City, the City will attempt to give the notice required by this article. If the Contractor cannot be contacted or does not comply with the City's request for correction within a reasonable time as determined by the City, the City may, notwithstanding the provisions of this article, proceed to make such correction or provide such attention; and the costs of such correction or attentions shall be charged against the Contractor. Such action by the City will not relieve the Contractor of the guarantees required by this article or elsewhere in the contract documents.

This article does not in any way limit the guarantee on any items for which a longer guarantee is specified or on any items for which a manufacturer or supplier gives a guarantee for a longer period. The Contractor agrees to act as a co-guarantor with such manufacturer or supplier and shall furnish the City all appropriate guarantee or warranty certificates upon completion of the project. No guarantee period, whether provided for in this article or elsewhere, shall in any way limit the liability of Contractor or his sureties or insurers under the indemnity or insurance provisions of these General Provisions.

UTILITIES

Public Utility Locations. The Contractor shall contact Underground Service Alert (U.S.A.) at 811 and the correct City of Porterville Public Works departments to request utility marking prior to any excavation work.

The Contractor shall cooperate with the public utility companies who may be engaged on related or adjacent work and Contractor shall so conduct operations so as not to interfere with such work, nor to injure or damage such work.

The locations in public streets of pipes, conduits, and other facilities as furnished by the public utility companies and by the City, are indicated on the plans. However, the City makes no representation as to the accuracy of said locations (horizontal and vertical), and Bidders are herewith instructed to apply to companies and City departments concerned, for any additional information which may be required.

The fact that any underground facility is not shown on the plans shall not relieve the Contractor of his responsibility in protecting such underground facilities from injury or damage. Contractor is responsible for maintaining all existing utilities during construction and is responsible for all repairs of existing utilities during construction. It shall be the Contractor's responsibility to ascertain the existence of any underground improvements or facilities which may be subject to damage by reason of his operations. The contractor shall notify Underground Service Alert (USA) a minimum of 48-hours prior to the start of work. Upon exposing any utility's underground facility, the contractor shall notify that owner of that utility immediately.

Connections. The Contractor shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the public or private authorities having jurisdiction over the use of said fire hydrant or pipeline and from the public or private agency owning the affected water system. For each such connection made, the Contractor shall first attach to the fire hydrant, or pipeline, a valve and a meter, if required by said authority, of a size and type acceptable to said authorities and agency. The Contractor will be granted privilege to draw water from an authorized point of connection as needed for the proper execution of said contract. There will be no charge for the water if it is being used for the City project.

PROSECUTION, PROGRESS, AND ACCEPTANCE OF THE WORK

Construction Schedule and Commencement of Work. The Contractor's proposed Construction Schedule, in Microsoft Excel or Projects format, shall be submitted at the pre-construction meeting. The Contractor shall have **One Hundred Forty (140)** working days from the effective date of the NOTICE TO PROCEED to complete the required work. The Contractor shall submit periodic Progress Reports to the Project Manager by the tenth day of each month. The report shall include an updated Construction Schedule, in Microsoft Excel or Projects format. Any deviations from the original schedule shall be explained. Progress payments will be withheld pending receipt of any outstanding reports.

Contractor shall include changes to updated schedules that do not alter a critical path or extend the scheduled completion date compared to the current schedule. Changes may include:

- Adding or deleting activities
- Changing activity constraints
- Changing durations
- Changing logic

If any proposed change in planned work would alter the critical path or extend the scheduled completion date, submit a revised schedule within fifteen (15) working days of the proposed path.

TIME OF COMPLETION

The time for completion shall be as set forth in Article V of the Contract Agreement.

Working Day. **All of the Contractor's activities including daily clean up shall be confined to the hours between 7:00 a.m. and 4:00 p.m., Monday through Friday, excluding holidays**. Deviation from these hours will not be permitted without the prior consent of the Engineer, except in emergencies involving an immediate hazard to persons or property. In the event of either a requested or emergency deviation, inspection service fees will be charged against the Contractor. The service fees will be calculated at overtime rates including benefits, overhead, and travel time. The service fees will be deducted from any amounts due the Contractor.

SUSPENSIONS

Temporary suspension of work is covered under Section 8-1.06, "Suspensions," of the Caltrans Standard Specifications and gives the City Engineer the authority to suspend work. In areas subject to adverse weather, it is permissible to suspend an entire project if this action is considered to be in the best interest of the City. However, authority to suspend work is limited to the reasons stated in Section 8-1.06. Mutually agreed-upon suspensions are covered under Section 1-1.07 "Definitions," of the Caltrans Standard Specifications. During any suspension, the City will advise the Contractor under which maintenance will be performed.

PROJECT SITE MAINTENANCE

Comply with Section 7-8 of the Standard Specifications. To comply with dust control rules, limit or expeditiously remove accumulations of mud or dirt from adjacent public streets at the end of each workday. Do not use rotary brushes. Use a regenerative air sweeper with properly maintained dust filters. Remove "Trackout", within the urban areas, immediately when it extends more than 50 feet from work site and at the end of each workday. Failure to comply with any of these requirements will result in the Contractor being assessed $400 per day in penalties.

NOISE PRODUCED BY CONTRACTOR'S EQUIPMENT AND FACILITIES

A noise level limit of 86 db at a distance of fifty feet (50') shall apply to all construction equipment on or related to the job whether owned by the Contractor or not. The use of excessively loud warning signals shall be avoided except in those cases required for the protection of personnel.

WORK REQUIRING CITY PERSONNEL

The Contractor shall pay for City personnel labor, equipment and materials wherever City forces are called upon to repair marked water mains, services, valves, sewer mains, laterals, etc. Fee schedules for all City personnel and equipment are available upon request.

LABOR LAWS

The Contractor, and all Subcontractors, suppliers, and vendors, shall comply with all City, state and federal orders regarding affirmative action to ensure equal employment opportunities and fair employment practices. Failure to file any report due under said orders will result in suspension of periodic progress payments.

The Contractor shall ensure unlimited access to the job site for all equal employment opportunity compliance officers.

PERMITS

Prior to the start of any work, the Contractor shall take out the applicable City permits and make arrangements for City inspections. The Contractor and all Subcontractors shall each obtain a City business license and shall be licensed in accordance with the State Business and Professions Code. The Contractor shall also obtain, at his own cost and expense, any and all other permits, licenses, inspections, certificates, or authorizations required by any governing body.

CONSTRUCTION SURVEYING

Construction surveying will be provided by the City of Porterville. All re-staking and requested special staking will be at the Contractor's expense. See Section 2-9, "Surveying," of the Standard Specifications for Public Works.

PUBLIC CONVENIENCE AND SAFETY

Notice to the Public. Prepare a written notice to all property owners/occupants adjacent to and/or affected by the construction works and submit it for City approval not less than five days prior to start of construction. Include in the notice, the name of company, the name and phone number of the contact person(s) in your company and the date construction work will start. Deliver the notice to all owners/occupants of the property adjacent to and/or affected by the construction, not less than 48 hours prior to start of construction.

Traffic and Access. The Contractor shall comply with Section 7-10 of the Standard Specifications and Chapter 5 of the Cal-Trans Traffic Manual. The Contractor shall notify the occupants of all affected properties at least forty-eight (48) hours prior to any temporary obstruction of access. No overnight closure of any driveway will be allowed except as permitted by the Engineer.

Lane transitions shall not be sharper than a taper of thirty to one (30:1).

Clearances from traffic lanes shall be 5' to the edge of any excavation and 2' to the face of any curb, pole, barricade, delineator, or other vertical obstruction.

Street Closures, Detours, and Barricades. The Contractor shall prepare any traffic control or detour plans that may be required as directed by the Engineer. Refer to Section 01011 –

Special Instructions for construction phasing information for underground and paving operations.

Temporary traffic channelization shall be accomplished with flashing barricades and delineators. Temporary striping will not be allowed unless specifically permitted by the Engineer. The Contractor shall prepare any plans that may be required for temporary striping to the satisfaction of the Engineer. In no event will temporary striping be allowed on pavement surfaces to remain.

Public Safety Orders. The Contractor shall comply with the provisions of any ordinances or regulations regarding requirements for the protection of excavations and the nature of such protection.

LAWS TO BE OBSERVED

The Contractor shall give all notices and comply with all prevailing Federal, State and Local laws, ordinances and all such orders and decrees as exist, or may be enacted by bodies or tribunals having any jurisdiction or authority over the work, and shall indemnify and save harmless the City against any claim or liability arising from, or based on, the violation of any such law, ordinance, regulation, order or decree, whether by him/herself or his/her employees and Subcontractors.

A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

PAYROLL RECORDS

Certified payroll records shall be kept in the office of the Contractor for five years after completion of the work. Required payroll records should be submitted weekly to the City and should include daily and/or weekly status reports. Required certified payroll records from each contractor and subcontractor shall be smutted to the City no later than the 15th date of each month for the previous month's work. Progress payments will be withheld pending receipt and approval of any outstanding reports or if the records are not property certified. Progress payments will be withheld pending receipt and approval of any outstanding reports or if the records are not properly certified.

DUST ABATEMENT

The Contractor shall furnish all labor, equipment and means required, and shall carry out effective measures wherever and as often as necessary to prevent his

operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals or causing a nuisance to persons living or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from any dust originating from his operations. Dust abatement measures, in compliance with all applicable San Joaquin Valley Unified Air Pollution Control District Rules, shall be continued until the Contractor is relieved of further responsibility by the Engineer (see Compliance Assistance Bulletin dated April 2007 in the appendix).

MEASUREMENT AND PAYMENT

Partial and Final Payment. The closure date for periodic progress payments will be the twenty-fifth day of each month.

Authorization to pay is commonly received on the tenth day of the following month. However, payments will be withheld pending receipt of any outstanding reports required by the contract documents. In addition, the final progress payment will not be released until the Contractor returns the control set of Plans and Specifications showing the as-built conditions.

The full five percent (5%) retention will be deducted from all payments. The final retention will be authorized for payment thirty-five (35) days after the date of recordation of the Notice of Completion, provided no liens or stop notices are filed and required testing is completed (e.g., Mandril tests).

The Contractor may elect to receive one hundred percent (100%) of payments due under the contract from time to time without retention of any portion of the payments by the public agency by depositing securities of equivalent value with the public agency in

accordance with the provisions of Section 4590 of the Calif. Government Code. Such securities, if deposited by the Contractor, shall be valued by the Public Agency's Finance Director, whose decisions on valuation of the securities shall be final.

Prompt Payment

The City ensures that the following clauses or equivalent will be included in each DOT-assisted prime contract:

Prompt Progress Payment to Subcontractors

Section 7108.5 of the California Business and Professions Code requires prime contractors or subcontractors pay any subcontractor not later than 7 days of receipt of each progress payment, unless otherwise agreed to in writing with the City of Porterville. A declaration stating that all subcontractors have been paid to date and signed by the contractor or their authorized representative is to be submitted with each progress payment request.

Any violation of Section 7108.5 shall subject the violating contractor or subcontractor to

the penalties, sanctions and other remedies of that Section. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise, available to the contractor or subcontractor in the event of a dispute involving late payment, or nonpayment by the contractor, or deficient subcontractor performance, or noncompliance by a subcontractor.

Prompt Payment of Funds Withheld to Subcontractors

No retainage will be held by the agency from progress payments due the prime contractor. Any retainage kept by the prime contractor or by a subcontractor must be paid in full to the earning subcontractor in 30 days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment may take place only for good cause and with the City's prior written approval. Any violation of these provisions shall subject the violating contractor or subcontractor to the penalties, sanctions, and remedies specified in Section 7108.5 of the California Business and Professions Code. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise, available to the prime contractor or subcontractor in the event of a dispute involving late payment, or nonpayment by the contractor, or deficient subcontractor's performance, or noncompliance by a subcontractor.

Delivered Materials. Materials and equipment delivered but not incorporated into the work, will not be included in the estimate for progress payment.

Final Payment. After the Contractor has completed all the work to be performed to the approval of the Engineer, and in strict accordance with the Plans, Specifications and Contract, the Engineer shall measure the work and prepare a final estimate of the total amount payable to the
Contractor. The estimate shall be itemized as to contract item quantities, extra work and any other basis for payment and shall show all deductions made or to be made for prior

payments and amounts to be kept or retained under the provision of the Contract. All prior estimates and payments shall be subject to correction in the proposed final estimate. Within 30 days after said final estimate has been submitted to the Contractor, he shall submit to the Engineer his written approval thereof. No claim will be considered that was not included in the proposed final estimate.

On the Contractor's approval, or if he files no claim within said period of 30 days, the Engineer will submit the final estimate of the total amount payable to the City Manager. If the City Council is satisfied the work has been properly completed and the final estimate is correct, and properly stated, the City will pay the Contractor ninety percent (90%) of the sum found to be due.

The date on which the City Council accepts the improvement shall be the beginning of the maintenance or warranty period.

COOPERATION AND COLLATERAL WORK

The Contractor shall be required, under contract, to work in conjunction with other affected agencies or companies for relocation or adjustment of their facilities. Coordination efforts will be discussed at the preconstruction meeting prior to starting the project. Every effort will be made to provide for the timely completion of all aspects of this project.

PREVAILING WAGE RATES

Pursuant to Subsection 1773 of the Labor Code of the State of California, the City has obtained from the Director of the Department of Industrial Relations, the general prevailing rate of per diem wages and the general prevailing rate required to execute the contract. Prevailing wage rates can be obtained at http://www.dir.ca.gov/DLSR/PWD. Said prevailing rate of per diem wages will be made available to any interested party upon request, and a copy thereof shall be posted at each job site.

STATUTORY PENALTY FOR FAILURE TO PAY MINIMUM WAGES

In accordance with Subsection 1775 of the California Labor Code, the Contractor and any subcontractor under the contractor shall, as a penalty to the State or political subdivision on whose behalf the contract is made or awarded, forfeit not more than two hundred dollars ($200) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rates as determined by the director for any public work done under the contract by the Contractor or by any Subcontractor under the Contractor.

STATUTORY PENALTY FOR UNAUTHORIZED OVERTIME WORK

In accordance with Subsection 1813 of the California Labor Code, the Contractor or subcontractor shall, as a penalty to the State or political subdivision on whose behalf the contract is made or awarded, forfeit twenty-five dollars ($25.00) for each worker employed

in the execution of the contract by the respective contractor for each calendar day during which the worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of Subsections 1810 through 1815 of the California Labor Code. In awarding any contract for public work, the awarding body shall cause to be inserted in the contract a stipulation to this effect. The awarding body shall take cognizance of all violations of this article committed in the course of the execution of the contract, and shall report them to the Division of Labor Standards Enforcement

CERTIFIED PAYROLL

In compliance with Subsection 1776 of the State Labor Code and Subsections 16400, 16401, 16402 and 16403 of the State Administration Code, each Contractor and Subcontractor shall keep accurate certified 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 or her in connection the public work. 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:

- The information contained in the payroll record is true and correct.
- The employer has complied with the requirements of Sections 1771, 1811, and 1815 for any work performed by his or her employees on the public works project.

Said payroll records shall be made available to the City upon request at no charge. Progress payments will be withheld pending receipt and approval thereof.

EXTRA WORK AND FORCE ACCOUNT

The City Contract Representative may order extra work or make changes by altering, adding to, or deducting from the Work via Change Order. Additionally, new and unforeseen work will be classed as extra work when such work cannot be covered by any of the various items or combination of items for which there is a bid price.

All Change Order work shall be performed under the same terms and conditions of the original description of the Work, except for any extension of completion times necessitated by said Change Order(s). Certified payrolls shall be submitted with each billing for extra work.

The value of any additional work ordered by the City shall be determined as follows:

a. By unit prices in the Construction Services Agreement or the Contract; or

b. By estimate and acceptance in a lump sum; or

c. By a fixed fee; or

d. By force account.

The Contractor shall do no extra work except upon written order from the City Contract Representative. For such extra work the Contractor shall receive payment as previously agreed upon in writing, or Contractor shall be paid on force account. In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss to life and/or property. The Contractor shall immediately notify the City Contract Representative of any work performed under this provision. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be reviewed and determined as provided in this section.

If the work is done on force account, the Contractor shall receive actual cost of all materials furnished by him as shown by his paid vouchers plus fifteen percent (15%). However, the City reserves the right to furnish such materials required as it deems expedient and the Contractor shall have no claim for profit on the cost of such materials.

For all labor that is necessary, the Contractor shall receive the actual amount paid for labor including benefits as shown on certified payrolls or the current prices in the locality which shall have been previously determined and agreed to in writing by the Engineer and the Contractor, whichever is less, plus fifteen (15%) percent. The price paid for labor shall also include compensation insurance paid by the Contractor on the labor supplied as evidenced by a billing from the insurance carrier.

For all equipment that is necessary, Contractor shall receive the current prices in the locality which shall have been previously determined and agreed to in writing by the City Contract Representative and by the Contractor, plus fifteen percent (15%).

The additional fifteen percent (15%) the Contractor shall receive on extra work for materials, labor and/or equipment includes the cost of bonds, insurance, overhead and profit for the work.

For work deleted from the contract, the Contractor shall provide an additional 15% credit on all materials, labor, and equipment. This shall not apply to the reduction of unit priced bid item quantities specifically identified in the contract Bid Schedule.

For all extra work performed by a subcontractor, the Contractor shall receive actual cost of the work plus five percent (5%). This additional five percent (5%) the Contractor shall receive includes the cost of bonds, insurance, overhead and profit for the work. Likewise, for subcontracted work deleted from the contract, the Contractor shall provide an additional 5% credit for all materials, labor, and equipment. This shall not apply to the reduction of unit priced bid item quantities specifically identified in the contract Bid Schedule.

All extra work and/or force account work shall be documented daily upon report sheets prepared by the City Contract Representative, furnished by the Contractor, and signed by both parties, which daily reports shall thereafter be considered the true record of extra work or force account work done.

Daily reports shall be submitted no later than the second working day following the work for labor and equipment involved and no later than the fifth working day for material invoices and specialized forces. Unless otherwise permitted by the City Contract Representative, no payment will be made for extra work on a force account basis if it has not been reported within the time and in the manner specified.

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PART 2 - CONSTRUCTION MATERIALS & METHODS

CONSTRUCTION MATERIALS

Construction materials shall comply with all applicable sections of the following:

1. Standard Specifications for Public Works Construction (Greenbook), 2018 edition adopted by the City of Porterville.

2. Standard Plans and Specifications of the City, current edition.

3. Standard Specifications, State of California Department of Transportation (Cal-Trans), latest edition adopted by the City of Porterville.

The Standard Plans and Specifications of the Agency and with the specific requirements of the Special Provisions.

CONSTRUCTION METHODS

Construction methods shall comply with all applicable sections of the Standard Specifications for Public Works Construction ("The Greenbook") 2018 edition adopted by the City of Porterville, the Standard Plans and Specifications of the City and with the specific requirements of the Special Provisions unless noted otherwise herein.

Rejected Work. The Engineer may reject work, which is not done in accordance with the contract. All work, which has been rejected, shall be remedied or removed and replaced by the Contractor in an acceptable manner and no compensation will be allowed for such removal, replacement or remedial work.

Any work done beyond the boundaries established by the engineer or any work as hereinafter specified which is done without proper permits, inspection and testing, will be considered as unauthorized work and will be rejected. Upon order of the Engineer, unauthorized work shall be remedied, removed, or replaced at the Contractor's expense.

Upon failure of the Contractor to comply promptly with an order, the Engineer may cause rejected or unauthorized work to be remedied, removed or replaced, and deducts the cost from any money to become due to the Contractor.

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PART 3 – TECHNICAL SPECIFICATIONS

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SECTION 01011 – SPECIAL INSTRUCTIONS

PART 1 – GENERAL

1.01 TIME FOR COMPLETION

A. Work shall be completed in 390 working days from the date of the Notice to Proceed. Work shall commence no later than 10 calendar days after the Notice is received.

B. Contractor shall review and comply with Section 1.02, SUSPENSION OF and 1.03, SEQUENCING/ORDER OF WORK.

1.02 SPECIAL NOTE TO CONTRACTOR

A. The Contractor is hereby notified that any negligent act by the Contractor that requires the City staff and equipment to implement repairs will be charged to the Contractor. A negligent act includes, but is not limited to, hitting a marked water main, sewer main, storm drain, or damaging asphalt or concrete improvements outside the project limits.

B. A pay rate schedule for City crews and equipment is available to the Contractor upon request.

1.03 CONSTRUCTION NOTIFICATION SIGN

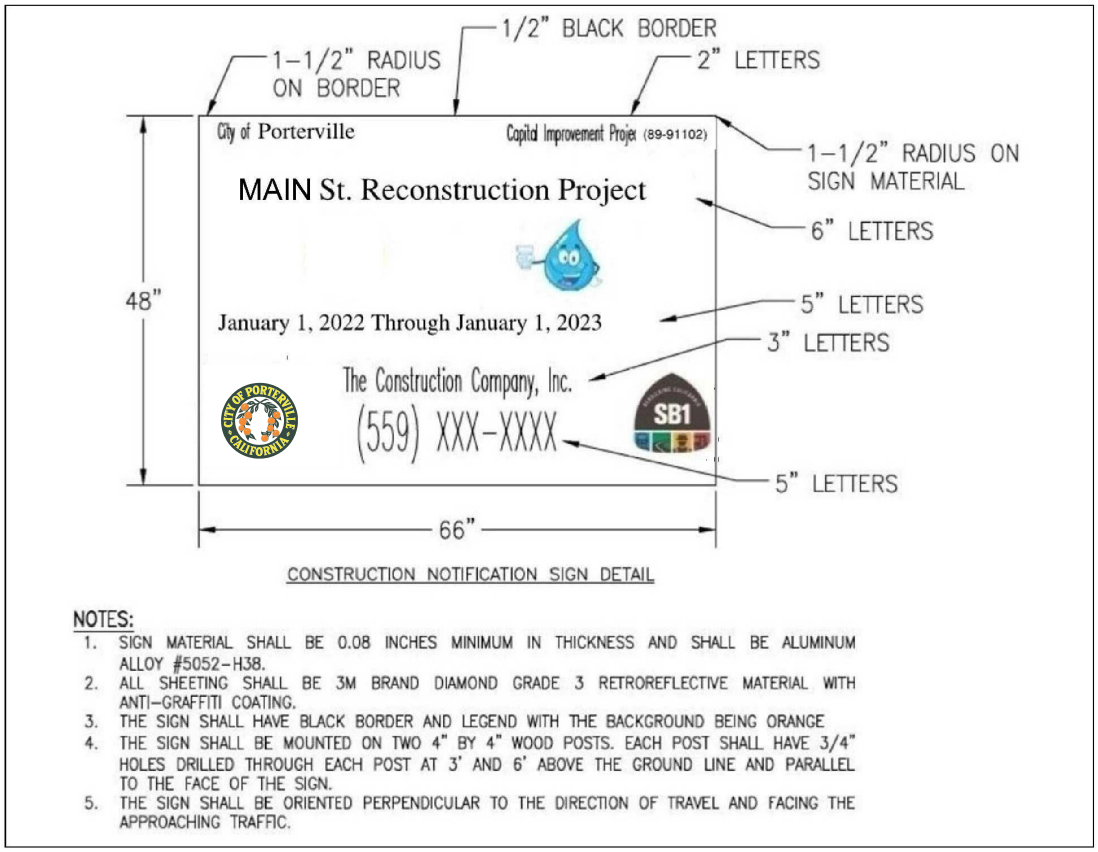
A. Construction notification signs shall be installed at or near the north and south limits of the project or as required by the City Engineer, notifying the public of (illustration is example only):
   a. Project name, and
   b. Project duration, and
   c. Contractor's company name with contact telephone number, and
   d. City Seal, and
   e. Prop 68 logo

B. Construction notification signs shall be installed as required by the Engineer. The sign's overall dimension shall not exceed 48 inches in height by 66 inches in width. The lettering size, sign materials, and related sign configuration is shown. The contractor shall submit a drawing of the proposed sign showing the project wording to be displayed and the size of the lettering prior to the fabricating of the signs. A map shall be included with the submittal showing the location of each construction notification sign. Since the project will involve multiple phases, the signs shall be relocated accordingly, as directed by the Engineer.

C. The contractor is responsible for maintaining the sign for the duration of the project. The sign shall be mounted on posts and conform to the 2018 Standard Plans, pages RS-1 through RS-4, of the State of California Department of Transportation.

D. The construction notification signs shall be removed within five (5) days of the completion of the project.

E. If, any sign is damaged or in the opinion of the City needing to be repaired or replaced, the contractor shall repair or replace the sign within twelve (12) hours of being notified. Full compensation for the repair or replacement of the construction notification sign(s) shall be considered as included in the contract price paid for the related item of work and no additional compensation will be allowed, therefore.



CONSTRUCTION NOTIFICATION SIGN DETAIL

NOTES:

1. SIGN MATERIAL SHALL BE 0.08 INCHES MINIMUM IN THICKNESS AND SHALL BE ALUMINUM ALLOY #5052-H38.
2. ALL SHEETING SHALL BE 3M BRAND DIAMOND GRADE 3 RETROREFLECTIVE MATERIAL WITH ANTI-GRAFFITI COATING.
3. THE SIGN SHALL HAVE BLACK BORDER AND LEGEND WITH THE BACKGROUND BEING ORANGE.
4. THE SIGN SHALL BE MOUNTED ON TWO 4" BY 4" WOOD POSTS. EACH POST SHALL HAVE 3/4" HOLES DRILLED THROUGH EACH POST AT 3' AND 6' ABOVE THE GROUND LINE AND PARALLEL TO THE FACE OF THE SIGN.
5. THE SIGN SHALL BE ORIENTED PERPENDICULAR TO THE DIRECTION OF TRAVEL AND FACING THE APPROACHING TRAFFIC.

END OF SECTION

City of Porterville

Fourth Street Community Center and Park Specification Manual

Date: 10/9/2024

RRM Design Group
3765 South Higuera, Suite 102
San Luis Obispo CA, 93401

RRM Project No.: 2883-01-RC22

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Section 01 1000
Summary

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Fourth St Community Center & Park

B. Owner's Name: City of Porterville.

C. Architect's Name: RRM Design Group.

D. This project generally includes, but is not limited to the Improvements of approximately 6.6-acre site:
   1. Demolition of existing curb, gutter, and asphalt along Henderson ave.
   2. Construction of a community center, parking lot, Mini-pitch soccer field, splash pad, challenge course, rock climbing boulder, pumptrack, fitness areas, sidewalks,trash enclosure, picnic areas, shade structures, playground, and landscaping.
   3. Electrical utilities, including the extension of new service to the site for community center, pedestrian and parking lot lighting.
   4. Site utilities, including storm-drain, sewer and water.
   5. Stormwater management utilizing bmps including bioretention basins.
   6. New irrigation system utilizing recycled water and potable water at new points of connection.
   7. New tree, shrub, and turf-grass planting.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Bid Documents .

1.03 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 1000

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Section 01 2500
Substitutions

PART 1 - GENERAL

1.01 "Or Equal" Substitutions

A. One Product Specified: Unless the Specifications state that no substitution is permitted, whenever in the Contract Documents any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction is indicated or specified by name, make, trade name, or catalog number, with or without the words “or equal”, such specification shall be deemed to be used for the purpose of facilitating description of material, process, or article desired and shall be deemed to be followed by the words “or equal”. Contractor may, unless otherwise stated, offer any material, process, or article, which shall be substantially equal or better in every respect to that so indicated or specified and will completely accomplish the purpose of the Contract Documents.

B. Two or More Products Specified: When two or more acceptable products are specified for an item of the Work, the choice will be up to the Contractor. Contractor shall utilize the same product throughout the Project. If a timely substitution request as set forth in Section 1.02.A. is not provided and an “or equal” substitution is requested, the Owner may consider the substitution only if the product specified is no longer commercially available.
   1. The burden of proof as to the equality of any material, process or article shall rest with the Contractor, and the Contractor shall submit all data substantiating a request for an “or equal” substitution item as provided in Section 3400 of the Public Contract Code, Specification Section 01 3300 and other specific sections of the specifications prior to Award of Contract.

1.02 Request for Substitutions

A. Substitute Request Form: Requests for substitutions of products, materials, or processes other than those specified must be made on the Substitution Request form attached. Requests must be submitted fourteen (14) calendar days prior to the date of the Bid Opening to be considered. An addendum will be issued seven (7) calendar days prior to Bid Opening, identifying all equipment and materials deemed equivalent to those specified and approved by the Architect.

B. Substitution Request Content: A substitution request must constitute a representation that the subcontractor/general contractor:
   1. Has investigated proposed product and determined that it is equal in quality and serviceability of the specified item.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other work, which may be required for the work to be complete with no additional cost to General Contractor / Owner.
   4. Will be acceptable in consideration of the required design and artistic effect.
   5. Will require no excessive or more expensive maintenance including adequacy and availability of replacement parts.

6. Waives claims for additional costs or time extension, which may subsequently become apparent.
7. Will reimburse Owner for review or redesign services by the Architect and re-approval fees by authorities, agencies, or the Owner.

C. Substitution Submittal Procedure:
1. Contractor shall furnish four (4) copies of the requested information sufficient to determine whether the proposed substitution is equivalent including, but not limited to, all drawings, specifications, samples, performance data, calculations, and other information as may be required to assist the Architect and the Owner in determining whether the proposed substitution is acceptable.
2. The final decision shall be the Owner's. Owner may condition its approval of the substitution upon delivery to Owner of an extended warranty or other assurances of adequate performance of the substitution.
3. If the Substitution is Permitted: The Contractor shall be solely and directly responsible for fitting approved substituted material and equipment into the available space in a manner acceptable to the Owner and for the proper operation of the substituted equipment with all other equipment with which it may be associated. The Contractor shall bear all costs of meeting the above requirements for presenting a proposed substitution, and if the substitution is accepted, the Contractor must bear all costs involved including costs of Construction Manager's, Architect's, and Engineer's services required in adapting the substituted material or equipment to the installation to the complete satisfaction of the Owner.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SUBSTITUTION OF "OR EQUAL" PRODUCT

Date:

Company:

Contact Person:

Address:

Telephone: **Fax:**

Plan Sheet:

Specification Section:

Listing of Proposed “Or Equal” Products:

Section 01 2613
Interpretation of Contract Documents (Prior to Bid)

PART 1 - GENERAL

1.01 Interpretation of Contract Documents

A. If any firm contemplating submitting a bid for the proposed contract is in doubt as the true meaning of any part of the drawings, specifications, or other Contract Documents, or finds discrepancies in, or omissions from the drawings or specifications, he or she shall submit to the Architect a written request (use attached "Request for Interpretation" form) 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 and will be faxed or e-mailed and/or mailed to each person receiving set of such documents. Owner will not be responsible for any other explanation or interpretation of the Contract Documents.

1.02 Requests for Interpretation

A. Page 2 of Section 01 2613 is a form titled, "Request for Interpretation". Bidders are to use this form to submit written requests for interpretations or corrections by fax or e-mail to the Owner's Architect:

RRM Design Group
(805) 543-4609 Fax
Attention:Lance Wierchem
E-mail address: ldwierschem@rrmdesign.com

To expedite the inpretation process, interpretations may be faxed or e-mailed to bidders as addenda, follow-up hard copies may be delivered by mail.

B. All information must be filled out on the form as pertains to the Contractor's information: Company name, address, phone number, fax number, e-mail, contact person, date, and time of request. Questions or Requests for Clarification are to be printed or typed on these forms. If bidders have several questions, which will not fit on one form, the bidder is to photo copy the form, number each page, and submit multiple forms.

C. Deadline for Requests for Interpretation: All requests for interpretation must be received by noon on the tenth (10th) calendar day preceding the bid date.

END OF SECTION

REQUEST FOR INTERPRETATION OF CONTRACT DOCUMENTS

Date: **Time:**

Company:

Contact Person:

Address:

Telephone: **Fax:**

E-mail:

Plan Sheet:

Specification Section:

Interpretation Requested:

Reply: See Addendum # _____ item # _____

Issued:

Section 01 3119
Project Meetings

PART 1 - GENERAL

1.01 Preconstruction Conference

A. Prior to commencement of work, a preconstruction conference will be held to discuss procedures to be followed during the progress of the work.

B. Location: A convenient site for all parties designated by the Owner.

C. Attending shall be:
1. Owner's Representative
2. Architect or Architect's designated representative.
3. Contractor
4. Contractor's Superintendent
5. Major Listed Subcontractors
6. Others subcontractors as appropriate
7. Testing Lab and Inspection

1.02 Labor Compliance Program Meeting

A. Prior to commencement of work, a labor compliance conference will be held to discuss procedures to be followed during the progress of the work.

B. Location: A convenient site for all parties designated by the Owner.

C. Attending shall be:
1. Owner's Representative
2. Architect or Architect's designated representative.
3. Contractor
4. Contractor's Superintendent
5. All Subcontractors
6. Testing Lab and Inspection

1.03 Proposed Progress Meetings

A. Weekly progress meetings will be conducted by the Construction Manager.

B. Location: Construction Manager's field office

C. Attending shall be:
1. Construction Manager/Project Inspector
2. Contractor's Project Manager
3. Contractor's Superintendent
4. Subcontractors, as appropriate to the issues to be reviewed

5. Suppliers, as appropriate to the issues to be reviewed
6. Others, as appropriate to the issues to be reviewed
7. Owner's Representative
8. Architect or Architect's designated representative.
    a. Consultants, as appropriate to the issues to be reviewed, as determined by the Construction Manager

D. Construction manager will take and distribute meeting notes to the attendees. Attendees taking exception to anything in the meeting notes shall state same in writing, directed to Construction Manager within five (5) working days following receipt of meeting notes.

1.04 Billing Meetings

A. As part of the last progress meeting each month, the Construction Manager may schedule and hold a billing meeting for the purpose of agreeing on the percentage of the work completed up to that date and establishing the amount to be requested in the Application for Payment.

B. Location: Construction Manager's field office

C. Attending shall be:
1. Construction Manager
2. Owner's Representative
3. Contractor
4. Architect or Architect's designated representative.

D. Prepare an itemized draft of the month's proposed billing for review with the Project Team at the billing meeting.

E. Following review of the proposed billing, revise as required, prepare Application for Payment, and submit to the Construction Manager. The Construction Manager will review, certify, and forward it to the Owner, who will authorize payment upon receipt of partial waivers of lien from the Contractor for previous payment, monthly certified payroll, and updated progress schedule.

1.05 Guarantee/Warranties, Bonds, and Service and Maintenance Contracts Review Meeting

A. Eleven months following date of final completion and acceptance of the Owner, the Contractor shall arrange for and hold a meeting at the Project Site for the purpose of review of guarantees/warranties, bonds, and service and maintenance contracts for materials and equipment. Contractor shall notify the following attendees of the date and time at least seven (7) days in advance. Contractor shall take action as appropriate to implement repair or replacement of defective items, and to extend service and maintenance contracts.

B. Attending shall be:
1. The Owner's Representative
2. Construction Manager
3. Architect or Architect's designated representative.
4. Contractor
5. Subcontractors, as appropriate to the agenda
6. Suppliers, as appropriate to the agenda

7. Others, as appropriate to the agenda

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED.

End of Section 01 3119

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Section 01 3126
Electronic Communication Protocols

PART 1 GENERAL

1.01 SUMMARY

A. Utilize a web based construction project management collaboration software to submit, track, distribute and collaborate on project documentation and action items.

B. The intent of utilizing a web based construction management application is to reduce cost and schedule risk, improve quality and safety, and maintain a healthy team dynamic by improving information flow, reducing non-productive activities, reducing rework and decreasing turnaround times.

1.02 SOFTWARE CAPABILITIES (including but not limited to)

A. Daily Log
   1. Provide daily log entry from web and mobile with automatic capture of daily weather conditions.
   2. Provide ability to attach photographs to entries directly from mobile.
   3. Provide reporting capabilities to easily report on man-hours and activities for a certain time frame and contractor.

B. Dashboards
   1. Provide a dashboard that shows the status of all currently assigned items with drill down capability to see the subject, assignee and due date of each item.

C. Deficiency Tracking
   1. Provide a means for recording, assigning and confirming completion of any deficiency or observation noted during the course of construction. Must be accessible from web and mobile.

D. Directory
   1. Provide a directory of all team member's contact information that is accessible from web and mobile.

E. Documents
   1. Provide a storage location for miscellaneous project documents with the ability to have a folder hierarchy and privacy settings on folders.
   2. There should not be a storage limit.
   3. Provide download tracking.
   4. Provide the ability to revision and check out files, with access to all previous revisions.

F. Drawings
   1. Provide access to a system maintained current set of drawings on web and mobile, with access to all previous revisions as well.
   2. Provide automatic hyperlinking capability for detail callouts.

3. Provide drawing markup capabilities on web and mobile.
4. Provide ability to link RFIs, Submittals, Punchlist Items, Photos and Project Documents to the drawings.
5. Drawing Markups should be carried forward when new revisions are uploaded.
6. Markups and linked documentation should be able to be public or private.

G. Financial Management
1. Provide ability to manage contracts, payment applications and change orders through the software.
2. Provide ability to view contracts and change orders from web and mobile.

H. Inspections
1. Provide ability to create inspections from web and mobile.
2. Provide ability to create a deficiency item from an inspection that can be assigned and tracked to completion.

I. Meetings
1. Provide ability to create, edit and view meeting minutes from web and mobile.
2. Provide ability to create action items with assignees and due dates from a meeting item.

J. Mobile Accessibility
1. Provide native mobile applications for iOS and Android phones at a minimum that provide access to relevant project documentation, including as-built versions of Drawings and Specifications, even when there is no internet access.

K. Photos
1. Provide ability to upload and view photos from web and mobile.
2. Provide ability to markup photos from mobile to clarify anything important in the photo.
3. Provide ability to link photos to specific locations on drawings.

L. Punchlist
1. Provide ability to create punchlist items from web and mobile and link them to specific locations on the drawings.
2. Provide ability to distribute punchlist items to all contractors, for contractors to mark them as resolved with photographic proof of resolution via mobile, and for the items to be marked as complete via mobile or web.

M. Requests for Information (RFIs)
1. Provide ability to create RFIs with assignees, due dates and attachments.
2. Provide ability for assignees to respond to RFIs both via the software and by responding to the system generated email.
3. Provide an auto-generated log of all RFIs.

N. Schedule
1. Provide ability to display schedules from typical scheduling software such as Microsoft Project, Primavera P3, Primavera P6 or Asta Powerproject.

O. Specifications
1. Provide ability to upload project specifications and manage them at the individual specification level.

2. Provide ability to view and search specifications on web and mobile.
3. Provide ability to upload revisions to individual specifications and maintain all revision history.
4. Provide an auto-generated current specification log that provides access to the current version of each specification.
5. Provide ability to link specifications to submittals and view the specification from the submittal.

P. Submittals
1. Provide ability to upload a submittal register of all expected submittals.
2. Provide ability to create multi-step approval workflows for submittals, with reminder notifications for the current assignee.
3. Provide the ability to upload any file type without size restrictions.
4. Provide an auto-generated submittal log.

1.03 TECHNOLOGY

A. Fully web based with mobile apps for Windows, iOS and Android phones.

B. Accessible without logging in through a virtual private network (VPN).

C. Works on the current version of Internet Explorer, Google Chrome, Mozilla firefox and Apple Safari browsers.

D. Can generate emails automatically, and all attachments are included in the emails via download links to avoid emails not being delivered due to size.

E. PDF output of forms such as RFIs, Submittals, Meetings, Change Orders, etc. should be available and customizable.

1.04 TRAINING AND SUPPORT

A. The software must provide support to all parties via email, phone and live chat at no additional charge.

B. The software must provide training in the form of self-paced learning videos as well as interactive webinars.

C. The contractor shall hold a kickoff meeting with the Owner and applicable consultants at the beginning of the project to discuss how the software will be used, routing & naming protocols, etc.

PART 2 PRODUCTS

2.01 UTILIZATION OF PROCORE

A. This project will utilize Procore's (www.procore.com) project management and collaboration system for all project documentation. Contrator and subcontractors will be invited to, and are required to create a Procore username (email) and password if they do not already have one.

Contrators will be expected to obtain drawings, sketches, RFIs, meeting minutes, coordination drawings, change information, etc. via this application. Contractor will notify subcontractors as relevant items are added. It will be the responsibility of the Contractor to regularly check and review updated documents as they are added. Applicable team members of the Contractor are required to complete a free, one-hour subcontractor training certification course located at http://learn.procore.com/procore-certification-subcontractor within (2) two weeks following contract execution. There will be no cost to this Contractor for use of Procore.

B. It is recommended that the Contractor provide mobile iOS or Android devices with the Procore App installed to at least one individual on-site to provide real-time access to current posted drawings, specifications, RFIs, submittals, project documents, as well as any deficient observations or punch list items. Providing mobile access will improve communication, efficiency, and productivity for all parties.

PART 3 EXECUTION

3.01 PROCEDURES

A. RFIs and Submittals
   1. The Contractor will be responsible for submitting all RFIs and Submittals through the software and assigning them to the appropriate parties.
   2. Architects / Engineers / Consultants etc. are responsible for posting all responses to these items via the software, including all relevant attachments.
   3. The Contractor will distribute responses to all affected subcontractors and confirm agreement with the response by closing the item.

B. Construction Documentation
   1. The Contractor will manage Drawings, Specifications and Documents in the software to ensure that the current version of all applicable construction documentation is available to the entire team via web and mobile.
   2. The Contractor will ensure that all RFIs which modify the current drawings are posted to the drawings and available via web and mobile within 24 hours of the RFI being responded to.

C. Contractor will record and distribute meeting minutes and action items via the software.

D. Contractor will take daily site photos and make them publicly available.

E. Punchlist
   1. All punchlist items will be managed through the software.
   2. Punchlist items will be created by the Contractor while walking with the Owner and applicable consultants.
   3. It will be at the Owner's discretion whether or not Punchlist Items can be closed while a representative from the Owner or applicable consultant is not present.

F. General
   1. It is intended that the contractor will utilize the software for at least all functions identified in "Section 1.02 - Software Capabilities."

3.02 PRICING

A. The cost of Procore Technologies services has been paid in full by the Owner.

B. The software must allow for unlimited users to ensure that all parties have access to the system.

END OF SECTION 01 3126

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Section 01 3216
Construction Progress Schedule

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work under this section shall consist of furnishing computerized Critical Path Method (CPM) contract schedule showing in detail how the Contractor plans to execute and coordinate the work.

1.02 SUBMITTALS

A. CPM Contract Schedule
   1. Within seven (7) calendar days after receiving Notice to Proceed, Contractor shall furnish the Owner's Representative, Architect and Construction Manager each, two (2) prints of a CPM contract schedule (six copies total).
   2. Construction Manager will review the CPM contract schedule for conformance with the requirements of the contract. Within seven (7) calendar days after receipt, Owner's Representative will accept the CPM contract schedule or will return it with comments. If the proposed CPM contract schedule is not accepted, Contractor shall revise the schedule to incorporate comments and resubmit the schedule for acceptance within seven (7) calendar days after receiving it.

B. Construction Progress Schedule
   1. Contractor shall submit to the Construction manager, Architect and Owner's Representative each month an up-to-date status report of the work.

1.03 GENERAL REQUIREMENTS

A. The contract schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. The responsibility for developing the contract schedule and monitoring actual progress as compared to the schedule rests with the Contractor.

B. Failure of the contract schedule to include any element of the work, or any inaccuracy in the contract schedule, will not relieve the Contractor from responsibility for accomplishing all the work in accordance with the contract.

C. No constraint on any activity is allowed in the schedule unless it is required by the contract. The schedule should reflect a logical flow of the project activities.

D. Acceptance of the official contract schedule will not relieve the Contractor of the responsibility for accomplishing the work in accordance with the contract.

1.04 CONSTRUCTION PROGRESS SCHEDULE

A. The Contractor's monthly Construction Progress Schedule report shall include:

1. Contractor's estimated percentage complete for each activity not yet completed.
2. Actual start/finish dates for activities as appropriate.
3. Identification of processing errors, if any, on the previous update reports.
4. Revisions, if any, to the assumed activity durations, including revisions for weather impact, for any activities due to the effect of the previous update on the schedule.
5. Identification of activities which are affected by Cost Request Bulletin issued during the update period.
6. Resolution of conflict between actual work progress and schedule logic. When out-of-sequence activities develop in the contract schedule because of actual construction progress, the Contractor shall submit a revision to schedule logic to conform to current status and direction.

B. Progress payments pursuant to the contract will require an update of the construction progress schedule.

1.05 SHORT INTERVAL SCHEDULE:

A. Short Interval Scheduling (SIS) may be used throughout the on-site construction activity.

B. The interval shall be a three (3) week projection and shall include the week submitted and two (2) weeks thereafter.

C. It shall contain sufficient detail to evaluate daily milestones and manpower/equipment loading, and shall identify/tie into the monthly updated contract schedule.

D. Short interval schedule shall be approved by the Construction Manager and Owner's Representative.

E. Short interval schedule shall be submitted weekly.

F. During the weekly construction meeting, the Construction Manager and the Contractor will review and discuss short interval schedules.

1.06 SCHEDULE REVISIONS

A. Should the Contractor, after acceptance of the contract schedule, intend to change his plan of construction, the Contractor shall submit his requested revisions to the Construction Manager and Owner's Representative along with a written statement of the revision; including a description of the logic for rescheduling the work, methods of maintaining adherence to intermediate milestones, and other specific dates and the reasons for the revisions. If the requested changes are acceptable to the Owner's Representative, they will be incorporated into the contract schedule in the next reporting period.

B. Schedule revisions shall be submitted at least seven (7) calendar days prior to the date of submission of update information. The Owner will have seven (7) calendar days to review the revisions.

C. If the sequence of construction differs significantly from the contract schedule, as determined by the Owner's Representative or the Construction Manager, the Contractor shall submit within fifteen (15) calendar days a revised schedule to the Owner's Representative for acceptance.

1.07 SCHEDULE CHANGES

A. When a Cost Request Bulletin is issued which has the potential to impact specified completion dates, a network window shall be prepared by the Contractor to reflect the impact of such changes, said network window shall be submitted to the Owner's Representative and Construction Manager. After the network window has been accepted, by the Owner's Representative and Construction Manager, and the Contractor ordered to proceed with the Cost Request Bulletin, it shall be incorporated into the contract schedule. Time extensions will be considered only to the extent there is insufficient remaining float to accommodate these changes, and pursuant to Part 1 of these specifications. No additional cost beyond that provided in the General Conditions will be allowed for the incorporation of approved Cost Request Bulletin into the contract schedule.

B. The Contractor shall submit to the Construction Manager, Architect and Owner's Representative, a network window for all claimed time extension requests showing the impact of claimed delay on the contract schedule. Time extensions shall be negotiated per the requirements of the General Conditions.

C. Float or Slack Time is the amount of time between the earliest start date and the late start date or between the earliest finish date and the latest finish date of activities of the contract schedule. No time extensions or delay costs will be allowed for delays caused by the Owner, on paths or activities containing float time, providing such delay does not exceed the float time per the latest updated version of the contract schedule.

D. The Owner's Representative and Construction Manager shall have no obligation to consider any time extension request unless the requirements of the contract documents are complied with; the Owner shall not be responsible or liable to the Contractor for any construction acceleration due to failure of the Owner to grant time extensions under the contract documents should the Contractor fail to substantially comply with the submission requirements and the justification requirements of this contract for time extension requests. The Contractor's failure to perform in accordance with the contract schedule shall not be excused because the Contractor has submitted time extension requests; until, and unless, such requests are approved by the Owner.

1.08 RECOVERY SCHDEULE:

A. If the contract schedule falls fourteen (14) calendar days behind schedule on milestone dates or completion dates, the Contractor shall be required to prepare and submit a Recovery Schedule to the Construction Manager and Owner's Representative, with form and detail appropriate to the need to explain, and display, how they intend to reschedule activities to regain compliance with the contract schedule during the immediate subsequent pay period.

B. Upon acceptance by the Construction Manager and Owner's Representative, the recovery schedule shall be incorporated into the contract schedule by the Contractor.

1.09 PAYMENTS WITHHELD:

A. Progress payments may be withheld in whole or in part should the Contractor fail to comply with the requirements of this section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 3216

Section 01 3300
Submittals

PART 1 - GENERAL

1.01 Description

A. To ensure that specified products are furnished and installed in accordance with plans and specifications, transmittal procedures have been established for submittals for review by the Construction Manager, the Architect, and the Owner.

B. Make all following submittals in strict accord with provisions of this Section and with requirements of the General Conditions:
   1. Progress Schedule.
   2. Schedule of Values
   3. Certification.
   4. Shop Drawings.
   5. Descriptive Data/Material Lists.
   6. Samples.
   7. Alternatives (Substitutions).

1.02 Related Requirements

A. General Conditions.

B. Section 01 7700 - Contract Closeout:

C. Section 01 3216 - Construction Progress Schedule

D. Test Reports: Pertinent Specification Sections.

PART 2 - PRODUCTS

2.01 Progress Schedule -- Prepare and submit progress schedule of procurement and fabrication activities, and component deliveries as required by Section 01 3216 and within the time of completion identified in Notice to Bidders.

2.02 Shop Drawings

A. Submittals shall include eight complete copies of each original, name and location of project, name of Contractor, and contract numbers and cross references to contract documents. Number shop drawings consecutively. Make drawings legible and complete in every respect. Refer to General Conditions.

B. If shop drawings show variations from Contract requirements because of standard shop practice or other reason, make specific mention of such variations in letter of transmittal, as well as on

drawings, in order that (if acceptable) suitable action may be taken for proper adjustment of Contract. Unless specific changes have been noted and accepted, no deviations from Contract Documents will be permitted.

2.03 Product Data/Material Lists

A. Manufacturer's Standard Schematic Drawings:
   1. Modify drawings to delete information, which is not applicable to Project.
   2. Supplement standard information to provide additional information applicable to Project.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data:
   1. Clearly mark each copy to identify pertinent materials, products, or models.
   2. Show dimensions and clearances required.
   3. Show performance characteristics and capacities.
   4. Show wiring diagrams and controls.
   5. Include calculations when applicable.

2.04 Samples -- Where required by the specifications and by change orders, the Contractor shall provide at no additional cost:

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

B. Where size of samples is not specified, office samples should be of sufficient size and quantity to clearly illustrate:
   1. Functional characteristics of product or material, with integrally related parts and attachment devices.
      a. After review, samples may be used in construction of project.

PART 3 - EXECUTION

3.01 Submission Requirements

A. Schedule submissions at least eight weeks before dates reviewed submittals will be needed. Some submissions may be required to be submitted even earlier.

B. Identification: Identify all submittals with names and location of project, name of Contractor and contract numbers.
   1. Submittals shall be accompanied by letter of transmittal addressed to Construction Manager following format and procedures established at the Preconstruction Conference.
   2. Each submittal shall be consecutively numbered and shall contain list of items submitted, properly identified as to drawing numbers, Specifications Section or other identification.
   3. Submittals not adequately identified will be returned to Contractor for correction and resubmittal.

C. Architect will review submittals for conformance with Contract Documents and acceptance by Architect covers only such conformance. Responsibility for accuracy and correction and resubmittal shall be the Contractor's.

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

E. No portion of work requiring submittals that affect the construction shall be commenced until submittal has been reviewed and accepted by Architect. All such portions of work shall be in accordance with accepted submittals.

F. Number of copies required by Architect: Provide copies as follows; or greater quantity where so specified in individual Specification Section. Add number of copies required by Contractor for distribution to the following numbers:
   1. Schedule of Values: Two (2) copies AIA form G107 with back up sheets.
   2. Certification: Three (3) copies
   3. Samples: As specifically indicated in pertinent Specification Section.
   4. Samples for Color/Pattern Selection. Three (3) sets of manufacturer's complete range for initial selection: and additional samples as requested of selected color/pattern for inclusion in final color schedule.
   5. Alternatives: Six (6) copies of all required related data and information.

3.02 Submittals shall include (where applicable):

A. Date and revision dates.
   1. Project title and work order number.
   2. Names of Contractor, subcontractor and supplier or manufacturer.
   3. Identification of product or material.
   4. Relation to adjacent structure or material.
   5. Field dimensions, clearly identified as such.
   6. Specification Section number.
   7. Consecutive submittal number.
   8. Blank space for Architect's stamp and approving agency as required.
   9. Contractor's stamp, initialed or signed, certifying review of submittal, verification of field measurements and compliance with Contract Documents.

End of Section 01 3300

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Section 01 4000
Quality Control

PART 1 - GENERAL

1.01 Definitions

A. Soils Engineer and Testing Laboratory: The Owner will retain a qualified soils engineer and testing laboratory to perform tests and report on work as specified in the contract documents, and as otherwise required.

B. Testing Agency: An organization other than the testing laboratory, retained and paid by the Owner to perform tests and report on whether or not designated items of work comply with the requirements of the contract documents.

1.02 Tests

A. The Owner will select an independent testing laboratory to conduct the tests. Selection of the material required to be tested shall be by the laboratory or the Owner's representative and not by the Contractor.

B. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the contract documents, which must by terms of the Contract be tested, in order that the Owner may arrange for the testing of same at the source of supply.

C. 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 job.

D. The Owner will select and pay testing laboratory costs for all tests and inspections, but may be reimbursed by the Contractor for such costs under the contract documents.

1.03 Testing Laboratory

A. General: Services of a testing laboratory are required for work specified in various individual specification Sections.

B. Contractor Responsibilities:
   1. Contractor shall cooperate with testing laboratory personnel.
   2. Furnish copies of product test reports as specified.
   3. Furnish incidental labor and facilities:
      a. To provide access to work to be tested
      b. To obtain and handle samples at the project site or at the source of the product to be tested as requested by the testing lab
      c. To facilitate inspections and tests
      d. To facilitate storage and curing of test samples

e. To fabricate testing samples as indicated

1.04 Test Reports

A. The testing laboratory will distribute reports as follows:
   1. Construction Manager (1 copy)
   2. Architect (1 copy)
   3. Applicable Consultants (1 copy each)
   4. State Agencies as appropriate
   5. Owner's Project Inspector

B. The Owner shall distribute reports in the same manner and number as for the testing laboratory.

1.05 Retesting

A. The Owner Representative shall have the right to order additional tests as instructed if he has reasonable doubt that materials comply with Specification requirements.
   1. If additional tests establish that materials comply with Specification requirements, costs for such tests will be paid by the Owner.
   2. If additional tests establish that materials do not comply with Specification requirements, costs for such retests shall be paid by the Contractor.

1.06 Inspection by the Owner

A. The Owner, Construction Manager and Architect shall, at all times, have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

B. The Owner, Architect and Construction Manager shall have the right to reject materials and quality of work, which are defective, or to require their correction. Rejected work quality shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the Owner may correct same and charge the expense to the Contractor.

C. Should it be considered necessary or advisable by the Owner, Architect or Construction Manager, at any time before final acceptance of the entire work to make an examination of the 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 the fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 MANUFACTURERS' FIELD SERVICES

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, as applicable, and to initiate instructions when necessary.
   1. Submit qualifications of observer to Architect 30 days in advance of required observations.
   2. Observer subject to approval of Architect.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION 01 4000

Section 01 4213
Abbreviations

PART 1 - GENERAL

1.01 Abbreviations

A. The following abbreviations may be used in the contract documents:
1. AAMA Architectural Aluminum Manufacturers' Association
2. AASHTO American Association of State Highway and Transportation Officials
3. ACI American Concrete Institute
4. AIA American Institute of Architects
5. AIMA Acoustical and Insulation Materials Association
6. AISC American Institute of Steel Construction
7. ANSI American National Standards Institute
8. APA American Plywood Association
9. ASHRAE American Society of Heating, Refrigerating, and air-conditioning Engineers
10. ASME American Society of Mechanical Engineers
11. ASTM American Society for Testing and Materials
12. AWI Architectural Woodwork Institute
13. AWPI American Wood Preservers' Association
14. AWS American Welding Society
15. BHMA Builders Hardware Manufacturers' Association
16. BMP Best Mangement Practices
17. BTU British Thermal Unit
18. CAC California Administrative Code
19. CAL/OSHA State of California Construction Safety Orders
20. CBC California Building Code
21. CEC California Electric Code
22. CFC Chlorofluorocarbon
23. CLFMI Chain Link Fence Manufacturers' Institute
24. CMC California Mechanical Code
25. CPC California Plumbing Code
26. CRSI Concrete Reinforcing Steel Institute
27. CALTRANS State of California, Business and Transportation Agency, Department of Transportation, "Standard Specifications"
28. ESO Electrical Safety Orders
29. FAA Federal Aviation Administration
30. FGMA Flat Glass Marketing Association
31. FM Factory Mutual System, Factory Mutual Engineering Corporation
32. FS Federal Specifications
33. FSC Forest Stewardship Council
34. HVAC Heating, Ventilation, & Air Conditioning
35. IAQ Indoor Air Quality
36. IBC International Building Code
37. LEED Leadership in Energy and Environmental Design

38. MM State of California, Business and Transportation Agency, Department of Transportation, "Materials Manual"
39. NEC National Electrical Code
40. NEMA National Electric Manufacturers' Association
41. NFPA National Fire Protection Association
42. PS United States Department of Commerce Product Standard
43. RIS Redwood Inspection Service
44. SFM State of California, Office of State Fire Marshal
45. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.
46. SRI Solar Reflectance Index
47. TCA Tile Council of America
48. UBC Uniform Building Code
49. UL Underwriters Laboratories, Inc.
50. USGBC United States Green Building Council
51. USS United States Standard
52. VOC Volotile Organic Compound
53. WCLIB West Coast Lumber Inspection Bureau
54. WI Woodwork Institute

B. Additional abbreviations used only on the drawings are listed and defined thereon.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED.

END OF SECTION 01 4213

Section 01 5000
Construction Facilities & Temporary Controls

PART 1 GENERAL

1.01 Work Included

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:
   1. Water service and distribution.
   2. Temporary electric power and light.
   3. Sanitary facilities, including drinking water and washing facilities.
   4. Storm and sanitary sewer.

C. Support facilities include, but are not limited to, the following:
   1. Temporary enclosures.
   2. Waste disposal services.
   3. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:
   1. Temporary fire protection.
   2. Enclosure fence for the site.

1.02 Quality Assurance

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
   1. Building code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, fire department, and rescue squad rules.
   5. Environmental protection regulations.

B. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.03 Standards - Comply with the following listed standards

A. NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations

B. ANSI A10 Series standards for "Safety Requirements for Construction and Demolition

C. NECA Electrical Design Library "Temporary Electrical Facilities

D. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

E. NFPA 10 "Standard for Portable Fire Extinguishers"

F. NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1.04 Project Conditions

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 PRODUCTS

2.01 Materials

A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Open-Mesh Fencing: Provide 0.120-inch- (3-mm-) thick, galvanized 2-inch (50-mm) chain link fabric fencing 6 feet (2 m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts.

2.02 Equipment

A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4-inch (19-mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Provide self contained washing facilities, stocked with soap, disposable towels, and drinking cups; Use only potable water in Health Dept. approved containers.

F. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 EXECUTION

3.01 Installation

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 Temporary Utility Installation

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
   1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
   2. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
   3. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.

B. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switchgear.
   1. Install electric power service underground, except where overhead service must be used.
   2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

3.03 Support Facilities Installation

A. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.

B. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

C. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.04 Security and Protection Facilities Installation

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.

B. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

C. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

D. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth or portable fencing, if appropriate, with sufficient hold down weight to prevent overturning..

E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

F. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

G. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or

that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.05 Operation, Termination, and Removal

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
   2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
   3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
      a. Replace air filters and clean inside of ductwork and housings.
      b. Replace significantly worn parts and parts subject to unusual operating conditions.
      c. Replace lamps burned out or noticeably dimmed by hours of use.

End of Section 01 5000

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Section 01 5725
Storm Water Pollution Prevention Plan

PART 1 - GENERAL

1.1 Summary

A. The State Water Resources Control Board (SWRCB) regulates storm water discharges associated with construction and land disturbance activities. Certain projects are required to obtain permit coverage under California's Construction General Permit (GCP), Order 2022-0057-DWQ. A site-specific Storm Water Pollution Prevention Plan (SWPPP) is required to obtain permit coverage under the CGP.

B. The Central Valley Regional Water Quality Control Board, Region 5F (RWQCB) is the Regional Board responsible for inspections, if any, and enforcing the CGP.

C. Related Sections

1. Section 01 000: Construction Facilities & Temporary Controls

D. The Owner or Owner's agent will be responsible for filing the Notice of Intent (NOI) and obtaining permit coverage, and developing a site-specific SWPPP.
1. The Contractor shall assist the owner in completing the NOI by providing information requested by the owner or the owner's agent.
2. The Owner has prepared and paid for the Storm Water Pollution Prevention Plan (SWPPP) and this plan is issued with these Contract Documents as an attachment. The entire SWPPP document can be made available either in draft format or final format at the request of the Contractor. The entire SWPPP will be made available for the Contractor to retain on the construction site prior to the scheduled commencement of construction activities.
3. This project is a Risk Level 1 project. All provisions of Attachment C of the CGP shall apply to this project.

E. Nothing in this section shall preclude the Contractor, the Contractor's QSP, or other subcontractors from fully complying with applicable provisions of the CGP.

1.2 REFERENCES

A. National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2022-0057-DWQ, NPDES No. CAS000002.

B. Applicable amendments and/or modifications to Order No. 2022-0057-DWQ

C. California Stormwater Quality Association (CASQA) BMP Handbook, August 2023

1.3 QUALITY ASSURANCE

A. The individual responsible for implementing the SWPPP in accordance with the CGP must be a Qualified SWPPP Practitioner (QSP) for this project and hold such certification from CASQA.

B. The Contractor's QSP shall have an active online account on the State Water Resources Control Board's Storm Water Multiple Application & Report Tracking System (SMARTS).

C. Install BMPs as directed on the Water Pollution Control Drawing at the appropriate time, and maintain during construction. Remove and replace any damaged or ineffective BMPs.

D. The QSP should use his or her discretion to implement additional BMPs as necessary that may or may not be called out specifically in the SWPPP, and to ensure the construction site complies with the CGP.

E. The QSP shall be responsible for notifying the Qualified SWPPP Developer (QSD) of any significant discrepancies between the Drawing(s) and the actual site conditions. The QSD will make revisions to the SWPPP and issue amendments as applicable. Upon receiving amendments or other revised documents, the QSP shall be responsible for inserting these documents into the SWPPP and keeping them through the life of the Construction project.

F. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

1.4 SUBMITTALS

A. The Contractor shall submit a copy of the QSP's certificate no later than 1 week prior to the commencement of construction activities.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Erosion control products shall comply with those products named in Section 01 5710

B. Provide materials, not specifically described but required for proper completion of the work of this Section, as selected by the Contractor, subject to approval of the Architect.

C. Specific materials shall comply with the Erosion Control Plan/Water Pollution Control Drawings and should comply with the applicable BMP Fact Sheets in the CASQA BMP Handbook.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the site and the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work.

3.2 IMPLEMENTATION

A. The QSP shall implement the SWPPP in accordance with the Contract Documents and as required in the CGP.

B. The SWPPP Binder(s) and other Storm Water Pollution Prevention Documents shall be kept on the construction site at all times. It shall be made readily available for a RWQCB inspector.

C. The construction schedule shall be inserted into the SWPPP Binder and any subsequent revisions to the construction schedule.

D. The QSP shall be responsible for conducting and documenting all training activities in accordance with the CGP. The documentation of the training activities shall be inserted and kept in the project SWPPP. The training activities shall consist of:

1. Training for individuals responsible for all activities associated with the CGP (i.e. general contractor, site superintendents and subcontractors)
2. Training for all individuals responsible for BMP installation, inspection, maintenance and repair

E. The QSP shall be responsible for coordinating with the Legally Responsible Person (LRP), or Owner to be added to as a Data Entry Person on the LRP's SMARTS account.

F. The Contractor's QSP shall be responsible for completing and filing all annual reports on SMARTS and shall coordinate with the LRP for necessary certifications. Annual Reports shall be submitted no later than September 1st of each compliance year. The QSP shall complete and file all annual reports as required by the CGP.

G. The QSP shall be responsible for responding to any Notice of Violations (NOVs) or Staff Enforcement Letters (SELs) that may be issued by the RWQCB for non-compliance. The Contractor's QSP shall also be responsible for responding to the RWQCB and preparing any technical reports or other documents that may be requested by the RWQCB.

H. The QSP shall file a Notice of Termination on the SMARTS website no later than 30 days from the completion of the project.

I. If delays in construction occur that cause construction to continue beyond the contracted end date, that are solely the responsibility of the Contractor, the Contractor shall be held responsible for additional costs associated with implementing the SWPPP in accordance with the CGP, and any fines levied by the Regional Water Quality Control Board.

J. At the termination of construction activities and after the Notice of Termination has been approved by the SWRCB, the Contractor shall be responsible for delivering the SWPPP, including all amendments, inspections forms and any other documents added during the course of construction to the Architect.

3.3 FIELD QUALITY CONTROL

A. The Contractor and the Contractor's QSP shall be responsible for ensuring all subcontractors on the site comply with the SWPPP and the CGP and their individual actions do not result in any enforcement actions. The Contractor shall be liable for non-compliance fines from the RWQCB or SWRCB.

B. All construction trades, including their supplies who enter the construction site shall comply with the Good Housekeeping Measures named in Section B of Attachment C of the CGP.

C. Upon commencement of construction, a rain gauge shall be installed on the site in a prominent location where it will not be shielded from rainfall.

D. Install BMPs where noted on the Drawing(s) and maintain as required by the CGP throughout the life of the construction project. BMPs shall be replaced at the discretion of the QSP to comply with the CGP.

E. At the end of each workday all stockpiles shall be covered and protected around their perimeter.

F. All trash and debris shall be cleaned up and properly disposed of at the end of each work day.

G. The QSP or an individual under the direct supervision of the QSP shall conduct all inspections, maintenance repair and sampling activities. Records of inspections shall be kept using a form provided by the SWRCQ, RWQCB, CASQA, or another alternative format.

H. Upon identification of BMP failures or shortcomings during inspections, effective remedies shall be implemented within 72 hours of identification.

END OF SECTION

Section 01 6000
Product Requirements

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sustainable design-related product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Product quality monitoring.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

C. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing asbestos

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.02 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 6000

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Section 01 7123
Field Engineering

PART 1 - GENERAL

1.01 Description

A. Lay out and install the work to the lines and grades indicated and specified.

B. Retain and pay expenses of a qualified civil engineer or land surveyor to establish on the site the required reference points and bench marks. Establish building lines and elevations, check structural framework for plumbness, and establish the required basic grid lines from which work of other SECTIONS shall be laid out.

1.02 Qualifications of Engineer or Surveyor - The engineer or land surveyor shall be licensed in the State of California and shall be acceptable to the Owner.

1.03 Survey Reference Points

A. Existing basic horizontal and vertical control points for the Project are indicated on the Horizontal Control Plan and Grading and Drainage Plan .

B. Locate and protect control points prior to starting site work, and preserve permanent reference points during construction.
   1. Make no changes or relocations without prior written notice from the Owner's Representative and Architect.
   2. Report to the Owner's Representative and Architect if a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
   3. Require the civil engineer or land surveyor to replace control points which become lost or destroyed; base replacements on original survey control.

1.04 Project Survey Requirements

A. Establish and maintain lines and levels, locate and lay out:
   1. Site Improvements
      a. Stakes for grading, fill, and topsoil placement
      b. Utility slopes and invert elevations
   2. Batter boards for structures
   3. Building foundations, column locations, floor level, and retaining walls.
   4. Controlling lines and levels required for mechanical and electrical work

B. From time to time verify layouts

1.05 Records

A. Maintain a complete, accurate log of control and survey work as it progresses.

1.06 Submittals

A. Submit name and address of civil engineer or land surveyor.

B. Upon request, submit documentation to verify accuracy of field engineering work.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED.

END OF SECTION 01 7123

Section 01 7135
Restoration of Improvements

PART 1 - GENERAL

1.01 Structures

A. The Contractor shall carefully cut and or remove such existing structures, utilities, and improvements as required to complete the work, including but not limited to: curbs, gutters, pipelines, sidewalks and utility poles, as may be necessary for the performance of the work and shall rebuild the structures thus removed in as good a condition as found. The Contractor shall also repair existing structures or improvements, which may be damaged as a result of the work under this contract.

1.02 Roads and Streets

A. Unless otherwise specified, roads and streets in which the surface is removed, broken, or damaged, or in which the ground has caved or settled during the work under this contract, shall be resurfaced and brought to the original grade and section by the Contractor. Roadways used by the Contractor shall be cleaned and repaired to local and State Standards. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean solid, saw-cut vertical faces, and shall be free of loose material.

1.03 Cultivated Areas and Other Surface Improvements

A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored to their original condition or better.

B. Existing guard posts, barricades, and fences shall be protected and replaced if damaged.

C. Special attention shall be given to avoid trees, bushes and shrubs not indicated for removal.

1.04 Protection of Existing Installations

A. The Contractor shall immediately correct or replace existing equipment, controls or systems that are damaged as a result of his operations.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 7135

Section 01 7329
Cutting and Patching

PART I - GENERAL

1.01 SECTION INCLUDES

A. Proceedures for cutting and patching as may be required to complete the work of this project.

1.02 RELATED SECTIONS

A. Section 01 5000 - Construction Facilties and Temporary Controls

B. Section 01 7135 - Restoration of Improvements

C. Section 01 7420 - Cleaning

D. Section 01 7419 - Construction Waste Mangement & Disposal

1.03 DEFINITONS

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.

C. Miscellaneous Elements: Do not cut or patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut or patch 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. 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.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 7329

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Section 01 7419
Construction Waste Management and Disposal

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible with the goal of diverting 65% of waste from the landfill.

B. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

C. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

D. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

B. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and

packaging.

6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   5. Material Reused on Project: Include the following information for each:
      a. Identification of material and how it was used in the project.
      b. Amount, in tons or cubic yards.
      c. Include weight tickets as evidence of quantity.
   6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. Waste management and diversion goals may be achieved by the following methods:
   1. Roll Off Waste Container: Contractor may hire a company which provides a roll off waste container which is then sorted off site.
   2. On Site Sorting: Contractor to sort waste on site.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 7419

Section 01 7420
Cleaning

PART 1GENERAL

1.01 Section Includes

A. Cleaning throughout the construction period, and final project cleaning prior to the acceptance tour.

1.02 Related Sections

A. Section 01 5000 - Construction Facilities and Temporary Controls

1.03 Quality Assurance

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 the requirements specified herein, comply with pertinent requirements of authorities having jurisdiction.

PART 2PRODUCTS

2.01 Cleaning Materials and Equipment

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.02 Compatibility

A. Use cleaning materials and equipment that are compatible with the surfaces being cleaned, as recommended by the manufacturer of the material to be cleaned.

PART 3 EXECUTION

3.01 Progress Cleaning

A. General:
   1. Retain 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 this work. Debris shall be removed from the site and disposed of in a lawful manner. Disposal receipts or dump tickets shall be furnished to Architect upon request.

3. At least twice each month, and more often if necessary, remove scrap debris, and waste material from the job site.
4. Provide adequate storage for items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:
1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove items to the place designated for their storage. Flammable waste shall be kept in sealed metal containers until removed from the site.
2. Weekly, and more often if necessary, inspect, arrangements of materials stored on the site; restack, tidy, or otherwise service arrangements to meet the requirements specified above.
3. Maintain the site in a neat and orderly condition.

C. Structures:
1. Weekly, and more often if necessary, inspect the structures and pick up scrap, debris, and waste material. Remove items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
   a. "Clean", for the 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 a handheld broom, i.e., "broom-clean".
3. As required preparatory to installation of succeeding materials, clean the structures of pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the required cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily, and more often if necessary, and while work is being performed in the space in which finish materials have been installed.
   a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material that, in the opinion of the Architect, may be injurious to the finish floor material, i.e., "vacuum-clean".

D. General: The General Conditions require general cleaning during construction. Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste, conduct final progress cleaning as described below.

E. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions. Unless otherwise specifically directed by the Architect, water and broom clean paved areas on the site and public paved areas directly adjacent to the site. Remove resultant debris

F. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
1. Remove labels that are not permanent labels.
2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

G. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original

condition. Leave concrete floors broom clean. Vacuum carpeted surfaces. Sweep and mop vinyl and rubber surfaces.

H. Structures:
   1. Exterior: In areas affected by the work under this contract, visually inspect exterior surfaces and remove traces of soil, waste material, smudges, and other foreign matter. Remove traces of splashed material from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure.
   2. 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 Owner.

I. Interior: In areas affected by the 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 the cleaning materials and equipment instructed by the manufacturer of the surface material.

J. Glass: Clean glass inside and outside.

K. Polished surfaces: On surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished. Glossy surfaces shall be cleaned and shined as intended by the manufacturer
   1. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
   2. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

L. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

M. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

N. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

O. Extra Materials: Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

P. Timing: Schedule final cleaning as accepted by the Architect to enable the Owner to accept a completely clean project.

Q. Cleaning During Owner's Occupancy
   1. Should the Owner occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of

the occupied spaces shall be determined by the Architect in accordance with the General Conditions of the Contract.

END OF SECTION 01 7420

Section 01 7700
Contract Closeout

PART 1 - GENERAL

1.01 Requirements Included

A. Closeout Procedures.

B. Project Record Documents.

C. Operation and Maintenance Data.

D. Guaranties, Warranties, Bonds and Waivers.

E. Spare Parts and Maintenance Materials.

1.02 Related Requirements

A. General Conditions: Fiscal provisions, legal submittals and other administrative requirements.

B. Section 01 1100 - Summary of Work

C. Section 01 3300 - Submittals

D. Section 01 7135 - Restoration of Improvements

E. Section 01 7420 - Cleaning

1.03 Closeout Procedures

A. Comply with procedures stated in General Conditions of the Contract.

B. When Contractor considers work has reached substantial completion, submit written certification that work is ready for inspection.

1.04 Removal of Utilities, Facilities, and Controls

A. Each trade/subcontractor responsible for installation shall be responsible for and not limited to the following:
   1. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to final application for payment inspection.
   2. Remove unused or temporary underground utilities or installations completely.
   3. Clean and repair damage caused by installation or use of temporary work.
   4. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.05 Project Record Drawings and Specifications

A. General
   1. Maintain, on daily basis, Record Drawings showing "as-built" condition of project; subject to monthly review by Architect, Construction Manager, or Owner.
   2. Store documents separate from those used for construction.
   3. At time of installation, installed locations of all work relating to above and underground utilities, architectural, structural, heating, ventilation, air conditioning, plumbing, electrical, and other scopes of work as may be required, shall be recorded on prints by Contractor, and reviewed with the Owner. Do not conceal work until required information is recorded.
   4. The Contractor will transfer installed locations to reproducible prints and submit prints for review by Architect through the Construction Manager.
      a. All information entered on reproducible prints shall be neat, legible, and emphasized by drawing "balloons" around changed items.
      b. Locate and dimension all work, including stubs for future connections, with reference to permanent landmarks or buildings and indicate approximate depth below finish grade.
      c. Symbols and designations used in preparing Record Drawings shall match those used in Contract Drawings.
   5. Prior to final inspection, submit project record documents with transmittal letter containing date, project title, Contractor's name and address, list of documents and signature of Contractor.
      a. Failure of the Contractor to comply with this section in total or in part may constitute reason for the withholding of all or part of the monthly progress payment due the Contractor for that month.
   6. Prior to processing the Contractor's monthly payment request, Construction Manager, Architect, or Owner's Representative will meet with the Contractor to review and verify that the Record Documents have been updated.
   7. Label and date each Record Drawing “RECORD DOCUMENT” in legibly printed letters.

B. Record Drawing Information:
   1. Record the following information:
      a. Locations of work buried under or outside each building, such as plumbing and electrical lines and conduits.
      b. Actual numbering of each electrical circuit.
      c. Locations of significant work concealed inside each building whose general locations are changed from those shown on the Contract.
      d. Locations of all items, not necessarily concealed, which vary from the Contract Documents.
      e. Installed location of all cathodic protection anodes.
      f. Deviations from the sizes, locations and other features of installation shown in the Contract Documents.
      g. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.
      h. Sufficient information to locate work concealed in each building with reasonable ease and accuracy; in some instances, this may be by dimension. In others, it may be in relation to the spaces in the building near which it was installed.
   2. Provide additional drawings as necessary for clarification.

C. Record Specifications
   1. Owner's Representative will provide Contractor with one (1) set of Contract Specifications, which shall be labeled “Record Document” in legible letters.
   2. Mark each section legibly to record manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.

1.06 Operation and Maintenance Data

A. Provide data for other Sections as required by the Contract Documents.

B. Submit two sets prior to final inspection, bound in 8-1/2 x 11 inch three ring side binders with durable plastic covers; with identification on, or readable through, front cover stating general nature of manual.

C. Provide a separate volume for each system, with a table of contents and index tabs for each volume; all material neatly typewritten; each volume containing:
   1. Part 1: Directory, listing names, addresses and telephone numbers of Owner's Representative.Contractor, and relevant Sub-Contractors; and index furnishing complete information as to location in manual of all emergency data regarding installation.
   2. Part 2: Operation and maintenance instructions, arranged by system. For each system, give names, addresses and telephone numbers of subcontractors and suppliers; and include the following:
      a. List of equipment.
      b. Parts list; including complete nomenclature and names and address of nearest vendor of parts.
      c. Detailed operating instructions.
      d. Maintenance instructions, equipment, including routine maintenance cards with time frequency of routine maintenance noted.
      e. Maintenance instructions, finishes.
      f. Shop drawings and product data, including changes made during construction.
      g. Copies of Guaranties/Warranties.

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

E. Final inspection will not be scheduled until all maintenance/operating manuals are delivered to the District Representative.

F. Contractor will be responsible for training of Owner's personnel for operation of all building systems.

1.07 Guaranties, Warranties, and Bonds

A. Standard Guarantee: Guarantee all work executed under this Contract to be free of all defects of work quality and materials for a period of one (1) year after completion and acceptance by the Owner. Refer to General Conditions and to other specific product and installation warranties listed in individual sections.

1.08 Spare Parts and Maintenance Materials Extra Stock

A. Provide products, spare parts, and maintenance materials in guaranties specified in each section, in addition to that used for construction of work. Coordinate with the Construction Manager and deliver to project site. Provide with a detailed transmittal and obtain receipt prior to final payment.

End of Section 01 7700

Section 01 7900
Demonstration and Training

PART 1 GENERAL

1.01 SUMMARY

1.02 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

1.03 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

END OF SECTION 01 7900

Section 01 9113
General Commissioning Requirements

PART 1 GENERAL

1.01 Summary

A. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the Owner's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:
   1. Verify that the applicable equipment and systems are installed in accordance with the contact documents and according to the manufacturer's recommendations.
   2. Verify and document proper integrated performance of equipment and systems.
   3. Verify that Operations & Maintenance documentation is complete.
   4. Verify that all components requiring servicing can be accessed, serviced, and removed without disturbing nearby components including ducts, piping, cabling or wiring.
   5. Verify that the Owner's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
   6. Document the successful achievement of the commissioning objectives listed above.

B. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the Owner and the Commissioning Agent to be indexed for future reference.

C. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.02 Related Documents

A. General requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

B. Related Sections
   1. Division 01: General Requirements
   2. Division 22: Plumbing
   3. Division 23: Heating Ventilating and Air Conditioning
   4. Division 25: Integrated Automation (If applicable)
   5. Division 26: Electrical
   6. Division 27: Communication Systems.
   7. Section 32 84 00: Landscape Irrigation
   8. Division 33: Site Utilities

1.03 Definitions

A. Basis of Design (BOD): The Engineer's Basis of Design is comprised of two components: The Design Criteria and the Design Narrative, these documents record the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines.
B. Commissioning Agent (CxA): The qualified Commissioning Professional who administers the Cx process by managing the Cx team and overseeing the Commissioning Process. Where CxA is used in this specification it means the Commissioning Agent, members of his staff or appointed members of the commissioning team.
C. Commissioning Manager (CxM): A qualified individual appointed by the Contractor to manage the commissioning process on behalf of the Contractor.
D. Commissioning Observation: An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform to the project OPR, contract documents or standard industry best practices.
E. Commissioning Plan: A document that outlines the commissioning process, commissioning scope and defines responsibilities, processes, schedules, and the documentation requirements of the Commissioning Process.
F. Commissioning Process: A quality focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all its systems, components, and assemblies are planned, designed, installed, tested, can be operated, and maintained to meet the Owner's Project Requirements.
G. Commissioning Report: The final commissioning document which presents the commissioning process results for the project. Cx reports include an executive summary, the commissioning plan, issue log, correspondence, and all appropriate check sheets and test forms.
H. Functional Test Procedure (FTP): A written protocol that defines methods, steps, personnel, and acceptance criteria for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.
I. Issues Log: A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the Commissioning Team during the Commissioning Process.
J. Owner's Project Requirements (OPR): A written document that details the project requirements and the expectations of how the building and its systems will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
K. Pre-Functional Checklist (PFC): A form used by the contractor to verify that appropriate components are onsite, correctly installed, set up, calibrated, functional and ready for functional testing. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
L. Systems Manual: A system-focused composite document that includes all information required for the owners' operators to operate the systems.
M. Testing, Adjusting, and Balancing (TAB): A systematic process or service applied to heating, ventilating, and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as "Testing, Adjusting, and Balancing" and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.
N. Training Plan: A written document that details, in outline form the expectations of the

operator training. Training agendas should include instruction on how to obtain service, operate, startup, shutdown and maintain all systems and components of the project.

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1.04 Commissioning Team

A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers, suppliers, and specialists deemed appropriate by the Owner and Commissioning Agent.
B. Members Appointed by Contractor:
   1. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.
   2. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.
C. Members Appointed by Owner:
   1. Commissioning Agent: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. The Owner will engage the CxA under a separate contract.
   2. User: Representatives of the facility user and operation and maintenance personnel.
   3. A/E: Representative of the Architect and engineering design professionals.

1.05 Owner's Responsibilities

A. Provide the OPR documentation to the CxA and each Contractor for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.
B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
   1. Coordination meetings.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Testing meetings.
   4. Demonstration of operation of systems, subsystems, and equipment.
C. Participate in issue resolutions that may occur during the commissioning process.

1.06 Contractor's and Subcontractor's Responsibilities

A. Provide utility services required for the commissioning process.
B. Each Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
   1. Participate in design- and construction-phase coordination meetings.
   2. Participate in maintenance orientation and inspection.
   3. Participate in operation and maintenance training sessions.
   4. Participate in final review at acceptance meeting.
   5. Certify that Work is complete, and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
   6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

7. Review and approve final commissioning documentation.

C. Contractor shall include all commissioning activities into Contractor's master construction schedule.

D. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.

E. Contractor shall provide a means to effectively commission the BMS system. To include the following at minimum.
   1. Schedule the controls contractor to run the BMS functional tests.
   2. Provide ample space and facilities to perform BMS functional performance test. Including: Table, Chairs, additional monitor, and cables for connection to the contractors BMS controls.

F. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
   1. Participate in construction-phase coordination meetings.
   2. Participate in maintenance orientation and inspection.
   3. Complete pre-functional checklists for all required equipment. Submit completed forms and start-up reports upon completion to CxA.
   4. Provide flushing/disinfection plans and water reports to the CxA for review.
   5. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
   6. Provide information to the CxA for developing construction-phase commissioning plan.
   7. Participate in training sessions for Owner's operation and maintenance personnel.
   8. Verify all systems function correctly by testing each mode of operation, alarm, and system function.
   9. Perform quality control of all work and certify it is complete prior to request for observation and/or testing.
   10. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified.
   11. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.
   12. Participate in pre-TAB meeting and jobsite inspections to verify TAB readiness.
   13. Provide completed TAB report to CxA for review. CxA will require up to 25% of TAB report for TAB contractor to demonstrate compliance with completed TAB report.
   14. Provide point-to-point, calibration of BMS system to CxA for review.
   15. Complete system certificate of readiness and pre-functional checklist form prior to Functional Performance Testing and provide to GC and CxA.
   16. Perform seasonal testing (if required) at the direction of the CxA.

1.07 Architect and Design Engineer Responsibilities

A. Responsible for developing the construction contract documents and clarifying the design intent during the construction phase of the project.

1.08 CxA's Responsibilities

A. Organize and lead the commissioning team.
B. Prepare a construction-phase commissioning plan. Collaborate with each Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.
C. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, contract documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.
D. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
E. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB work; and project completion.
F. Periodically observe and inspect construction and report progress and deficiencies. In addition to compliance with the OPR, BoD, and Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
G. Prepare project specific Start-Up Lists and Checklists and Systems Functional Performance Test procedures.
H. Witness selected tests, inspections, and systems startup.
I. Witness and document Systems Functional Performance Testing.
J. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
K. Review project record documents for accuracy. Request revisions from Contractor to achieve accuracy.
L. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.
M. Review and comment on operation and maintenance documentation and systems manual outline developed by the contractor for compliance with the Contract Documents.
N. Prepare commissioning reports.
O. Assemble the final commissioning documentation, including the Commissioning Report and Project Record Documents.

1.09 Commissioning Documentation

A. Commissioning Plan: A document, prepared by CxA, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:
    1. Description of the organization, layout, and content of commissioning documentation to be provided along with identification of responsible parties.
    2. Identification of systems and equipment to be commissioned.

3. Identification of items that must be completed before the next operation can proceed.
4. Description of responsibilities of commissioning team members.
5. Description of observations to be made.
6. Description of requirements for operation and maintenance training, including required training materials.
7. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
8. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
9. Process and schedule for completing pre-start and startup checklists for systems, subsystems, and equipment to be verified and tested.
10. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.

B. Pre-Functional Checklists: CxA will develop pre-functional checklists for all systems to be commissioned. Pre-Functional Checklists shall be completed by the Contractor, verifying that the systems, subsystems, controls, and equipment are ready for testing. The CxA will spot check the Pre-Functional Checklists to verify accuracy and readiness.

C. Functional Performance Testing: CxA shall develop functional performance test procedures for all equipment and systems to be commissioned. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
1. Name and identification code of tested item.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Deficiencies.
8. Issue number, if any, generated as the result of test.

D. Certificate of Readiness: Certificate of Readiness shall be signed by each Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.

E. Test and Inspection Reports: CxA shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

F. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.
1. Any additional testing or retesting the Commissioning Agent must perform will incur additional fees billable to the contractor in question.

G. Issues Log: CxA shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the OPR, BoD, and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.

1. Creating an Issues Log Entry:
    a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
    b. Assign a descriptive title of the issue.
    c. Identify date and time of the issue.
    d. Identify test number of tests being performed at the time of the observation, if applicable, for cross-reference.
    e. Identify system, subsystem, and equipment to which the issue applies.
    f. Identify location of system, subsystem, and equipment.
    g. Include information that may be helpful in diagnosing or evaluating the issue.
    h. Note recommended corrective action.
    i. Identify commissioning team member responsible for corrective action.
    j. Identify expected date of correction.
    k. Identify person documenting the issue.
2. Document Issue Resolution:
    a. Log date correction is completed, or the issue is resolved.
    b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
    c. State that correction was completed, and system, subsystem, and equipment is ready for retest, if applicable.
    d. Identify person(s) who corrected or resolved the issue.
3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, CxA shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, CxA shall include the following information in the issues log and expand it in the narrative:
    a. Issue number and title.
    b. Date of the identification of the issue.
    c. Name of the commissioning team member assigned responsibility for resolution.
    d. Expected date of correction.

H. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BoD, and Contract Documents. The commissioning report shall include, but is not limited to, the following.
1. Lists and explanations of substitutions; compromises; variances in the OPR, BoD, and Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the OPR, BoD, and Contract Documents and those that do not meet requirements of the OPR, BoD, and Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.
2. OPR and BoD documentation.
3. Commissioning plan.
4. Testing plans and reports.
5. Corrective modification documentation.
6. Issue's log.
7. Completed test checklists.
8. Listing of off-season test(s) not performed and a schedule for their completion.

I. Systems Manual: CxA shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:
   1. OPR and BoD, including system narratives, schematics, and changes made throughout the Project.
   2. Project Record Documents as specified in Division 01 Section "Project Record Documents."
   3. Final commissioning plan.
   4. Commissioning report.
   5. Operation and maintenance data as specified in Division 01 Section "Operation and Maintenance Data."

1.10 Submittals

A. Commissioning Plan: CxA shall submit the commissioning plan. Deliver one copy to Contractor, one to Owner. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final construction-phase commissioning plan.
B. Pre-Functional Checklists: CxA will submit sample checklists for review, comment, and approval by Contractors and Sub-Contractors. Contractor completed Pre-Functional Checklists are required to be submitted for review and approval before Functional Performance Testing can begin.
C. Functional Test Forms: CxA will submit first draft functional Test Plan and checklists for comment. The final Functional Test forms will be used for functional Testing.
D. Site Inspection Reports: CxA shall submit test and inspection reports.
E. Corrective Action Documents: CxA shall submit corrective action documents.
F. Final Commissioning Report: CxA shall submit the final commissioning report. CxA shall deliver the report to the Owner, and one copy to Architect. The final submittal must address previous review comments and shall include a copy of the pre-final submittal review comments.
G. CxA will provide contractor with a list of specific submittals for review to facilitate the commissioning process. These requests are intended to be integrated into the normal submittal process and protocol of the construction team.

1.11 Coordination

A. Scheduling: The Contractor shall work with the Commissioning Agent and the Owner's Representative to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations, and predecessors) on commissioning activities to allow the Contractor and the Owner's Representative to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner to expedite the project and the commissioning process. The Contractor shall update the Master Construction schedule as directed by the Owner's Representative.
B. Coordinating Meetings: CxA shall conduct periodic coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
C. Pre-testing Meetings: CxA shall conduct pretest meetings of the commissioning team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services

for each system, subsystem, equipment, and component to be tested.

D. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 PRODUCTS

2.01 Test Equipment

A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing.

B. Data logging equipment and software required to test equipment shall be provided by the Contractor.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 oC (1.0 oF) and a resolution of + or - 0.1 oC (0.2 oF). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

PART 3 EXECUTION

3.01 Procedures for Pre-functional Testing

A. In conjunction with the Pre-Functional Checklists, adjustments and tests shall be made by Contractor as specified herein and as required by governing codes, regulations, manufacturer’s recommendations, and specification requirements. Contractor shall adjust, calibrate, and test equipment and devices installed under these Specifications. Except as otherwise specified, Contractor shall furnish labor, materials, tools, and instruments required to perform the work.

B. In accordance with the Contract Documents, individual systems and items of equipment shall be completed in a sequence that will permit systematic checkout, and trial operation of each such component before it is incorporated in the initial operation. Contractor shall provide supervision and other workers required to adjust and correct deficiencies as may be required.

C. Work shall be performed as necessary to meet the Contract Document requirements and the approved construction schedule.

D. Personnel completing Pre-Functional Checklists shall be the installing Contractor qualified to perform adjustments and conduct tests. Adjustments and tests shall be performed as many times as is necessary to assure proper operation of equipment and systems and quality materials and workmanship.

E. The Contractor shall submit completed Pre-Functional Checklists and inspection reports for each item of equipment or system that verifies, and documents tests and inspections performed. When manufacturer’s service representative has been involved, report shall include verification by that representative that the equipment or system is ready for operation.

3.02 Procedures for Functional Performance Testing

A. In conjunction with the Pre-Functional Checklists, adjustments and tests shall be made by Contractor as specified herein and as required by governing codes, regulations, manufacturer's recommendations, and specification requirements. Contractor shall adjust, calibrate, and test equipment and devices installed under these Specifications. Except as otherwise specified, Contractor shall furnish labor, materials, tools, and instruments required to perform the work.

B. Contractor shall review the Functional Performance Test Procedures to ensure feasibility, safety, and equipment protection prior to the scheduled FPT and report any items to the CxA that do not represent the actual system configuration and operation. The Contractor shall bring to the attention of the CxA any test item, which presents a hazard, may change equipment, or cannot be tested in the manner described.

C. Contractor shall demonstrate systems operation for CxA verification. Under direction of the CxA, contractor shall exercise all equipment and controls through each sequence using the Functional Performance Test Procedure forms for occupied and unoccupied modes, seasonal conditions. The CxA shall witness and document the results of all Functional Performance Tests using the specific procedural forms developed for that purpose.

3.03 Documentation and Non-conformance

A. Documentation.
   1. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose.

B. Non-conformance.
   1. The CxA will record the results of the functional test on the test form. All deficiencies or non-conformance issues shall be noted and reported to the Commissioning Team and documented on the Issues Log.
   2. Corrections of minor deficiencies identified may be made by the Contractor during the tests at the discretion of the CxA. In such cases, the deficiency and resolution will be documented on the test form.
   3. As tests progress and a deficiency is identified, the CxA will notify the executing contractor of the deficiency.
   4. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the testing procedures.
      a. When there is no dispute on the deficiency and the contractor accepts responsibility to correct it.
         i. The CxA documents the deficiency on the Functional Test Form. After testing, The CxA documents deficient test items on the Issues Log.
         ii. The contractor reschedules the test and coordinates with CxA to establish a time and date that the test is to be repeated.
      b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
         i. The deficiency shall be documented on the Issues Log.
         ii. Resolutions will be made at the lowest management level possible. Other parties will be brought into the discussions as needed. Final interpretive authority is with the Architect or Engineer of Record.
         iii. The CxA documents the resolution process.
         iv. Once the interpretation and resolution have been decided, the

appropriate party corrects the deficiency, and indicates the resolution on the Issues Log. The Contractor reschedules the test and coordinates with the CxA to establish a time and date that the test is to be repeated.

5. Cost of Retesting
   a. The cost for the Contractor to retest a Functional Performance test will be the responsibility of the Contractor. The CxA will allow for one retest of the test item during the initial testing period. Costs associated with any additional testing beyond the initial testing period where the CxA is required to attend will be charged to the contractor.

3.04 Deferred Testing

A. Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition, or other deficiency, execution of Functional Testing may be delayed upon approval by Owner.
B. Seasonal Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. Tests will be executed and documented, and any deficiencies corrected by the appropriate contractor. Any final adjustments made to the systems by the Contractor due to the testing shall be documented in the Systems Manual and as-built documents.

3.05 Systems Manual

A. Contractor shall provide the CxA the following documents to develop a Systems Manual:
   1. Construction record documents and as-built drawings.
   2. As-built control system sequence of operation.
   3. Start-up records and documents, tests, and reports.
   4. Air and Water testing and balancing report.
   5. Original setpoints for all commissioned systems.
   6. Training Documents.
   7. Equipment operation and maintenance manuals as soon as they are available.

3.06 Training of Owner Personnel

A. Contractor shall be responsible for training coordination, scheduling and ultimately for ensuring that training is completed.
B. Contractor shall coordinate the scheduling of the training with the CxA and the Owner prior to the commencement of the training.
C. Contractor and Vendor responsible for training will submit a written training plan to the CxA for review. The plan will cover the following elements:
   1. System or Equipment (included in training).
   2. Location of training.
   3. Learning objectives.
   4. Topics or Subjects.
   5. Duration of training on each topic or subject.
   6. Instructor(s) Name, Trade, Title, Company, and Instructor Qualifications.
   7. Instructional methods (classroom lecture, site walk-through, actual operational demonstrations, etc.).
D. Contractor to record attendance at training sessions, and document name of attendee, title,

organization, duration of attendance, topic of training (hours), and date training occurred.

END OF SECTION

Section 02 4119
Selective Demolition

PART 1 - GENERAL

1.01 Work Included – Work includes, but is not necessarily limited to:
- A. Demolition and removal of selected site elements.
- B. Salvage of existing items to be reused or recycled.

1.02 Related Work Described Elsewhere:
- A. Section 01 1000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
- B. Section 01 7300 "Execution" for cutting and patching procedures.
- C. Section 31 1000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

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: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 Materials Ownership

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
- A. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 Closeout Submittals

A. Inventory: Submit a list of items that have been removed and salvaged.

1.06 Field Conditions

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   A. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   A. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.01 Performance Requirements

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 Examination

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

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. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
   A. Comply with requirements specified in Section 01 3233 "Photographic Documentation."
   B. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.02 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:
   A. 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.
   B. 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.
   C. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   D. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
   E. Maintain adequate ventilation when using cutting torches.
   F. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   G. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   H. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   I. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 5000 "Temporary Facilities and Controls."

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

C. Removed and Salvaged Items:
   A. Transport items to Owner's storage area.

D. Removed and Reinstalled Items:
   A. Clean and repair items to functional condition adequate for intended reuse.
   B. Pack or crate items after cleaning and repairing. Identify contents of containers.
   C. Protect items from damage during transport and storage.

D. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.03 Disposal Of Demolished Materials

A. General: Except for items or materials indicated to be 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.
   A. Do not allow demolished materials to accumulate on-site.
   B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   C. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   D. Comply with requirements specified in Section 01 5000 "Temporary Facilities & Controls."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.04 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

Section 03 0000
Concrete Work - General

PART 1 GENERAL

1.01 APPLICABLE SECTION

A. Submit Shop Drawings, Product Data, Mill Certificates and Samples required by other portions of Contract Documents. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, and installing concrete work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.

B. Work Included:
1. All formwork, including any special forms necessary to produce architectural details and/or to accommodate the work of others and removal of forms.
2. All concrete reinforcement, placement, bending and forming thereof.
3. All concrete and cement finishing; all surface treatment and curing, including non-slip finishes and color work.
4. Installation of all reglets, bolts, anchors, cans, sleeves, column anchor bolts, etc., whether furnished under this section or by others (except cans and sleeves required under the Electrical and Mechanical Divisions).
5. The furnishing of all items required to be or shown on the drawings as embedded in concrete, which are not specifically required under other sections.
6. Setting headers and screeds. Curing and protecting concrete.
7. Grouting of column bases.
8. Inserts, sleeves, cans, etc. required under the Plumbing, Mechanical, and Electrical Divisions 22, 23, and 26 respectively.
9. Routing out cracks and saw cutting control joints as required by waterproofing.

PART 2 PRODUCTS - See other portions of specifications.

PART 3 EXECUTION

3.01 DEFECTIVE WORK

A. General: Work considered to be defective may be ordered by the Architect to be replaced in which case the Contractor shall remove the defective work at his expense. Work considered to be defective shall include, but not be limited to, the following:

Reinforcing:

1. Kinks and bends therein which are not scheduled or indicated on the drawings; reinforcing improperly placed, or previously heated, or excessively cold worked reinforcing.

Concrete:

2. Concrete in which defective or inadequate reinforcing steel has been placed.
3. Concrete incorrectly formed or not conforming to details and dimensions on the drawings or with the intent of these documents, or concrete the surfaces of which are out of plumb or level.
4. Concrete below specified strength.
5. Concrete not meeting the maximum allowable drying shrinkage requirements.
6. Concrete containing wood, cloth, or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

3.02 CORRECTION OF DEFECTIVE WORK

A. The Contractor shall, at his expense, make all such corrections and alleviation measures as directed by the Engineer.

B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings, shall be chipped out until all unconsolidated material is removed.

C. Secure approval of chipped-out areas before patching. Patch per ACI 301.

END OF SECTION 03 0000

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Section 03 0516
Underslab Vapor Barrier

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under new concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 02 4119 - Selective Structure Demolition

B. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

C. Section 03 2000 - Concrete Reinforcing.

D. Section 03 3000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017 (Reapproved 2023).

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.
   1. Manufacturer’s samples and literature.
   2. Manufacturer’s installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
   3. Summary of test results per paragraph 9.3 of ASTM E1745.
   4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

C. Test Data: Submit report of tests showing compliance with specified requirements.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum [grains/(ft2 ? hr ? inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
   2. Complying with ASTM E1745 Class A.
   3. Thickness: 15 mils.
   4. Manfacturers:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil) Basis of Design: www.stegoindustries.com.
      b. Perminator 15 mils, polyolefin by W.R. Meadows.
      c. Moistop Ultra 15 mils, polyolefin by Fortifiber
      d. VaporBlock 15 mils, polyethylene by Raven Industries.

B. Accessory Products: Vapor barrier manufacturer's recommended tapes, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier and forming/screeding accessories to prevent undue penetrations of the membrane.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
   2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, water stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
   3. Apply seam tape/textured tape/double-sided tape to a clean and dry vapor barrier.
   4. Seal all penetrations (including pipes) per manufacturer’s instructions.
   5. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier.
   6. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

B. Lap joints minimum 6 inches and seal with manufacturer's tape.

C. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

D. No penetration of vapor barrier is allowed except for permanent utilities.

E. Repair damaged vapor retarder before covering with other materials.

F. Where installing in existing building tie into existing vapor barrier if possible.

END OF SECTION 03 0516

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Section 03 1000
Concrete Formwork

PART 1 GENERAL

1.01 APPLICABLE SECTION

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, installing, and removing form work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.

B. Work Included:
   1. Design of Formwork, Shoring and Falsework
   2. Construction and removal of all forms.
   3. Installation of items furnished under other sections but indicated therein to be installed under this section.
   4. Accuracy of installation is responsibility of section furnishing item.

C. Related Work Specified Elsewhere:
   1. Structure Excavation and Backfill; Section 02 2200
   2. Concrete Reinforcement; Section 03 2000
   3. Cast-in-Place concrete; Section 03 3000

1.03 REFERENCE STANDARDS

A. The following is a list of Reference Standards referred to in this portion of the Specification:
   1. W.C.L.I.B.; "Standard Grading and Dressing Rules No. 17"
   2. American Concrete Institute Standard ACI 347 "Guide to Formwork for Concrete" and ACI 318 "Building Code Requirements for Reinforced Concrete", Latest edition.
   3. California Building Code, current governing edition.
   4. American Plywood Association, "U.S. Product Standard PS1-19"

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.
   1. California Building Code, current governing edition.
   2. ACI-347 "Guide to Formwork for Concrete", current edition.
   3. State of California Department of Transportation Standard Specifications, current governing edition.

B. Qualifications: Design and detailing of formwork shall be by a person experienced in the design of formwork and familiar with the principles of engineering mechanics. Design and detailing of formwork over 12' in height, shoring, and falsework shall be prepared by a registered Civil/Structural Engineer of the State of California.

1.05 SUBMITTALS

A. General Requirements
1. Submittals shall be made to Architect in accordance with the requirements of Division 1, General Requirements of these specifications.
2. Construction, and fabrication or ordering of materials for formwork shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work as required in these specifications.

B. Shop Drawings:
1. Formwork: Submit shop drawings for fabrication and erection of forms for portions of the concrete surfaces, as indicated below:
   a. Formwork over 12' in height
   b. Show general construction of forms including size of members, bracing, jointing, special form joint or reveals, location and pattern of form tie placement, and other items that affect the structural integrity of formwork or exposed concrete visually. Formwork over 12' in height shall be designed, detailed, and stamped by a registered Civil/Structural Engineer of the State of California.
2. Falsework and Shoring Shop Drawings: The Contractor shall submit shop drawings and calculations of any required falsework or shoring. Shop drawings and calculations shall be prepared, stamped, and signed by a registered Civil/Structural Engineer of the State of California. Shop drawings and calculations shall be prepared in accordance with the requirements of the State of California Department of Transportation Standard Specifications, Section 51-1.06A, “Falsework Design and Drawings.”

1.06 SEQUENCING AND SCHEDULING

A. The Contractor shall obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete.

PART 2 PRODUCTS

2.01 FORMS

A. Plywood shall be 5/8" Exterior "B.B." Plyform Class I. Each sheet shall be grade stamped with an APA stamp.

B. Sheathing shall be Douglas Fir "Standard" grade per Grading Rules #17, W.C.L.I.B., Paragraph 118-c. 1x6 shiplap S4S.

C. Hardboard shall be 1/8" tempered.

2.02 SPREADERS

A. Spreaders shall be of metal type that will give positive tying and accurate spreading.

2.03 STUDS, WALES AND SHORING

A. Studs, wales, and shoring shall be Douglas Fir "Construction" grade per Grading Rules #17, W.C.L.I.B. Paragraph 122-b or "No. 2" grade, Paragraph 123-c.

2.04 MANUFACTURED ASSEMBLIES

A. Manufactured assemblies may be used as forms provided that maximum loadings and deflections used on jacks, brackets, columns, joists and other manufacturer devices does not exceed the manufacturer's recommendations.

PART 3 EXECUTION

3.01 GENERAL

A. Furnish and install all forms, clamps, accessories, etc., required for all poured-in-place concrete below grade and unexposed portions above grade. Where sides of excavations have been cut neat and accurate to size for pouring of concrete directly against the excavation, forms for footings will not be required. Where the face of excavation is more than 3 inches wider than the specified width formwork shall be used.

B. Furnish and install all forms, clamps, sealer, accessories, etc., required for all poured-in-place concrete above grade that will be exposed.

C. Provide crack control and keyed cold joint forms.

3.02 DESIGN AND CONSTRUCTION OF FORMWORK

A. Forms shall be constructed of sound material, of the correct shape and dimension, mortar tight, and of sufficient strength, and so braced and tied together that the movement of equipment, men, materials, or placing and vibrating the concrete will not throw them out of line or position. Construct so that they may be easily removed without damage to the concrete. Any movement or bellying of forms during construction shall be considered just cause for their removal and, in addition, the concrete work so affected. All formed joints on concrete surfaces to be exposed shall be taped and shall align so joints will not be apparent on the concrete surfaces. All dirt, chips, sawdust and other foreign matter shall be completely removed before concrete is placed.

B. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly coated with an approved form sealer. The form sealer shall be of high penetrating quality leaving no film on the surface of the forms that can be absorbed by the concrete.

C. Form supports shall be placed on adequate foundations and have sufficient strength and bracing to prevent settlement or distortion from the weight of the concrete or other cause. Support shall rest on double wedged shim, or other approved means, so that the forms will be maintained at

the proper grade.

D. Form Ties: Bolts, rods, or other approved devices shall be used for internal form ties and shall be of sufficient quantities to prevent spreading of the forms. The ties shall be placed at least 1 inch away from the finished surface of the concrete. The use of ties consisting of twisted wire loop will not be permitted. Bolts and rods that are to be completely withdrawn shall be coated with grease.

E. Form Stakes: Where used, form stakes shall be smooth metal, coated as required to allow for removal from hardened concrete. Wood form stakes are not permitted. Fill voids left by form stake removal with non-shrink grout.

3.03 PLUMBING, LEVELING, REPAIRING AND MAINTAINING FORMS

A. Before concrete is placed in any form, the horizontal and vertical position of the form shall be carefully verified and all inaccuracies corrected. All wedging and bracing shall be completed in advance of placing of concrete.

B. Boards or other form materials that have been damaged or checked or warped prior to placing of concrete shall be removed from the forms and replaced with approved materials or otherwise corrected to the satisfaction of the engineer.

C. Assign a sufficient number of men to keep watch on and maintain the forms during placing of concrete. Satisfactorily remedy any displacement or looseness of forms or reinforcement before placing of concrete. No form shall be moved or altered except as may be specifically directed.

D. Wall forms shall be set to account for movement of post-tensioned slabs that will occur due to long term shortening of slabs. The Engineer will establish the offsets at each level after the Contractor has submitted a detailed pour schedule.

3.04 FIELD QUALITY CONTROL

A. The Contractor shall hire the Engineer responsible for the design of formwork over 12' in height, falsework or shoring to inspect the work as detailed on the reviewed shop drawings.

B. The Engineer responsible for design of formwork over 12' in height, falsework or shoring shall write a letter to the Architect certifying construction is in accordance with the reviewed shop drawings and meets his/her approval prior to the Contractor placing any concrete.

C. The Contractor shall verify accuracy of items, furnished under other sections of these specifications and installed under this section.

3.05 REMOVAL OF FORMWORK, FALSEWORK AND SHORING

A. Formwork, falsework, and shoring shall not be removed until the concrete members have acquired sufficient strength to support their weight and the loads to be superimposed thereon safely.

B. The contractor is solely responsible for the design, installation, and removal of temporary bracing and construction supports required to complete the project. No portion of the structure shall be considered to be self supporting until the entire vertical and lateral load resisting system is in place.

C. Vertical forms shall remain on columns, walls, pilasters, etc., for at least seven (7) days, and formwork over 12' in height shall not be removed until the Engineer responsible for design of the formwork has approved removal.

D. Shoring and falsework under beams, girders, slabs, etc. shall remain in place for at least 14 days and until the Engineer responsible for design of shoring and falsework has approved removal.

E. The Contractor shall request to have field cured compression test specimens taken for any concrete where it is planned to remove formwork, falsework, or shoring sooner than indicated above.

F. In removing plywood forms, no metal pinch bars shall be used and special care to be taken in stripping. Start at top edge or vertical corner where it is possible to insert wooden wedges. Wedging shall be done gradually and shall be accompanied by light tapping of the plywood panels to crack them loose. Do not remove forms with a single jerk after it has been started at one end.

G. Forms shall be left in place as long as possible to permit shrinkage away from concrete and plywood forms shall be left in place until all other forms around are stripped and until there is no danger of damaging the architectural concrete due to other work in the vicinity.

H. Nothing herein shall be construed as relieving the contractor of any responsibility of the safety of the structure.

I. After stripping, properly protect all concrete to be exposed in the finish work from damage with boards and building paper to prevent staining, spoiled edges, chips, etc.

J. Whenever the formwork is removed during the curing period, the exposed concrete shall be cured by one of the methods specified in Section 03300.

3.06 CLEAN UP

A. Clean up shall be per special conditions. Failure to perform clean up within 24 hours notice by the Architect shall be considered adequate grounds for having the work done by others at the contractor's expense.

END OF SECTION 03 1000

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Section 03 2000
Reinforcing Steel

PART 1 GENERAL

1.01 APPLICABLE SECTION

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing all reinforcing bars, ties, spacing devices, inserts, and all other material required to complete installation, as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom.

B. Work Included:
1. Fabricating and installing all reinforcing steel for cast in place concrete and unit masonry.
2. Fabrication and installing all reinforcing steel for shotcrete.
3. Fabrication of reinforcing steel dowels to be embedded in existing concrete and existing masonry.
4. Fabrication and installing all reinforcing steel for tilt-up precast concrete.

C. Related Work Specified Elsewhere:
1. Concrete Formwork; Section 03 10 00
2. Cast-in-Place Concrete; Section 03 30 00
3. Shotcrete; Section 03 36 00
4. Tilt-up Precast Concrete; Section 03 47 00
5. Post-tensioning Concrete; Section 03 36 50
6. Post Installed Anchors; Section 03 70 10
7. Concrete Unit Masonry; Section 04 22 00

1.03 REFERENCE STANDARDS

A. The following is a list of Reference Standards referred to in this portion of the specifications:
1. ASTM A184/A184M, Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
2. ASTM A615, "Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement".
3. ASTM A706, "Specification for Deformed and Low-Alloy Steel Bars for Concrete Reinforcement".
4. ASTM A970, “Specification for Headed Steel Bars for Concrete Reinforcement”.
5. ASTM A1064, "Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plan and Deformed, for Concrete".

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with all applicable Federal, State and Local Code and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
   1. ACI 315R, "Guide to Presenting Reinforcing Steel Design Details", latest edition.
   2. ACI 318, "Building Code Requirements for Structural Concrete", latest edition.
   3. AWS D1.4, "Structural Welding Code- Steel Reinforcing Bars", latest edition.

B. Mill Certificates: The Contractor shall provide Mill Certificates for reinforcing steel in accordance with the requirements of Part 1.05,, "Submittals" of this specification section. When Mill Certificates cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Part 1.05,, "Submittals" of this specification section.

C. Sampling, Testing, and Inspection:
   1. General
      a. All materials and work shall be subject to inspection at the mill, the fabrication shop, and at the building site. Material or workmanship not complying fully with the drawings, and/or specifications will be rejected.
      b. If the Owner's agent, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
   2. Owner: The Owner shall employ an independent testing laboratory as the Owner's agent to perform the sampling, testing and inspections shown on the contract drawings, and submit certified test results.
   3. Contractor:
      a. The Contractor shall cooperate with and notify Owner's agent at least 24 hours in advance of inspections required and shall provide samples, test pieces, and facilities for inspection without extra charge.
      b. The Contractor shall identify each lot of fabricated reinforcing steel to be shipped to the site by assigning an individual lot number that identifies steel by heat number and shall be tagged in such a manner that each such lot can be accurately identified at the job site.
      c. The Contractor shall remove all unidentified reinforcing steel, anchorage assemblies and bar couplers received at the site.

1.05 SUBMITTALS

A. General Requirements:
   1. Submittals shall be made to Architect in accordance with the requirements of Division 1, General Requirements of these specifications.
   2. Construction, fabrication, or ordering of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Shop Drawings:
   1. Shop Drawings shall be submitted that show diagrammatic elevations of all walls, footings, columns, beams, slabs, etc., at a scale sufficiently large to show clearly the

positions and erection marks of reinforcing bars, their dowels, and splices.
2. Use same bar marks on diagrammatic elevations as used on the bar schedule.
3. Shop drawings shall also show details for congested areas and connections.
4. Shop Drawings used in field must be reviewed copies.
5. Contract drawings shall not be reproduced in whole or in part. Contract drawings modified into shop drawings will be returned without review.
6. Revised submittals shall have clear indications of revised or new information. Clouding is an acceptable form of identification.

C. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following items intended for use on project:
1. Mechanical anchorage devices for butt splices.

D. Mill Certificates:
1. The Contractor shall provide Mill Certificates for each size of bar for each heat to be used on project.
2. Mill Certificates shall include name of mill, date of rolling, date of shipping to fabricator and shall be signed by fabricator certifying that each material complies with or exceeds the specified requirements. A Mill Certificate shall be furnished with each lot of material delivered to the project and the lot shall be clearly identified in the Certificate.
3. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance and provide laboratory test reports. The Contractor shall pay for the cost of testing.

E. Laboratory Test Reports:
1. Laboratory test reports shall show the name of testing agency; date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California.
2. When required by other portions of these specifications, laboratory test reports shall be submitted for each size of bar tested for each heat to show compliance with appropriate ASTM Standards and these specifications.

1.06 STORAGE OF MATERIALS

A. Store reinforcement during fabrication and at site to avoid excessive rusting or coating with grease, oil, dirt, or other objectionable materials.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate work with all trades so as not to interfere with the work of other trades. Bring interferences between trades to Architect's attention and resolve before any concrete is placed.

PART 2 PRODUCTS

2.01 REINFORCING BARS

A. Bars for reinforcement listed below shall conform to the requirements of ASTM A706, Grade 60, except as allowed in ACI 318 Section 20.2.2.5.
1. Chord Bars

2. Vertical Bars, Columns
3. Vertical Bars, Pilasters
4. Vertical and Horizontal Bars in Shear Walls, Coupling Beams, and Footings
5. All Reinforcing Bars to be Welded or Field Bent
6. All elements identified in ACI 318 Table 20.2.2.4a

B. Bars for reinforcement not noted above shall conform to the requirements of ASTM A615, Grade 60.

2.02 WIRE

A. All wire for concrete reinforcement shall conform to ASTM A1064.

B. Holding wire for fusion welding shall conform to ASTM A1064.

2.03 WELDED WIRE FABRIC

A. All wire fabric mesh shall conform to ASTM A1064.

2.04 WELDING ELECTRODES

A. Welding electrodes shall be per Table 5-1 of AWS D1.4.

2.05 MECHANICAL COUPLING DEVICES

A. Mechanical coupling devices shall develop 125 percent of the minimum yield strength of the bars spliced.

2.06 OTHER MATERIALS

A. All other materials, not specifically described by these specifications but required for complete and proper placement of reinforcement shall be new, first quality of their respective kinds, and subject to the approval of the Architect.

PART 3 EXECUTION

3.01 EXISTING CONDITIONS

A. Prior to all work of the section, carefully inspect the installed work of other trades and verify that all work is sufficiently complete to permit the start of work under this section and that the completed work of this section will be in complete accordance with the original design and the reviewed shop drawings. In the event of discrepancy, immediately notify the Architect/Engineer in writing.

B. In the event conduits, pipes, inserts, sleeves, or any other items interfere with placing the reinforcement as indicated on the drawings or approved shop drawings, or as otherwise required, immediately notify the Architect/Engineer and obtain approval on procedure before placement of reinforcement is started.

3.02 FABRICATION

A. Bends for reinforcing steel shall be made in accordance with ACI 318 latest edition. Bend all bars cold. Do not field bend reinforcing steel in a manner that will injure material, cause the bars to be bent on too tight a radius, or that is not indicated as allowed on drawings or permitted by Engineer. Do not straighten bent or kinked bars for use on project without permission of Engineer. Replace bars with kinks or bends not shown on the drawings.

B. The use of fusion welding for attaching carrying wires to the foundation rebar work is acceptable with the following provisions:
   1. Fusion welding shall be to the stirrups and is not allowed to longitudinal reinforcing steel.
   2. Fusion welding of holding wires shall not occur on a bent portion of a reinforcing bar. After holding wire has been fusion welded to a reinforcing bar, that bar may not be bent where the fusion weld occurs.
   3. All reinforcing steel to be welded shall comply with ASTM A706.
   4. The welding process shall be as outlined in ASTM A1064.
   5. The contractor shall submit a complete shop welding program outlining the type of the specific fusion welding machine.
   6. Fusion welding shall have periodic special inspection of the in-plant welding, including review of the setup of the machine prior to the start of welding and testing of samples.

3.03 PLACING

A. All reinforcement shall be placed in strict conformity with the requirements of the engineering drawings, both as to location, position and spacing of members. It shall be supported and secured against displacement by the use of adequate and proper wire supporting and spacing devices, tie wires, etc. so that it will remain in its proper position in the finished structure.

B. Preserve clear space between parallel bars of not less than 1 1/2 times the nominal diameter of round bars and in no case let the clear distance be less than 1 1/2 inches nor less than 1-1/3 times the maximum size of aggregate for concrete. Bars placed in shotcrete shall have a minimum clearance between bars of 2 1/2" for No. 5 and smaller and 6 bar diameters for bars larger than No. 5.

C. Lap splices shall be contact lap splices in accordance with ACI 318 unless noted otherwise on the Contract Drawings. Bars shall be wired together at laps. Wherever possible, stagger splices in adjacent bars. Make all splices in wire fabric at least 1 1/2 meshes wide or 12", which ever is greater. When splicing in areas to receive shotcrete, lap splices shall be non-contact with at least 2" clearance between bars.

D. Butt splices shall be accomplished by mechanical anchorage devices.

3.04 CLEANING REINFORCEMENT

A. Take all means necessary to ensure that steel reinforcement, at the time concrete is placed around it, is completely free from rust, dirt, loose mill scale, oil, paint and all coatings which will destroy or reduce the bond between steel and concrete.

3.05 FIELD QUALITY CONTROL

A. Inspection: The Owner's agent will perform the inspections shown on the contract drawings.

END OF SECTION 03 2000

Section 03 3000
Cast-In-Place Concrete

PART 1 GENERAL

1.01 APPLICABLE SECTION

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, and installing cast-in-place concrete work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.

B. Work Included:
1. Design of Concrete Mixes.
2. All concrete and cement finishing; all surface treatment and curing, including non-slip finishes and color work.
3. Installation of all reglets, bolts, anchors, cans, sleeves, column anchor bolts, etc., whether furnished under this section or by others (except cans and sleeves required under the Electrical and Mechanical Divisions).
4. The furnishing of all items required to be or shown on the drawings as embedded in concrete, which are not specifically required under other sections.
5. Setting headers and screeds. Curing and protecting concrete.
6. Grouting of column bases and post-tensioning anchor recesses.
7. Routing out cracks and sawcutting control joints as required by waterproofing.
8. Grouting between bearing plates, channels, etc. and bearing surfaces.
9. Drilling of existing concrete and masonry for placement of bars, dowels, and rods.
10. Grouting of bars, dowels, and rods in existing concrete and existing masonry.

C. Related Work Specified Elsewhere:
1. Concrete Formwork; Section 03 10 00
2. Reinforcing Steel; Section 03 20 00
3. Structural Steel and Miscellaneous Iron; Section 05 12 00
4. Inserts, sleeves, cans etc. required under Plumbing, Mechanical, and Electrical Divisions 22, 23, and 26 respectively.
5. Underslab vapor barrier; Section 07 19 40
6. Post-tensioning concrete; Section 03 36 50

1.03 REFERENCE STANDARDS

A. The following is a list of Reference Standards referred to in this portion of the Specification:
1. ASTM C31 " Standard Practice for Making and Curing Concrete Test Specimens in the

Field"
2. ASTM C33 "Standard Specification for Concrete Aggregates "
3. ASTM C39 " Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens"
4. ASTM C42 " Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete"
5. ASTM C94 "Standard Specification for Ready Mixed Concrete"
6. ASTM C143 "Standard Test Method for Slump of Hydraulic-Cement Concrete"
7. ASTM C150 "Standard Specification for Portland Cement"
8. ASTM C157 " Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete"
9. ASTM C171 " Standard Specification for Sheet Materials for Curing Concrete"
10. ASTM C172 " Standard Practice for Sampling Freshly Mixed Concrete"
11. ASTM C173 " Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method"
12. ASTM C231 " Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method"
13. ASTM C260 " Standard Specification for Air-Entraining Admixtures for Concrete"
14. ASTM C309 " Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete"
15. ASTM C330 " Standard Specification for Lightweight Aggregates for Structural Concrete"
16. ASTM C494 " Standard Specification for Chemical Admixtures for Concrete"
17. ASTM C618 " Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete"
18. ASTM C881 " Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete"
19. ASTM D1751 “Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
1. ASTM C94, "Specifications for Ready Mixed Concrete".
2. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
3. ACI 121R, Quality Management System for Concrete Construction.
4. ACI 201.2R, Guide to Durable Concrete.
5. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
6. ACI 214R, Recommended Practice for Evaluation of Strength Test Results in Concrete.
7. ACI 301, Specifications for Structural Concrete.
8. ACI 302.1R, Guide for Concrete Floor and Slab Construction.
9. ACI 304.2R, Placing Concrete by Pumping Methods.
10. ACI 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
11. ACI 305R, Guide to Hot Weather Concreting.
12. ACI 306.1, Standard Specification for Cold Weather Concreting.
13. ACI 308R, Guide to Curing Concrete.
14. ACI 309R, Guide for Consolidation of Concrete.
15. ACI 311.4R, Guide for Concrete Inspection.

16. ACI 318, Building Code Requirements for Structural Concrete.
17. ACI SP-15, Field Reference Manual: Standard Specifications for Structural Concrete with Selected ACI and ASTM References.
18. ACI SP-2, ACI Manual of Concrete Inspection.
19. ACI SP-66, ACI Detailing Manual.
20. California Building Code, current edition.

B. Certificates of Compliance: The Contractor shall provide Certificates of Compliance for concrete materials in accordance with the requirements of Part 1.05, "Submittals", of these specifications. When Certificates of Compliance cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Part 1.05, "Submittal" of these specifications.

C. Engineer's Review: The Engineer will review the mix designs prepared by the testing laboratory hired by the Contractor.

D. Sampling, Testing and Inspection:
   1. General:
      a. All materials and work shall be subject to inspection at the batch plant, and at the building site. Material or workmanship not complying fully with the drawings, and/or specifications will be rejected.
      b. If the Owner's agent, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
   2. Owner: The Owner shall employ an independent testing laboratory as the Owner's agent to perform the sampling, testing, and inspections shown on the contract drawings, and submit certified test results.
   3. Contractor:
      a. The Contractor shall cooperate with and notify Owner's agent at least 24 hours in advance of inspection required and shall provide samples and facilities for inspection without extra charge.
      b. The Contractor shall hire a professional testing laboratory to provide concrete mix designs for each type of concrete on the job. Each mix design shall be verified by trial batch tests or laboratory test reports and certified to by a principal of the laboratory who is a registered Civil Engineer in the State of California and submitted to the Architect for review. Laboratory test reports, in order to be acceptable, must indicate that not less that 90 percent of at least 20 consecutive 28-day tests exceed the specified strength, and none of said tests are less than 95 percent of specified strength.

1.05 SUBMITTAL

A. General Requirements:
   1. Submittals shall be made to Architect in accordance with the requirements of Division 1, General Requirements of these specifications.
   2. Construction and fabrications or mixing of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Mix Designs:
   1. Mix designs shall be submitted for each class of concrete on the job and shall show names and brands of all materials, proportions, slump, strength, gradation of coarse and fine

aggregates, and location to be used on job.

2. Mix designs for concrete designated by compressive strength shall be proportioned on the basis of field experience or trial mixtures, as described in ACI 301.
3. Drying shrinkage data should be provided in the test histories or trial mixtures for suspended slabs and slabs on grade.
4. When continuous batch plant inspection is waived, provide current certificate from the National Ready Mixed Concrete Association indicating that the plant has automatic batching and recording capabilities. See section 3.17 below for additional criteria.

C. Concrete Placement Schedule: The Contractor shall submit a concrete placement schedule which shall show all proposed construction joint locations, limits of each placement sequence, order of placement and type of joint proposed at each joint location.

D. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following materials:
1. Epoxies
2. Grout
3. Admixtures
4. Curing Compounds
5. Chemical Hardener
6. Moisture Barriers
7. Waterstops
8. Joint Fillers

E. Shop Drawings:
1. Construction Joints: Submit drawings of proposed construction joint locations in concrete for slab-on-grade, mat foundations, structural floors, roofs and walls. Submit any additional or changed reinforcing that is required at construction joints that differs from that shown on the drawings.
2. Openings, Sleeves, and Cores: Submit drawings of all openings to be formed, sleeved, cored, or sawcut in cast-in-place elements. Drawings shall indicate size and location of openings, sleeves, or cores.
3. Penetrations in Beams and Joists: Submit drawings locating all horizontal and vertical penetrations in beams and joists. Drawings shall indicate location, size, orientation, and type of penetrations.
4. Embedded Items: Submit drawings showing all items to be embedded in concrete elements, including plates, angles, bolts, and any non-structural items, such as pipe and conduit. Drawings shall indicate location, size, orientation, and type of embedded item.

F. Samples: Submit samples of materials as specified and as otherwise required by Architect, including names, sources and descriptions.

G. Certificates of Compliance:
1. The Contractor shall provide Certificate of Compliance for each type of aggregate, cement and admixture to be used in each class of concrete or a Certificate of Compliance for each class of concrete.
2. Certificates of Compliance shall include the name, source, and description of all materials used in each class of concrete and shall be signed by the concrete supplier certifying that each material item complies with, or exceeds the specified requirements. Certificates of

Compliance shall be furnished 60 days in advance of any concrete pours.

3. When Certificates of Compliance cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance of each type of material to be used in each Class of Concrete. The cost of testing shall be paid for by the Contractor.

H. Laboratory Test Reports:
   1. Laboratory test reports shall show the name of testing agency, date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California. Laboratory tests shall not be older than eight (8) months and shall certify that the tested materials meet the specified standards.
   2. Laboratory test reports for concrete mix designs shall clearly identify each material or mix number of each mix tested to verify the correlation between the tested mix designs and the proposed mix designs.
   3. When required by other portions of these specifications, laboratory test reports shall be submitted for each material to be used in each class of concrete, or for each mix design and shall show compliance with appropriate ASTM Standards and these specifications.

I. Weight and Batch Tags:
   1. Weight and batch tags will be supplied to the engineer upon request.

J. Engineering Analysis: Prepared by a California-licensed Civil or Structural Engineer; justifying construction-imposed loads on slabs, beams, and walls which exceed those allowed by CBC for the specified use.
   1. 2,000 lbs maximum allowable construction load without analysis
   2. 10,000 lbs maximum allowable construction load with analysis

1.06 SEQUENCING AND SCHEDULING

A. Obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete so provision for their work can be made without delaying the project.

B. Do any cutting and patching made necessary by failure or delay in complying with these requirements, at no cost to Owner.

PART 2 PRODUCTS

2.01 CEMENTITIOUS MATERIALS

A. Portland Cement
   1. Portland cement shall conform to ASTM C150 for Type II cement. Use a single, approved standard brand throughout work.

B. Fly Ash
   1. Fly ash shall conform to ASTM C618 for Class F fly ash.

C. Ground Granulated Blast Furnace Slag
   1. Slag shall conform to ASTM C989, Grade 100 or 120.

2.02 CONCRETE AGGREGATES

A. Aggregates for hardrock concrete shall conform to ASTM C33.

B. Aggregates for light-weight concrete shall conform to ASTM C330.

C. Fine Aggregate: Use washed natural sand of hard, strong particles and not more than 1% of deleterious materials. Not more than 2.5% shall pass the No. 200 sieve. Fineness modulus - 2.65 to 3.05.

D. Coarse Aggregate: Use clean, sound-washed gravel or crushed rock. Not more than 1% deleterious material or 5% flat, thin, elongated or laminated material allowed. Cleanness value shall not be less than 75 when tested in accordance with California Test 227.

2.03 WATER

A. Mixing Water for concrete shall be clean and free from deleterious amounts of acids, alkalis or organic materials.

2.04 NONSHRINK GROUT

A. Nonshrink grout shall be pre-mixed, high strength, flowable grout which does not shrink as it cures. Nonshrink grout shall attain a minimum compressive strength of 5000 psi at 7 days. Subject to compliance with requirements provide one of the following:
   1. Metallic
      a. Embeco 636; BASF.
      b. Sikagrout 212; Sika Chemical Company.
      c. Burke Metallic Spec Grout; Dayton Superior Corporation.
   2. Non-Metallic
      a. Masterflow 928; BASF.
      b. Sonogrout 10K; BASF.
      c. Sure-Grip Grout; Dayton Superior Corporation.

2.05 CURING PRODUCTS

A. Liquid membrane curing compounds: Liquid membrane curing compounds shall conform to the requirements of ASTM C309.

B. Waterproofing Paper: Waterproofing paper for curing concrete shall conform to the requirements of ASTM C171.

2.06 AIR-ENTRAINING ADMIXTURE

A. Air-entraining admixtures shall conform to the requirements of ASTM C260. Subject to that compliance, provide one of the following:
   1. Sika Aer; Sika Corporation.
   2. MB-VR or MB-AE; BASF.
   3. Dorex AEA; W.R. Grace.

2.07 WATER-REDUCING ADMIXTURE

A. Water-reducing admixtures shall conform to the requirements of ASTM C494, Type A, and contain not more than 0.1% chloride ions. Subject to compliance with requirements, provide one of the following:
   1. Eucon WR-75; Euclid Chemical Company.
   2. MasterPozzolith 322; BASF.
   3. Plastocrete 160; Sika Chemical Corporation.

2.08 HIGH-RANGE WATER-REDUCING ADMIXTURE (SUPER PLASTICIZER)

A. Super Plasticizer shall conform to the requirements of ASTM C494, Type F or Type G and contain not more than 0.1% chloride ions. Subject to compliance with requirements, provide one of the following:
   1. ADVA 190; W.R. Grace.
   2. Sikament; Sika Chemical Corporation.
   3. Pozzolith 400; BASF.

2.09 WATER-REDUCING, RETARDING ADMIXTURE

A. Water-reducing, retarding admixtures shall conform to the requirements of ASTM C494, Type D, and contain not more than 0.1% chloride ions. Subject to compliance with requirements, provide one of the following:
   1. Pozzolith 300-R; BASF.
   2. Daratard; W.R. Grace.
   3. Plastiment; Sika Chemical Corporation.

2.10 WATERSTOPS

A. General: Provide waterstops at all construction joints and other joints in all foundation walls below grade and where shown on the drawings. Size to suit joints and factory fabricate corners, intersections, and directional changes. The selected waterstop products shall be appropriate for the specific joint condition as specified by the manufacturer, including number of layers of reinforcement, minimum concrete thickness and minimum concrete cover.

B. Swell Hydrophilic Waterstops: Conform to _____. Subject to compliance with requirements, provide one of the following:
   1. GCP Applied Technologies
   2. ADCOR ES
   3. ADCOR 500S

C. Polyvinyl Chloride (PVC) Waterstops: Conform to the requirements of Corps of Engineers CRD-C 572. Provide flat, dumbbell type or centerbulb type as noted on the drawings.
   1. W. R. Meadows Seal Tight PVC waterstop
   2. Sika Greenstreak PVC waterstop

D. Rubber Waterstops: Conform to the requirements of Corps of Engineers CRD-C513. Subject to compliance with requirements, provide one of the following:
   1. Dayton Superior Corporation

2. Progress Unlimited
3. Williams Products

E. Preformed Plastic Waterstops: Conform to the requirements of Federal Specifications SS-S-210A "Sealing Compound for Expansion Joints". Subject to compliance with requirements, provide one of the following:
   1. Henry Corporation
   2. Synko-Flex Waterstop

F. Bentonite Waterstops: Waterstop shall consist of sodium bentonite and butyl rubber compound formed into uniform coils.
   1. CETCO Bentonite Waterstop-RX

2.11 SEMI-RIGID JOINT FILLER

A. Control and Construction Joint-Filler Material for Slabs-on-Grade: Provide a two-component semi-rigid, 100% solids epoxy having a minimum Shore A Hardness of 80 when tested in accordance with ASTM D 2240 and an elongation below 75% when measured in accordance with ASTM D 638. Subject to compliance with requirements, provide one of the following:
   1. The Euclid Chemical Company; Euco 700.
   2. Dayton-Superior Corporation, Inc.; Sure Fil J52
   3. BASF Corporation; MasterSeal CR 190.
   4. Metzger/McGuire Co.; MM-80.
   5. W.R. Meadows, Inc; Rezi-Weld Flex.
   6. SpecChem, LLC; SpecPoxy CJ.

2.12 JOINT-FILLER STRIPS

A. Joint-Filler Strips shall conform to one of the following:
   1. ASTM D1751, asphalt-saturated cellulosic fiber
   2. ASTM D1752, cork or self-expanding cork

2.13 CONCRETE

A. Concrete Mix Requirements: See plans for concrete mix design requirements and specifications.

B. Lightweight Concrete Mix Requirements: Lightweight concrete shall have a maximum air dried weight of 115#/ft^3, a minimum 28-day compressive strength, minimum cement concrete and maximum water/cement ratio as listed in the contract documents.

C. Slumps noted on the plans are for concrete without admixtures to be consolidated using vibration. Formwork constraints, congestion of rebar, and pumping of concrete may require increased slump beyond the slump listed on the plans. The contractor shall adjust the slump up to 8” max using admixtures as necessary to provide workability and consistency to permit concrete to be worked readily into forms and around reinforcement under conditions of placement to be employed without segregation or excessive bleeding. All admixtures shall be noted in the submitted mix design and are subject to the Engineer’s review. Slump shall not exceed 3" for any concrete placement where top of surface slopes more than 2%.

D. At Contractor's option, an air entraining agent conforming to the latest revision of ASTM Specification C260 may be added to the concrete to provide entrained air. Air-entraining shall not exceed 3% ± 1.5% without the approval of the engineer.

E. Drying Shrinkage: The average "Drying Shrinkage" of the concrete after 21 days of drying shall not exceed 0.040 in suspended slabs and 0.048 percent for slabs on grade.

2.14 CONTROL JOINTS

A. Control joints shall be sawcut using SOFF-CUT International or equal.

2.15 UNDERSLAB VAPOR BARRIER/RETARDER

A. Vapor barrier/retarder membrane including installation accessories, for installation under concrete slabs-on-grade for floors of interior spaces as follows:
   1. Minimum 15-mil-thick polyolefin geomembrane for superior barrier performance and for tear strength and puncture resistance, manufactured from ISO certified virgin resins.
   2. Acceptable Manufacturers:
      a. Stego Wrap (15-mil) Vapor Barrier as manufactured by Stego Industries LLC, San Juan Capistrano, CA, 949-493-5460, website: www.stegoindustries.com.
      b. Ecosheild-E15 (15-mil) Vapor Barrier as manufactured by Epro, Derby, KS.
      c. Griffolyn Vaporguard as manufactured by Reef Industries, Houston, TX.
   3. Physical Properties:
      a. Tensile Strength: ASTM E-175, minimum 45.0-lbf/in.
      b. Water Vapor Barrier: ASTM E-1745, meets or exceeds Class B.
      c. Water transmission Rate: ASTM E-96, 0.006-gr/ft2/hr or lower.
      d. Permeance Rating: ASTM E-96, 0.01-gr/ft2/hr or lower.
      e. Puncture Resistance: ASTM E-1745, minimum 1970 grams.
   4. Installation Accessories:
      a. Seam Tape and Vapor Proofing Mastic: Water Vapor Transmission Rate shall be 0.3-perms or lower per ASTM E 96.
      b. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.
      c. Vapor Stakes: Provide Density of 0.0289-lb/in3 per ASTM D 1505: and Specific Gravity of 0.0477 per ASTM D 792.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Produce concrete of required consistency and strength to present appearance satisfactory to Architect.

B. Use only one brand of cement unless otherwise authorized by Architect.

C. Store materials delivered to the job and protect from foreign matter and exposure to any elements which would reduce the properties of the material.

D. When concrete is cast against existing concrete the surface shall be cleaned and roughened by sandblasting, grinding, bush hammering or other suitable means. Wet the surface until it is damp, but without visible free water.

3.02 UNDERSLAB VAPOR BARRIER/RETARDER PLACEMENT

A. Vapor barrier/retarder membrane shall be installed in accordance with manufacturer's printed instructions and ASTM E 1643. The following shall serve as a general outline for preparation and installation:
   1. Preparation: Ensure that subsoil is approved by architect or geotechnical firm. Level and tamp or roll aggregate, sand or tamped earth base as applicable.
   2. Schedule preconstruction meeting/conference at the site with field representative of the vapor barrier/retarder membrane prior to installation. Provide minimum one week notice to manufacturer's representative and the Architect.
   3. Unroll vapor barrier/retarder with the longest dimension parallel with the direction of the pour. Lap vapor barrier/retarder over footings and seal to foundation walls. Seal to interior/perimeter footings using specified mastic. Overlap joints 6 inches and seal with manufacturer's seam tape.
   4. Seal all penetrations (including pipes) per manufacturer's instructions, and as follows:
      a. Seal single pipe penetrations using pipe boot constructed from the product:
         1) Cut a piece of vapor barrier membrane; minimum 12-inches wide and length of 1-1/2 times the circumference of the pipe.
         2) Cut slits half the width of the film using scissors.
         3) Wrap boot around pipe; tape onto pipe and completely tape the base to the vapor barrier/retarder membrane.
   5. Multiple pipe penetrations in close proximity and very small pipes may be sealed using specified vapor proofing mastic.
      a. Cut out a small area around pipes.
      b. Cut a patch of vapor barrier/retarder membrane extending at least 6 inches past the cut-out portion in all directions.
      c. Cut X's or small circles in the patch and install over pipes.
      d. Overlap at least 6 inches and tape.
      e. Build up 40-60 mils of mastic, or as needed to completely fill all voids between the pipe and the vapor barrier/retarder membrane.
   6. No penetration of the vapor barrier/retarder membrane is allowed except for reinforcing steel and permanent utilities.
   7. In the case that forms must be used vapor stakes should be used to hold forms in place:
      a. Penetrate plastic with stake.
      b. Treat stake as pipe penetrations(See above, 5.a. through 5.e.).
      c. Leave stakes permanently in concrete.
      d. Using a power saw, cut the stake off above the seal, but below the surface of the finished concrete.
      e. The lower portion of the vapor stake remains in place, permanently plugging the penetration.
   8. Repair damaged areas by cutting patches of vapor barrier/retarder membrane, overlapping damaged area 6-inches and taping all four sides with tape.

3.03 EXISTING CONCRETE SURFACE PREPARATION

A. Where concrete is to be cast against existing concrete, prepare the surface of existing concrete as follows, unless noted otherwise:
   1. Chip or scarify surface as required to remove all spalled, severely cracked, deteriorated, loose or unsound material.
   2. Chip or scarify any area as required to remove offsets which would cause an abrupt change in thickness of the new concrete. Taper edges to leave no square shoulders at the perimeter of a cavity.
   3. Sand-blast or water-blast all surfaces to receive new concrete to remove all dirt, paint, grease, fractured concrete, oil, or other substances that could interfere with the bond of the newly placed concrete. Clean forms and reinforcing of drippings. Clear away debris by compressed air.
   4. Wet the surface until it is damp, but without visible free water.

B. Where noted on the drawings to 'intentionally roughen' surface, prepare the surface of existing concrete as follows:
   1. Chip or scarify surface as required to remove all spalled, severely cracked, deteriorated, loose or unsound material.
   2. Chip or scarify any area as required to remove offsets which would cause an abrupt change in thickness of the new concrete. Taper edges to leave no square shoulders at the perimeter of a cavity.
   3. Sand-blast using coarse sand or water-blast to clean and roughen to 1/4" amplitude all surfaces to receive new concrete, exposing coarse aggregate solidly embedded in mortar matrix. Clean forms and reinforcing of drippings. Clear away debris by compressed air.
   4. Wet the surface until it is damp, but without visible free water.

3.04 EMBEDDED ITEMS

A. General: Place all pipe sleeves, inserts, anchors bolts, angle frames, ties and other embedded items required for adjoining work or for its support prior to concreting. Embedded items shall be positioned accurately and supported against displacement.
   1. Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.
   2. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto unless directed otherwise by these specifications.
   3. Install reglets to receive top edge of foundation sheet waterproofing where specified by the Architect, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles and other conditions.
   4. Voids in sleeves, inserts and anchor bolt slots shall be filled temporarily with a readily removable material to prevent entry of concrete into the voids.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

C. Do not install sleeves in any concrete member except where shown on the structural drawings or approved by the Architect and Engineer.

D. Securely fasten embedded plates, angles, anchor rods and other items to be built into the concrete to the formwork or hold in place with templates. Insertion of these items into concrete after concrete placement is prohibited.

3.05 CONDUITS AND PIPES EMBEDDED IN CONCRETE

A. Slabs-on-Grade:
   1. No pipe or conduit exceeding 1 inch outside diameter shall be embedded within the specified slab thickness except as specifically detailed.
   2. Do not stack or abut pipes, maintain 3 inches minimum clearance.

B. Sleeving and Wrapping:
   1. Foundations: Sleeve or wrap all individual pipe penetrations, minimum 1-1/2 inches clear to reinforcing all around.
      a. Sleeves: PVC. Provide 1 inch minimum clear all around O.D. pipe to I.D sleeve, UNO at ends, fill void space with mastic or plastic bituminous cement.
      b. Wrapped Vertical Pipes: Provide 1/8 inch nominal sheet foam with three wraps minimum, UNO.
      c. Wrapped Horizontal Pipes: Provide 1/8 inch nominal sheet foam with eight wraps minimum, UNO.
      d. Underground Fire Lines 4” and Larger: At sleeves provide 2 inch minimum clear all around O.D. pipe to I.D sleeve. At wrapped pipes, provide 1/8 inch nominal sheet foam with sixteen wraps minimum.
   2. Slabs or Curbs: Wrap pipes as described above.

C. Space groups of pipes/conduits at least 3 sleeve diameters apart, do not interrupt specified concrete and reinforcement.
   1. Provide block-outs as detailed when grouping of pipes/conduits in foundation or other structural member prevents spacing as described. Notify Architect/Engineer for review of any conditions not conforming to details.
   2. Center pipe/conduit penetrations in the depth and/or thickness of foundations.
   3. Maximum size of pipe/conduit penetrations shall not exceed the least dimension of concrete divided by 3.

D. Do not embed pipes/conduits in concrete slabs on metal deck.

E. Provide the following at pipes/conduits detailed to be embedded in a concrete beam, wall or column:
   1. Place as near as possible to center of member with reinforcing as specified on each side.
   2. Where reinforcing is located near or at center of member, place pipe or conduit 1 inch minimum clear from reinforcing and provide #3 at 12 inches on center perpendicular to the pipe/conduit. Reinforcing to extend 12 inches minimum past pipe/conduit each side.
   3. Maintain ¾ inch clear minimum from added reinforcing to face of concrete where not exposed to weather and 1-1/2 inches clear where exposed to weather.

4. Space embedded items (groups of pipe/conduit, junction boxes or other elements) minimum 3 inches apart.
5. Provide reinforcing in walls, beams, columns as detailed for groups of pipe/conduit. Provide minimum replacement reinforcement of same size and number for interrupted or displaced reinforcement for the full height, length, width of the wall, beam, and/or column on each side of the "effective opening."

3.06 MIXING

A. Use ready-mixing concrete complying with ASTM C94 and with the requirements of Contract Documents. Mix for a period of not less than ten (10) minutes; at least three (3) minutes of mixing period shall be immediately prior to discharging at the job.

B. Introduction of additional water after initial mixing not permitted.

3.07 WEATHER REQUIREMENTS

A. Do not mix or place when atmospheric temperature is below 40 degrees F. or when conditions indicate temperature will fall below 40 degrees within 72 hours. Reinforcement, forms, and ground which concrete will contact shall be completely free of frost. Keep concrete and formwork at a temperature not less than 50 degrees F. for not less than 72 hours after pouring.

B. When temperature is above 80 degrees F. Contractor shall take precautions to insure that rebar temperature does not exceed ambient temperature.

C. Temperature of concrete at time of placing shall not be less than 50 degrees F. and not more than 85 degrees F.

3.08 JOINTS IN CONCRETE

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Structural Joints (Construction/Cold Joints): Location and details of construction joints shall be as indicated on drawings, specified, or as approved by the Architect/Engineer. Locate so as not to impair the strength of the structure. Submit drawings with construction joints clearly defined, and schedule of pouring operations for approval in accordance with Part 1.05 "Submittals" of this specification section, prior to starting concreting.
   1. Keyways: Provide keyways with a depth of one tenth of the member thickness (1 1/2" minimum or as shown on the drawings) in construction joints only where shown on the drawings.
   2. Joint Construction:
      a. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise shown on the drawings. Do not continue reinforcement through sides of strip placements of floors and slabs.
      b. Locate construction joints in the middle third of suspended spans and grade beams and as shown on the drawings for slabs-on-grade and walls unless shown otherwise. Offset joints in girders a minimum distance of twice the beam width from a beam-

girder intersection.

c. Locate horizontal joints in walls and columns at underside of slabs and at top of footings and floor slabs.

d. Space vertical joints in walls as indicated on the drawings. Locate joints besides piers integral with walls, near corners, and in concealed locations where possible.

e. Dowels that cross construction joints shall be supported during concreting operations so as to remain parallel with the slab or wall surface and at right angles to the joint.

f. Sandblast all construction joints using coarse sand or waterblast to clean and roughen entire surface of joint, exposing coarse aggregate solidly embedded in mortar matrix. Clean forms and reinforcing of drippings. Clear away debris by compressed air.

3. Waterstops: Provide waterstops in construction joints as indicated on the Architectural and Structural Drawings. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions. Waterstops shall be installed with a minimum of 3” of concrete cover.

C. Control Joints in Slabs-on-Grade and Unbonded Topping Slabs: Install control joints at locations and spacings as indicated on the drawings or if not shown on drawings, located so as not to impair strength and appearance of the structure, as acceptable to Architect/Engineer. Maximum joint spacing shall be per the drawings and be perpendicular to the slab surface. Use one of the two following methods (sawed or formed) to create the joints. Do not use the formed joint in areas subject to vehicular traffic or in industrial slabs.

1. Sawed Joints

a. Primary Method: Early-Entry, dry-cut method, using Soff-Cut saws. Finisher must have documented successful experience in the use of this method prior to this project. Install cuts within one to four hours, depending on air temperature, after final finish as soon as the concrete surface is firm enough to not be torn or damaged by the blade at each saw cut location. Use 1/8 inch thick blade, cutting to a depth of one quarter of the slab thickness but not less than one inch. Cut to a depth of one third of the slab thickness for slabs reinforced with steel fibers or synthetic fibers.

b. Optional Method (where Soff-Cut System method equipment is not available, subject to limitations): This method may not be used when there is no dowel passing through the contraction joint. Use a conventional saw to cut joints within four to 12 hours after finishing as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Complete cutting before shrinkage stresses become sufficient to produce cracking. Use 1/8 inch thick blade, cutting to a depth of one quarter of the slab thickness but not less than one inch. Cut to a depth of one third of the slab thickness for slabs reinforced with steel fibers.

2. Formed Joints: Form contraction joints by inserting premolded plastic hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. The depth is to be one quarter of the slab thickness, but not less than one inch. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

3. Joint Filler: Provide in both control and saw-cut construction joints when specified.

a. Remove dirt and debris from the joint by vacuuming immediately prior to filling joint. Clean the joint of curing compounds and sealers.

b. Filler material shall be applied to the joints when the building is under permanent temperature control, but no less than 90 days after slab construction.
c. Follow the manufacturer's recommended procedure for installing filler material. The joint filler must be flush with the adjacent concrete. A concave profile on the top of the joint filler is unacceptable and will be grounds for removal and replacement.

4. The Contractor shall protect the joints from damage caused by wheeled traffic or other sources during construction until a joint-filler material (if specified) has been installed.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, Construct isolation joints (without dowels) in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, only where specifically detailed on the drawings. Install joint-filler strips at joints where indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated on the drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
4. Provide construction joints with dowels at all locations unless isolation joints are detailed.

3.09 CONVEYING AND PLACING

A. All concrete shall be mixed and delivered in accordance with the requirements of ASTM C94. All concrete shall be placed, finished and cured and all other pertinent construction practices shall be in accordance with the requirements of ACI 301.

B. It is the contractor’s responsibility to provide a concrete mix suitable for the job site conditions. Workability and pumpability may be increased by methods noted in Section 2.11.

C. Notify Architect at least 48 hours before placing any concrete.

D. Before placing, clean mixing and conveying equipment, clean forms and space to be occupied by concrete and wet forms. Remove ground water until completion of work.

E. Place no concrete in any unit of work until all formwork has been completely constructed, all reinforcements secured in place, all items to be built into concrete are in place, and form ties at constructions joints tightened.

F. Concrete shall be placed so that a uniform appearance of surfaces will be obtained. The concrete will be free of all rock pockets, honeycombs and voids. Deposit as nearly as practical in its final position.

G. The subgrade must be moist when the concrete is placed for floor slab to prevent excessive loss of water from the concrete mix.

H. Carry on concreting, once started, as a continuous operation until the section of approved size and shape is completed. Make pour cut-offs of approved detail and location.

I. Handle concrete as rapidly as practicable from mixer to place of deposit by methods which prevent separation or loss of ingredients. Deposit as nearly as practicable in final position to avoid rehandling or flowing. Do not drop concrete freely where reinforcing bars will cause segregation, nor drop freely more than four feet. Deposit to maintain a plastic surface approximately horizontal. In walls, deposit in horizontal layers not over eighteen inches deep. In pouring columns, walls or thin sections of considerable heights, use openings in forms, elephant trunks, tremies or other approved devices which permit concrete to be placed without segregation or accumulation of hardened concrete on forms or metal reinforcement above the level of the concrete. Install so concrete will be dropped vertically.

J. Concrete that has partially hardened shall not be deposited in the work.

K. All concrete floors except sloping to drains shall be brought to a level not exceeding one-eighth inch (1/8") in a 10'-0" measured with a straight edge.

L. Vibrating: Employ as many vibrators and tampers as necessary to secure the desired results. Minimum: one per each 20 cubic yards of concrete placed per hour. Eliminate the following practices: Pushing of concrete with vibrator; external vibration of forms; allowing vibrator to vibrate against reinforcing steel where steel projects into green concrete; allowing vibrator to vibrate contact faces of forms. Vibrators shall function at a minimum frequency of 3600 cycles per minute when submerged in concrete. Supplement vibration by forking and spading along the surfaces of the forms and between reinforcing whenever flow is restricted.

M. Tremie Concrete: Tremie concrete is a special procedure for placing concrete underwater. Tremie concrete shall be placed by pump or a gravity feed pipe. If a gravity feed pipe is used it shall be 8" minimum diameter and shall be affixed with a shutoff device at the bottom that will allow filling of the pipe with concrete without allowing water to enter. The trunk of the pump or gravity pipe shall be placed at the bottom of caisson prior to placing any concrete. The pump trunk or gravity pipe shall be removed slowly as the caisson is filled insuring that the end of pump trunk or gravity pipe is embedded in concrete a minimum of 1 foot.

3.10 CURING

A. General: Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures and shall be maintained with minimum moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.

B. Initial Curing:
   1. Initial curing shall immediately follow the finishing operation. Concrete shall be kept continuously moist at least overnight. One of the following material or methods shall be used: Ponding or continuous sprinkling; absorptive mat or fabric kept continuously wet.
   2. Curing compounds conforming to ASTM C309. Such compounds shall be applied in accordance with the recommendations of the manufacturer and shall not be used on any surface against which additional concrete or other cemetitious finishing materials are to be bonded, where epoxy flooring is called for, where concrete topping is to receive waterproofing membrane, nor on surfaces where such curing is prohibited by the project specifications.

C. Final Curing:
   1. Immediately following the initial curing and before the concrete has dried, additional curing shall be accomplished by one of the following materials or methods:
      a. Continuing the method used in initial curing.
      b. Waterproofing paper conforming to the requirements of ASTM C171.
      c. Other moisture-retaining coverings as approved.

D. Duration of Curing: The final curing shall continue until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is above 50 degrees F. has totaled seven days. If high-early-strength concrete has been used, the final curing shall continue for a total of three days. Rapid drying at the end of the curing period shall be prevented.

E. Formed Surfaces: Steel forms heated by the sun and all wood forms in contact with the concrete during the final curing period shall be kept wet. If forms are to be removed during the final curing period, one of the above curing materials or methods shall be employed immediately. Such curing shall be continued for the remainder to the curing period.

F. Architecturally Exposed Slabs: Architecturally exposed slabs shall be cured by moisture-retaining cover curing. Thoroughly wet the surface of the concrete and then cover with moisture-retaining cover, placed in widest practical width, with edges lapped at least 12 inches and extended 18 inches beyond the area of concrete to be cured, and seal with waterproofing tape. Maintain a film of water under the cover through the curing period by rolling back and rewetting. Immediately repair any holes or tears that occur using cover material and waterproof tape. Start moisture-retaining cover curing as soon as free water has disappeared from concrete surface following finishing. Curing shall be maintained for 7 days.

3.11 CONCRETE FINISHES

A. Finishes:

Element:	Finish
Exposed foundation surfaces	Rough troweled finish
Permanently exposed formed surfaces	Grout cleaned and sacked
Slabs	Smooth troweled finish

B. Grout Cleaned Finish: After the concrete still freshly hardened has been pre-dampened, a slurry consisting of one part cement and one and one-haft parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Any surplus shall be removed by scraping and then rubbing with clean burlap. The finish shall be cured in an approved manner. Sample to be approved by Architect.

C. Troweled Finish: Where a troweled finish is specified, the surface shall be finished first with power floats, then with power trowels, and finally with hand trowels. The first troweling after power floating shall be done by a power trowel and shall produce a smooth surface which is relatively free of defects but which may still contain some trowel marks. Additional trowelings shall be done by hand after the surface has hardened sufficiently. The final troweling shall be

done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be free of any trowel marks, uniform in texture and appearance.

D. Broom or Belt Finish: Slabs shall be given a coarse traverse scored texture by drawing a broom or burlap belt across the surface. Slabs with less than 6% slope shall receive a medium broom finish. Slabs with greater than 6% slope shall receive a heavy broom finish. This operation shall follow immediately after troweling.

3.12 ARCHITECTURAL, EXPOSED CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Adjustment to Concrete Mixes:
   1. Adjustment to concrete mix design shall be submitted and accepted prior to any concrete work. Concrete mix design cannot change once concrete has been poured on site.
   2. Do not add water to concrete during delivery, at Project site, or during placement.

C. Batch Control and Pour Sequencing: Intent is to produce monolithic, uniform concrete surfaces.
   1. Forms and sequencing to be scheduled with intention of providing continuous uniform surfaces.
   2. Where possible, allow for same-day pour of single wall surfaces. Control joint locations shown on Drawings are for control of concrete only and do not indicate an acceptance of cold joints at these locations.
   3. Mix to be controlled so as to provide uniform coloration. Time arrival of batches to minimize waiting time of concrete on site.
   4. Formwork shall be able to withstand excessive deflection when filled with wet concrete.
   5. Forms shall be tight to prevent leakage or washing out of cement mortar from concrete.
   6. Provide additional bracing, shoring, and accessories as required to achieve specified tolerances.
   7. Use extra studs, walers and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.
   8. Provide sealers, trim, corner bracing, stiffeners, to achieve profiles of joints and seams, as shown on Drawings.

D. Concrete Placement: Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seas or planes of weakness. Deposit concrete to avoid segregation at its final location. Deposit concrete continuously or consecutively to ensure consistency of raw materials.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

E. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
   1. Deposit and vibrate special finished concrete to ensure proper consolidation, elimination of unintended cold joints, and to minimize entrapped air on exposed surfaces.
   2. Proper placement and thorough effective compaction of architectural concrete are most important. Place vibrators in the concrete rapidly to minimize entrapped air between the concrete and the form and to blend the two layers. Insert vibrators in accordance with

manufacturer's recommended radius of influence. Vibrate with rubber type heads and, in addition, spade along forms with flat strap or plate. Keep vibrator heads a minimum of 2-1/2 inches from the architectural concrete face.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Do not permit vibrators to contact forms.

F. See Section 03 3500 for defective architectural, exposed concrete repair requirements.

3.13 PROTECTION

A. Protect from injurious action of elements and defacement of any nature during operations.

3.14 PATCHING AND CLEANING

A. After forms are removed, remove projecting fins, bottles, form ties, nails, etc. not necessary for the work or cut back one inch from the surface. Joint marks and fins in exposed work shall be smoothed off and cleaned as directed by the Architect.

B. Repair defects in concrete work as directed by the Engineer. Chip voids and stone pockets to a depth of one inch or more as required to remove all loose material. Voids, surface irregularities, chipped areas, etc., shall be filled by patching, gunite or rubbing, as directed by the Architect. Repaired surfaces shall duplicate appearance of unpatched work.

C. Clean exposed concrete surfaces and adjoining work stained by leakage of concrete to approval of Architect.

3.15 CLEANUP

A. In addition to the requirements of Supplementary General Conditions, clean up all concrete and cement work on completion of this portion of the work, except protective coatings or building papers shall remain until floors have completely cured or until interior partitions are to be installed.

3.16 GROUTING

A. Column base plates: The grout shall be mixed and placed in strict accordance with manufacturer's instructions. Care shall be taken in the grouting to ensure that there are no voids or air pockets, and that there is full bearing between the base plates and the grout.

B. Bearing plates and channels: The space between plates and channels bearing against masonry or concrete shall be filled with grout when required by the Engineer. The grout shall be mixed and placed in strict accordance with manufacturer's instructions. Care shall be taken in the grouting to ensure that there are no voids or air pockets, and that there is full bearing between the bearing plates and channels and the grout.

C. Post-tensioning Anchor Recesses.

3.17 CONCRETE SURFACE REPAIRS

A. Inspect all concrete surfaces immediately upon formwork removal. Notify Architect/Engineer of identified minor defects. Repair all minor defects as directed.

B. Surface and Finish Defects: Repair as directed by the Architect/Engineer, at no added expense to the Owner. Repairs include all necessary materials; reinforcement grouts, dry pack, admixtures, epoxy and aggregates to perform required repair.
   1. Repair minor defective surface defects by use of drypack and surface grinding. Specific written approval of Architect/Engineer is required. Submit proposed patching mixture and methods for approval prior to commencing work.
   2. Slabs-on-Grade, Elevated Slabs and on Slabs on Metal Deck: Review for "curled" slab edges and shrinkage cracks prior to installation of other floor finishes. Grind curled edges flush, fill cracks of 1/16 inch and greater with cementitious grout.
   3. Grind high spots, fins or protrusions caused by formwork; Fill-in pour joints, voids, rock pockets, tie holes and other void not impairing structural strength. Provide surfaces flush with surrounding concrete.

3.18 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required compressive strength, lines, details, dimensions, tolerances, finishes or specified requirements; as determined by the Architect/Engineer.

B. Repair or replacement of defective concrete will be determined by the Architect/Engineer who may order additional testing and inspection at his option. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

C. Specific Defects:
   1. "Low-Strength"; Concrete Not Meeting Specified Compressive Strength after 28 days:
      a. Concrete with less than 25% Fly Ash as cementitious material: Test remaining cylinder(s) at 56 days. If strength requirements are met, concrete strength is acceptable.
      b. Concrete with 25% or more Fly Ash as cementitious material: Test remaining cylinder(s) at 70 days. If strength requirements are met, concrete strength is acceptable.
   2. Concrete not meeting the maximum allowable drying shrinkage requirements: Complete removal and replacement of defective concrete, as directed by the Architect/Engineer.
   3. Excessive Shrinkage, Cracking, Crazing or Curling; Defective Finish: Remove and replace if repair to acceptable condition is not feasible.
   4. Lines, Details, Dimensions, Tolerances: Remove and replace if repair to acceptable condition is not feasible.
   5. Slab sections not meeting specified tolerances for trueness/flatness or lines/levels: Remove and replace unless otherwise directed by the Architect/Engineer. Minimum area for removal: Fifteen square feet area unless directed otherwise by the Architect/Engineer.
   6. Defective work affecting the strength of the structure or the appearance: Complete removal and replacement of defective concrete, as directed by the Architect/Engineer.
   7. Concrete in which defective or inadequate reinforcing steel has been placed: Complete removal and replacement of defective concrete, as directed by the Architect/Engineer.

3.19 FIELD QUALITY CONTROL

A. Inspections: The Owner's agent will perform inspections shown on the contract drawings.

B. Engineer Review: The Engineer shall inspect the surfaces between plates and channels, bearing on masonry and concrete to determine if grouting of space is necessary. If grouting of space is necessary, the Owner's agent shall inspect the grouting procedure.

C. Sampling and Testing: The Owner's agent will perform sampling and testing shown on the contract drawings.

D. Test Results: Test results shall be reported in writing to Engineer and Contractor within 7 days after tests are made. Test results of less than .6 fc' at 7 days and less than fc' at 28 days shall be reported in writing to the Engineer and Contractor within 48 hours after tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing services, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests. Strength level of concrete will be considered satisfactory if the averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below the specified compressive strength by more than 500 psi. Concrete batch plant weight tags shall be collected at the site and submitted to the Engineer.When the strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.

E. Additional Tests: The Owner's agent will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Owner's agent may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, other additional testing as may be required, and cost of repairing areas of structure tested when unacceptable concrete is verified.

F. Continuous Batch Plant Waiver: It is acceptable to waive the continuous batch plant inspection for concrete per CBC Section 1705A.3.3 provided the following requirements are met:
   1. The concrete plant shall be fully compliant with the requirements of ASTM C 94, sections 8 & 9 and shall provide a current certificate from the National Ready Mixed Concrete Association indicating that the plant has automatic batching and recording capabilities.
   2. A qualified technician of the testing laboratory shall check the first batch at the start of the day.
   3. A licensed weighmaster shall positively identify materials as to quantity and certify each load by a batch ticket.
   4. Batch tickets, including actual material quantities and weights, shall accompany the load and shall be transmitted to the inspector of record by a truck driver with the load identified thereon. The load shall not be placed without a batch ticket identifying the mix. The inspector shall keep a daily record of placements, identifying each truck, its load, time of receipt, and approximate location of deposit in the structure and shall transmit a copy of the daily record to DSA.

END OF SECTION 03 3000

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Section 03 3511
Concrete Floor Finishes

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

B. Liquid densifiers and hardeners.

C. Clear coatings.

D. Clear penetrating sealers.

E. Polished concrete.

F. Sealant at joints

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 REFERENCE STANDARDS

A. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.

B. {RSTEMP#10005605}

C. ASTM F2508 - Standard Practice for Validation, Calibration, and Certification of Walkway Tribometers Using Reference Surfaces; 2016.

D. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

E. CSDA-ST-115 - Measuring Concrete Micro Surface Texture; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

B. Concrete floor finishing sub-contractor to attend pre-installation meeting with concrete placement sub-contractor prior to placement of concrete.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Product Data: Manufacturer's published data and installation instructions for concrete polishing system and finishing products, including manufacturer's installation instructions, information on compatibility of different products, and limitations.

D. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

E. Provide letter of certification from concrete floor finish manufacturer for polished concrete system stating that the installer is a certified applicator of the polished concrete system and is farmiliar with proper procedures and installation requirements required by the manufacturer.

F. Provide copy of tribometer testing and validation reports per ASTM F2508

1.06 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Use an experienced installer and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
   2. The special concrete finish manufacturer shall certify applicator.
   3. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section.

1.07 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Mock-Up Size: Minimum 25 feet square for each specified finish and color .

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.09 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

1.10 PROTECTION

A. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
   1. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
   2. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
   3. No pipe cutting machine will be used on the inside floor slab.
   4. Steel will not be placed on interior slab to avoid rust staining.
   5. Acids and acidic detergents will not come into contact with slab.
   6. All trades are to be informed that the slab must be protected at all times.

B. Concrete Floor Protection Plan: Concrete floor finish Subcontractor shall assist Contractor in development of Concrete Floor Protection Plan (CFPP). Plan to include
   1. Signage to communicate with subcontractors protection requirements. (Available from ASCC as free download)
   2. Concrete floor protection materials and placement
   3. Plans for maintenance of protection materials

1.11 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on the Date of Substantial Completion.

C. Finish Warranty: Provide two-year manufacturer warranty against excessive degradation of finish. Include provision for refinishing areas with excessive loss of gloss.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Liquid Densifier and Hardener:
   1. Use at following locations: All locations shown on plans to have exposed concrete floors (not polished).

B. Polished Finish:
   1. Use at following locations: As shown on drawings..

2.02 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing.
   1. Composition: Lithium silicate.
   2. Products:
      a. Ashford Formula; Curecrete Distribution, Inc.: www.ashfordformula.com
      b. Euclid Chemical Company; ULTRASIL LI+: www.euclidchemical.com/#sle.

c. Hi-Tech Systems; ConDense LS: www.hitechpolyurea.com/#sle.
d. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; LiON HARD: www.lmcc.com/#sle.
e. PROSOCO, Inc; Consolideck LS/CS: www.prosoco.com/consolideck/#sle.
f. Sinak Corporation; LithoHard: www.sinak.com/#sle.
g. W. R. Meadows, Inc; Liqui-Hard Ultra: www.wrmeadows.com/#sle.
h. Universal Polishing Systems; Series 35 Diamond Glass Densifier: universalpolishingsystems.com
i. Complete Crete Systems; Lithium Nano Densifier: completecretesystems.com
j. Hydro-crete; Hydro-Dense Nano: hydro-crete.com

2.03 COATINGS

A. Concrete Stain or Dye: Translucent, penetrating compound for interior or exterior use.
1. Number of Coats: As recommended by manufacturer and as required to achieve specified color or effect.
2. Composition: Water-based, nonreactive.
a. Products:
1) Advanced Floor Products; Retroplate Concrete Dye: retroplatesystem.com
2) Ameripolish, Inc; Surelock Concrete Dye: www.ameripolish.com/#sle.
3) BRICKFORM; BRICKFORM Pro-Dye Plus: www.brickform.com/#sle.
4) Clemons Concrete Coatings; Super Dye: www.clemonsconcretecoatings.com/#sle.
5) Euclid Chemical Company; VIBRA-STAIN SB: www.euclidchemical.com/#sle.
6) Green Umbrella Architectural Concrete Systems; NanoDye: www.greenumbrellasystems.com/#sle.
7) PROSOCO, Inc; GemTone Stain: www.prosoco.com/consolideck/#sle.
8) SureCrete Design Products; Eco-Stain: www.surecretedesign.com/#sle.

B. Clear Coating: Clear coating recommended by manufacturer for finishing concrete floors and slabs and compatable with dye.
1. Products:
a. Curecrete; RetroGuard; curecrete.com
b. Universal Polishing Systems; 35 Series Diamond Glass Sealer; universalpolishingsystems.com
c. Complete Crete Systems; Gloss Guard: comletecretesystems.com
d. Hydro-Crete; Hydro-Guard Lithium: hydro-crete.com

C. Joint Filler: Heavy duty semi-rigid epoxy joint filler as approved by polishing system manufacturer for use with their polishing system.
1. Hardness: Shore "A" of 80 minimum per ASTM D2240
2. Color: As selected by architect from full range of available colors
a. Products available only in gray unacceptable at polished concrete floors
3. Products:
a. Metzger McGuire; MM-80: www.metsgermcguire.com
b. Euclid Chemical Company; Dural 340 SL; www.euclidchemical.com
c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 POLISHED CONCRETE SYSTEM

A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
   1. Acceptable Systems:
      a. Curecrete Distribution, Inc; RetroPlate: www.curecrete.com/#sle.
      b. Euclid Chemical Company; DOUBLE DIAMOND POLISHED CONCRETE FLOOR SYSTEMS: www.euclidchemical.com/#sle.
      c. Universal Polishing Systems: universalpolishingsystems.com
      d. Complete Crete Systems: comletecretesystems.com
      e. Hydro-Crete: hydro-crete.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

C. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.04 CONCRETE POLISHING

A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.

B. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/8 inch per foot nominal unless noted otherwise.

C. Final Grind Level:Class B - Fine Aggregate - Salt and Pepper
   1. Aggregate Appearance Classes Per ASCC Concrete Polishing Council for reference

a. Class A – Cement Fines (Commonly called: Cream Finish) 85-95% fines; 5-15% fine aggregate - No Exposed Aggregate.
b. Class B – Fine Aggregate (Commonly called: Salt/Pepper Finish) 85-95% fine aggregate; 5-15 % blend of fines and coarse aggregate - Exposed Sand and small aggregate.
c. Class C – Coarse Aggregate 80-90% coarse aggregate; 10-20% cement fines and fine aggregates - 1/4" to 1/2" exposed aggregate.
d. Special Aggregate (to be applied to concrete durring concrete pour):

D. Final Polished Sheen: B-1 Semigloss finish; other sheens are included as comparison to illustrate required sheen; final sheen is before addition of any sealer or coating, regardless of whether that is also specified or not.
1. Final polish sheen shall be measured using a texture meter as per CSDA-ST-115 and {RS#10005605}

Surface Texture Finish Chart - CSDA-ST-115			
(STG) Surface Texture Grade	**Unit of measure = Ra**		**Surface Grade**
	µ in	**µ m**	
A-1	2	0.0508	High Polish-Very High Gloss
A-2	4	0.1016	High Polish - High Gloss
A-3	8	0.2032	High Polish-Gloss
B-1	16	0.4064	Medium Polish -Semigloss
B-2	32	0.8128	Low Polish - Matte
B-3	64	1.6256	Honed Smooth
C-1	125	3.175	Honed
C-2	250	6.35	Ground
C-3	500	12.7	Heavy Texture

E. Slip Resistance:
1. Minimum wet dynamic coeficient of friction: 0.42 when measured per ANSI A326.3
2. Minimum floor roughness of 0.41 micrometers (16 micro inches) when measured per {RS#10005605}

F. Protect finished surface as required and as recommended by manufacturer of polishing system.

END OF SECTION 03 3511

Section 03 7010
Post Installed Anchors

PART 1 GENERAL

1.01 APPLICABLE SECTIONS

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing dowels in existing concrete, and masonry as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.

B. Work Included:
   1. Installation of adhesive anchors in existing concrete and masonry.
   2. Installation of expansion anchors in existing concrete and masonry.
   3. Installation of threaded anchors in existing concrete and masonry.

C. Related Work Specified Elsewhere:
   1. Reinforcing Steel; Section 03 20 00
   2. Cast-in-Place Concrete; Section 03 30 00
   3. Shotcrete; Section 03 36 00
   4. Concrete Unit Masonry; Section 04 22 00

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with all Federal, State and local codes and safety regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
   1. ACI 318, "Building Code Requirements of Reinforced Concrete", current edition.
   2. California Building Code, current edition.

B. Testing and Inspection: The Owner shall employ an independent testing laboratory as the Owner's agent to perform the inspections and tests, shown on the contract drawings and submit certified test results. The Contractor will cooperate with and notify the Owner's Agent at least 24 hours in advance of inspections required.

1.04 SUBMITTALS

A. General Requirements:
   1. Submittals shall be made to the Architect in accordance with the requirements of Division

1, General Requirements of these specifications.
2. Construction and fabrication shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Product Data: Manufacturer's catalog sheets including instruction for use and description of application shall be provided on each of the following materials:
1. Adhesive Anchors - In addition to Manufacturer's catalog sheets the Contractor shall provide a written description of where each adhesive material will be used for each different application and an explanation of why the particular material was selected.
2. Expansion Anchors - In addition to Manufacturer's catalog sheets the Contractor shall provide a written description of where each anchor will be used for each different application and an explanation of why the particular material was selected.
3. Threaded Anchors - In addition to Manufacturer's catalog sheets the Contractor shall provide a written description of where each anchor will be used for each different application and an explanation of why the particular material was selected.

PART 2 PRODUCTS

2.01 ADHESIVE ANCHORING SYSTEMS FOR CONCRETE

A. Adhesive anchoring systems shall have current ICC or IAPMO reports for shear and tension in cracked concrete per the requirements of the California Building Code. Adhesive anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:
1. HIT-RE 500 V3; Hilti [ICC ESR 3814].
2. HIT HY 200; Hilti [ICC ESR 3187].
3. SET-XP; Simpson Strong Tie [ICC ESR 2508].
4. AT-XP; Simpson Strong Tie [IAPMO UES ER 263].
5. PURE 110+; DeWalt\Powers Fasteners [ICC ESR 3298].
6. AC100+ GOLD; DeWalt\Powers Fasteners [ICC ESR 2582].
7. Approved Equal.

2.02 ADHESIVE ANCHORING SYSTEMS FOR GROUTED CONCRETE BLOCK

A. Adhesive anchoring systems shall have current ICC or IAPMO reports for shear and tension in grouted concrete block per the requirements of the California Building Code. Adhesive anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:
1. HIT HY 270; Hilti [ICC ESR 4143].
2. SET-XP; Simpson Strong Tie [IAPMO UES ER 265].
3. AT-XP; Simpson Strong Tie [IAPMO UES ER 281].
4. AC100+ Gold, DeWalt\Powers Fasteners [ICC ESR 3200]
5. Approved Equal.

2.03 ADHESIVE ANCHORING SYSTEMS FOR UNREINFORCED MASONRY

A. Adhesive anchoring systems shall have current ICC or IAPMO reports for shear and tension in unreinforced masonry per the requirements of the California Building Code. Adhesive anchors

shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:

1. HIT HY 270; Hilti [ICC ER 4143].
2. ET-HP; Simpson Strong Tie [IAPMO UES ER 241].
3. Approved Equal.

2.04 EXPANSION ANCHORING SYSTEMS FOR CONCRETE

A. Expansion anchoring systems shall have current ICC or IAPMO reports for shear and tension in cracked concrete per the requirements of the California Building Code. Expansion anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:

1. Kwik Bolt TZ2; Hilti [ICC ESR 4266].
2. Strong Bolt 2 Wedge Anchors; Simpson Strong Tie [ICC ESR 3037].
3. Power-Stud+ SD2; DeWalt\Powers Fasteners [ICC ESR 2502].
4. Approved equal.

2.05 EXPANSION ANCHORING SYSTEMS FOR GROUTED CONCRETE BLOCK

A. Expansion anchoring systems shall have current ICC or IAPMO reports for shear and tension in grouted concrete block per the requirements of the California Building Code. Expansion anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:

1. Kwik Bolt TZ2; Hilti [ICC ESR 4561].
2. Wedge All Anchors; Simpson Strong Tie [IAPMO ER 240].
3. Power-Stud+ SD1; DeWalt\Powers Fasteners [ICC ESR 2966].
4. Approved equal.

2.06 THREADED ANCHORING SYSTEMS FOR CONCRETE & GROUTED CONCRETE BLOCK

A. Threaded anchoring systems shall have current ICC or IAPMO reports for shear and tension in cracked concrete and grouted concrete block per the requirements of the California Building Code. Threaded anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:

1. Kwik HUS-EZ; Hilti [ICC ESR 3027].
2. Titen HD; Simpson Strong Tie [ICC ESR 2713].
3. Titen Concrete & Masonry Screw; Simpson Strong Tie [ICC ESR 3056].
4. Screwbolt+; DeWalt\Powers Fasteners [ICC ESR 3889-Concrete].
5. Approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of post installed anchors, including drilling and cleaning of holes, shall be in accordance with the current ICC or IAPMO report and the manufacturer’s recommendations.

B. Holes shall be drilled by methods that will not shatter or damage the concrete adjacent to the holes. Holes drilled through members or into thin elements such as walls or slabs shall utilize rotary drills to avoid impact damage to the opposite side of the member.

C. Holes in which longitudinal or transverse reinforcement is encountered during drilling before the specified depth is attained shall be rejected. A new hole, which does not strike reinforcement, shall be drilled adjacent to the rejected hole to the depth shown on the plans. Abandoned holes shall be patched with high strength grout or other material approved by the engineer.

D. The contractor shall use non-destructive methods to locate existing reinforcement prior to drilling where designated on the plans at no additional cost.

E. Any dowels which fail to bond or are damaged before new concrete is placed shall be removed and replaced at the contractor's expense.

F. Adhesive anchors shall be installed in concrete having a minimum age of 21 days at the time of anchor installation.

G. Installation of adhesive anchors that are to be under sustained tension loading in horizontal to vertically overhead orientation shall be done by a certified adhesive installer (AAI) as certified through ACI and in accordance with ACI 318 section D.9.2.2. Proof of current certification shall be submitted to the Engineer for approval prior to the commencement of installation.

3.02 FIELD QUALITY CONTROL

A. Testing and Inspections: The Owner's Agent will perform the inspections shown on the contract drawings for the placement of post installed anchors.

B. Test Results: Test results shall be reported in writing to the Architect and Contractor on a weekly basis, but no later than 5 working days after the end of the week in which the tests were performed.

C. Additional Tests: Additional testing required due to failure of post installed anchors to achieve the specified requirements shall be performed by the Owner's Agent at the Contractor's expense.

END OF SECTION 03 7010

Section 04 2000
Unit Masonry

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Mortar and grout.

C. Installation of Reinforcement

D. Placement of anchor bolts, assemblies and embeds

E. Grouting of plates and embeds

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

B. Section 05 5000 - Metal Fabrications: Fabricated steel items.

1.03 REFERENCE STANDARDS

A. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

B. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.

C. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

D. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

E. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

H. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

I. ASTN C1019 - Standard Test Method for Sampling and Testing Grout, 2016

J. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

C. Samples: Submit two samples of decorative block units to illustrate color, texture, and extremes of color range.

1.05 QUALITY ASSURANCE

A. Comply with provisions of the following codes and standards except where exceeded by requirements of the contract documents.
   1. California Building Code (CBC), 2016
   2. ACI 530/530.1/ERTA, Building Code Requirements for Masonry Structures, 2013

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Do not use damaged masonry units, damaged components of structure, damaged packaged materials,

C. Protect cementitious materials for mortar and grout from precipitation and groundwater

D. Do not use masonry materials that are contaminated

E. Store different aggregates separately

F. Protect reinforcement, ties and metal accessories from permanent distortions and store them off the ground.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:

1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.
2. Special Shapes: Provide nonstandard blocks configured for corners.
3. Nonloadbearing Units: ASTM C129.
    a. Hollow block, as indicated.
    b. Manufacturers:
        1) Angelus Block; www.angelusblock.com; or approved equal..
            (a) Color: Natural Gray Split Face
            (b) Accessories:
                (1) Angelus Flat Precision Caps 8"x2"x16"
                (2) Color: Natural Gray
        2) Substitutions: See Section 01 6000 - Product Requirements.

2.02 MORTAR AND GROUT MATERIALS

A. Mortar
    1. Provide mortar conforming to the following parameters
        a. Conform to ASTM C270
        b. Comply with Section 2103.2 of the 2016 CBC
        c. Type S Mortar
        d. 1,800 psi minimum 28 day compressive strength
        e. Color: 446 Spec Mix Mortar

B. Grout
    1. Provide grout conforming to the following parameters
        a. Conform to ASTM C476
        b. Comply with Section 2103.3 of the 2016 CBC
        c. 2,000 psi minimum 28 day compressive strength. Determine compressive strength of grout in accordance with ASTM C1019.
        d. Do not use admixtures unless accepted by the Engineer of Record. Field addition of admixtures is not permitted in self-consolidating grout.

C. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
    1. Hydrated Lime: ASTM C207, Type S.
    2. Grout Aggregate: ASTM C404.

D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

2.03 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: Type specified in Section 03 2000; size as indicated on drawings; uncoated finish.

2.04 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.

C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 MORTAR AND GROUT MIXING

A. Mortar
1. Mix cementitious materials and aggregates between 3 and 5 minutes in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency. Do not hand mix mortar. Maintain workability of mortar by remixing or retempering. Discard mortar which has begun to stiffen or is not used within 2-1/2 hours after initial mixing.
2. Limit the weight of mineral oxide or carbon black pigments added to project-site prepared mortar to the following maximum percentages by weight of cement:
   a. Pigmented portland cement-lime mortar
      1) Mineral oxide pigment = 10 percent
      2) Carbon black pigment = 2 percent
   b. Pigmented mortar cement mortar
      1) Mineral oxide pigment = 5 percent
      2) Carbon black pigment = 1 percent
   c. Pigmented masonry cement mortar
      1) Mineral oxide pigment = 5 percent
      2) Carbon black pigment = 1 percent

   Do not add mineral oxide or carbon black pigment to preblended colored mortar or colored cement.
3. Do not use admixtures containing more than 0.2 percent chloride ions

B. Grout
1. Except for self-consolidating grout, mix grout in accordance with the requirements of ASTM C476.
2. Unless otherwise required, mix grout other than self-consolidating grout to a consistency that has a slump between 8 and 11 inches.
3. Proportioning of self-consolidating grout at the project site is not permitted. Do not add water at the project site except in accordance with the self-consolidating grout manufacturer's recommendations.

C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.
1. Include verification that foundations are constructed within a level alignment tolerance of +/- 1/2 inch.

B. Verify that related items provided under other sections are properly sized and located.
   1. Include verification that reinforcing dowels are positioned in accordance with the project drawings.

C. If stated conditions are not met notify the Architect and Engineer of Record.

3.02 PREPARATION

A. Clean reinforcement and shanks of anchor bolts by removing mud, oil, or other materials that will adversely affect or reduce bond at the time mortar or grout is placed. Reinforcement with rust, mill scale, or both are acceptable without cleaning or brushing provided that the dimensions, of a cleaned sample are not less than required by the ASTM specification governing the reinforcement.

B. Prior to placing masonry, remove laitance, loose aggregate, and anything else that would prevent mortar from bonding to the foundation.

C. Wetting Masonry units
   1. Concrete Masonry - Unless otherwise required, do not wet concrete masonry before laying. Wet cutting is permitted.

D. Debris - Construct grout spaces free of mortar dropping, debris, loose aggregates, and any material deleterious to masonry grout.

E. Reinforcement - Place reinforcement and ties in grout spaces prior to grouting

F. Cleanouts - Provide cleanouts in the bottom course of masonry for each grout pour when grout pour exceeds 5 ft 4 in.
   1. Construct cleanouts so that the space to be grouted can be cleaned and inspected. In solid grouted masonry, space cleanout horizontally a maximum of 32 inches on center.
   2. Construct cleanouts with an opening of sufficient size to permit removal of debris. The minimum opening dimension shall be 3 in.
   3. After cleaning, close cleanouts with closures braced to resist grout pressure.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running. Unless Otherwise required on the drawings
   2. Coursing: One unit and one mortar joint to equal 8 inches.

3.04 PLACING AND BONDING

A. Placing mortar units

1. Mortar joints at foundations - In the starting course on the foundations and other supporting members, construct bed joints so that the bed joint thickness is a least /1/4 inch and not more than:
   a. 1-1/4" when the first course of masonry is solid grouted and supported by a concrete foundation.
2. Bed and head joints - Unless otherwise required construct 3/8 in thick bed and head joints except at foundation. Construct joints that also conform to the following
   a. Fill holes not specified in exposed and below grade masonry with mortar.
   b. Unless otherwise required, tool joint with a round jointer when the mortar is thumbprint hard.
   c. Remove masonry protrusions extending 1/2 inch or more into cells or cavities to be grouted.
3. Hollow units - Place hollow units so:
   a. Face shells of bed joints are fully mortared
   b. Webs are fully mortared in:
      1) all courses of piers, columns and pilasters;
      2) when necessary to confine grout or insulation.
   c. Head joints are mortared, a minimum distance from each face equal to the face shell thickness of the unit.
   d. Vertical cells to be grouted are aligned and unobstructed openings for grout are provided in accordance with the project drawings.
4. Open units with beveled ends - Fully grout open-end units with beveled ends. Head joints of open-end units with beveled ends need not be mortared. At the beveled ends, form a grout key that permits grout within 5/8 inch of the face of the unit to prevent leakage of grout.
5. All Units
   a. Place clean units while the mortar is soft and plastic. Remove and re-lay in fresh mortar any unit disturbed to the extent that the initial bond is broken after initial positioning.
   b. Cut exposed edges or faces of masonry units smooth, or position so that exposed faces or edges are unaltered manufactured surfaces.
   c. When the bearing of a masonry wythe on its support is less than two-thirds of the wythe thickness, notify the Architect and Engineer of Record.

B. Embedded items an accessories - Install embedded items and accessories as follows:
   1. Construct chases as masonry units are laid
   2. Install pipes and conduits passing horizontally through masonry partitions.
   3. Place pipes and conduits passing horizontally through piers, pilasters, or columns
   4. Place horizontal pipes and conduits in and parallel to plane of walls
   5. Install secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories.
   6. Install movement joints.
   7. Aluminum - Do not embed aluminum conduits pipes and accessories in masonry, grout or mortar unless they are effectively coated or isolated to prevent chemical reaction between aluminum and cement or electrolytic action between aluminum and steel.

C. Bracing of masonry - Design, provide and install bracing that will assure stability of masonry during construction.

D. Site tolerances - Erect masonry within the following tolerances from the specified dimensions.

1. Dimension of elements
   a. In cross section or elevation (-1/4 in., +1/2 in.)
   b. Mortar joint thickness
      bed joints between masonry courses (+ 1/8 in)
      bed joint between flashing and masonry (-1/2 in., +1/8 in.)
      head (-1/4 in., +3/8 in.)
   c. Grout space or cavity width, except for masonry walls passing framed construction (-1/4 in., +3/8 in.)
2. Elements
   a. Variation from level
      bed joints (+/- 1/4 in. in 10 ft, +/- 1/2 in. maximum)
      top surface of load bearing walls (+/- 1/4 in. in 10 ft, +/- 1/2 in. maximum)
   b. Variation from plumb (+/- 1/4 in. in 10 ft, +/- 3/8 in. in 20 ft,+/- 1/2 in. maximum)
   c. True to a line (+/- 1/4 in. in 10 ft, +/- 3/8 in. in 20 ft,+/- 1/2 in. maximum)
   d. Alignment of columns and walls (bottom versus top) (+/- 1/2 in. for load bearing walls and columns., +/- 3/4 in. for non-load bearing walls)
3. Location of elements
   a. Indicated in plan (+/- 1/2 in. in 20 ft, +/- 3/4 in. maximum)
   b. Indicated in elevation (+/- 1/4 in. in story height +/- 3/4 in. maximum)
   c. If the above conditions cannot be met due to previous construction, notify the Architect and Engineer of Record.
   d. Reinforcement, tie, and anchor installation

3.05 REINFORCEMENT, TIE AND ANCHOR INSTALLATION

A. Basic requirements - Place reinforcement, wall ties and anchors in accordance with the sizes, types, and locations indicated on the Project Drawings and as specified. Do not place dissimilar metals in contact with each other.

B. Reinforcement
   1. Support reinforcement to prevent displacement caused by construction loads or by placement of grout or mortar, beyond the allowable tolerances.
   2. Completely embed reinforcing bars in grout in accordance with the Section entititled grout placement.
   3. Maintain clear distance between reinforcing bards and the interior of masonry unity or formed surface of at least 1/4 inch for fine grout and 1/2 inch for coarse grout, except where cross webs of hollow units are used as supports for horizontal reinforcement.
   4. Place reinforcing bars maintining the following minimum cover:
      a. Masonry face exposed to earth or weather 2 in for bars larger than No. 5, 1-12/ in. for No. 5 bars or smaller.
      b. Masonry not exposed to earth or weather 1-1/2 in.
   5. Maintain minimum clear distance between parallel bars of the nominal bar size or 1 in., whichever is greater.
   6. In columns and pilasters, maintain minimum clear distance between vertical bars of one and one-half times the nominal bar size or 1-1/2 in., whichever is greater.
   7. Splice only where indicated on the Project Drawings, unless otherwise acceptable. When splicing by welding, provide welds in conformance with the provisions of AWS D1.4.
   8. Do not bend reinforcement after it is embedded in grout or mortar without approval from the Engineer of Record.

9. Noncontact lap splices - Postion bars spliced by noncontact lap splices no farther apart transversely than one-fift the specified length of lap nor more than 8 in.
10. Joint reinforcement
    a. Place joint reinforcement so that longitudinal wires are embedded in mortar with a minimum cover of 1/2 in. when not exposed to weather or earth; or 5/8 in. when exposed to weather or earth.
    b. Provide minimum 6 in. lap splice for joint reinforcement.
    c. Ensure that all ends of longitudinal wires of joint reinforcement at laps are embedded in mortar or grout.
11. Placement tolerances
    a. Place reinforcing bars in walls and flexural elements within a tolerance of +/- 1/2 in. when the distance from the centerline of reinforcing bars to the opposite face of masonry, d, is equal to 8 in. or less, +/- 1in. for d equal to 24 in. or less but greater than 8 in., and 1-1/4 in. for d greater than 24 in.
    b. Place vertical bars within:
        1) 2 in. of the required location along the length of the wall when the wall segment length exceeds 24 in.
        2) 1 in. of the required location along the length of the wall when the wall segment length does not exceed 24 in
        3) If it is necessary to move bars more than one bar diameter or a distance exceeding the tolerance stated above to avoid interference with other reinforcing steel, conduits, or embedded items notify the Engineer of Record.
        4) Foundation dowels that interfere with unit webs are permitted to be be bent to a maximum of 1 in. horizontally for every 6 in. of vertical height.

C. Anchor bolts
    1. Embed headed and bent-bar anchor bolts larger than 1/4 in. diameter in grout that is placed in accordance with Section 3.06A and Section 3.06B. Anchor bolts of 1/4 in.diameter or less are permitted to be placed in grout or mortar bed joints that have a specified thickness of at least 1/2 in. thickness.
    2. For anchor bolts placed in the top of grouted cells and bond beams, maintain a clear distance between the bolt and the face of masonry unit of at least 1/4 in. when using fine grout and 1/2 in. when using coarse grout.
    3. For anchor bolts placed throught the face shell of a hollow masonry unit, drill a hole that is tight-fitting to the bolt or provide minimum clear distance that conforms to Section 3.05D.2 around the bolt and through the face of the shell. For the portion of the bolt that is within the grouted cell, maintain a clear distance between the bolt and the face of masonry unit and between the head or bent leg of the bolt and the formed surface of grout of at least 1/4 in. when using fine grout and at least 1/2 in when using coarse grout.
    4. Place anchor bolt with a clear distance between parallel anchor bolts not less than the nominal diameter of the anchor bolt, nor less than 1 in.

3.06 GROUT PLACEMENT

A. Placing time - Place grout wihin 1-1/2 hr from introducing water in the mixture and prior to initial set.
    1. Discard site-mixed grout that does not meet the specified slump without adding water after initial mixing.
    2. For ready-mixed grout:
        a. Addition of water is permitted at the time of discharge to adjust slump.

b. Discard ready mixed grout that does not meet the specified slump without adding water, other than the water that was added at the time of discharge.
The time limit is waived as long as the ready mixed grout meets the specified slump.

B. Confinement - Confine grout to the areas indicated on the project drawings. Use material to confine grout that permits bond between masonry units and mortar.

C. Grout pour height - Do not exceed the maximum grout pour height given in the Table below

Grout Type (1)	Maximum grout pour height, ft	Minimum clear width of grout space, in (2,3)	Minimum clear grout space dimensions for grouting cells of hollow units, in x in (3,4,5)
Fine	1	3/4	1-1/2x2
Fine	5.33	2	2x3
Fine	12.67	2-1/2	2-1/2x3
Fine	24	3	3x3
Coarse	1	3/4	1-1/2x3
Coarse	5.33	2	2-1/2x3
Coarse	12.67	2-1/2	3x3
Coarse	24	3	3x4

1. Fine and course grouts are defined by ASTM C476.
2. For grouting between masonry wythes.
3. Minimum clear width of grout space and minimum clear grout space dimension are the net dimension of the space determined by subtracting masonry protrusions and the diameters of horizontal bars from the as-built cross section of the grout space. Select grout type and maximum grout pour height based on minimum clear space.
4. Area of vertical reinforcement shall not exceed 6 percent of the area of the grout space.

D. Grout lift height
1. For grout conforming to Section 2.02B
   a. Where the following conditions are met, place grout in lifts not exceeding 12 ft 8 in.
      1) The masonry has cured at least 4 hours
      2) The grout slump is maintained between 10 and 11 in.
      3) No intermediate reinforced bond beams are placed between the top and the bottom of the pour height
   b. When conditions 1 and 2 are met but there are intermediate bond beams within the grout pour, limit the grout lift height to the bottom of the lowest bond beam that is more than 5 ft. 4 in. above the bottom of the lift, but do not exceed a grout lift height of 12 ft. 8 in.
   c. When the conditions of 1 or 2 are not met, place grout in lifts not excedding 5 ft. 4 in.
2. For self-consolidating grout conforming to Section 2.02B:
   a. When placed in masonry that has cured for at least 4 hours, place in lifts not exceeding the grout pour height.
   b. When placed in masonry that has not cured for at least 4 hours, place in lifts not exceeding 5 ft. 4 in. or the grout pour height, whichever is less.

E. Consolidation
1. Consolidate grout at the time of placement.

a. Consolidate grout pours 12 in. or less in height by mechanical vibration or by puddling.
b. Consolidate pours exceeding 12 in in height by mechanical vibration, and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

2. Consolidation or reconsolidation is note required for self-consolidating grout.

F. Grout key - When grouting, form grout keys between grout pours. Form grout keys between grout lifts when the first lift is permitted to set prior to placement of the subsequent lift.
1. Form a grout key by terminating the grout a minimum of 1-1/2 in. below a mortar joint.
2. Do not form grout keys within beams.
3. At beams or lintels laid with closed bottom units, terminate the grout pour at the bottom of the beam or lintel without forming a grout key.
4. Alternate grout placement - Place masonry units and grout using construction procedures employed in the accepted grout demonstration panel.

G. Lap splices minimum 24 bar diameters.

H. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

I. Place and consolidate grout fill without displacing reinforcing.

J. Do not continue horizontal joint reinforcement through control or expansion joints.

K. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Verify f'm and f'AAC in accordance with Section 1.05

C. Sample and test grout as required in Section 1.04 and 1.05.

3.08 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Remove debris

F. Do not damage the masonry

3.09 PROTECTION

A. Protect adjacent construction and in place masonry against damage.

B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 2000

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Section 05 1200
Structural Steel and Miscellaneous Iron

PART 1 GENERAL

1.01 APPLICABLE SECTION

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, fabricating, priming, and erecting structural steel and miscellaneous iron complete in place, as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.

B. Work Included:
1. All structural steel indicated on the drawings.
2. Furnishing all column anchor bolts and base assemblies with nuts and washers.
3. Supervision of the placement of anchor bolt assemblies

C. Related Work Specified Elsewhere:
1. Cast-in-place Concrete; Section 03 3000
2. Grouting of Column Bases; Section 03 3000
3. Placement of Anchor Bolts, Assemblies, and Embeds; Section 03 3000, and Section 04 2200

1.03 REFERENCE STANDARDS

A. The following is a list of reference standards referred to in this portion of the specification:
1. ASTM A36, "Specification for Carbon Structural Steel"
2. ASTM A53, "Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless"
3. ASTM A307, "Specification for Carbon Steel Bolts and Studs"
4. ASTM A500, "Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes"
5. ASTM A572, “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel”
6. ASTM A992, “Specification for Steel for Structural Shapes for use in Building Framing”
7. ASTM F1554 “Specification for Anchor Bolts, Steel”
8. ASTM F3125 “Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated”
9. SSPC, "Systems and Specifications, Steel Structures Painting Manual Volume 2" by Steel Structures Painting Council.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with all Federal, State, and Local codes and safety regulations. In addition, the fabrication, priming, and erection of structural steel shall comply with all the applicable provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
   1. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction, current edition.
   2. "Codes of Standard Practice for Steel Buildings and Bridges" by said AISC, current edition.
   3. A.W.S. "Structural Welding Code – Steel," D1.1, current edition.
   4. A.W.S. "Structural Welding Code – Seismic Supplement," D1.8, current edition.
   5. "Specifications for Structural Joints using ASTM A325 or A490 bolts," current edition as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation, and endorsed by the AISC.

B. Qualifications: Welding processes and welding operators shall be qualified in accordance with AWS "Standard Qualification Procedure". Welders to be employed are to provide AWS certification for the type of welding necessary.

C. Mill Certificates: The Contractor shall provide Mill Certificates for structural steel and miscellaneous iron in accordance with the requirements of Part 1.05, "Submittals", of this specification section. When Mill Certificates cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Part 1.05, "Submittals", of this specification section.

D. Sampling, Testing, and Inspection:
   1. General:
      a. All materials and work shall be subject to inspection at the mill, the fabricating shop, and at the building site. Material or workmanship not complying fully with the drawings, and/or specifications will be rejected.
      b. If the inspector, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
   2. Owner:
      a. The Owner shall employ an independent testing agency or the Engineer as the Owner's agent to perform sampling, testing, and inspections as shown on the contact drawings and submit certified test results.
   3. Contractor:
      a. The Contractor shall cooperate with and notify Owner's agent at least 24 hours in advance of inspections required and shall supply samples, test pieces, and facilities for inspection without extra charge.
      b. The Contractor shall identify and tag each lot of fabricated steel to be shipped to the site by heat numbers in such a manner that it can be accurately identified at the job site.
      c. The Contractor shall remove all unidentified steel received at the site.

1.05 SUBMITTALS

A. General Requirements
   1. Submittals shall be made to Architect in accordance with the requirements of Division 1, General Requirements of these specifications.
   2. Construction, and fabrication or ordering of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Shop Drawings:
   1. Shop drawings for steel fabrications shall be submitted for review.
   2. Submittals shall include anchor bolt setting plans, erection drawings and fabrication drawings. Information shown on the shop drawings shall include, but not be limited to, the following:
      a. Anchor bolt setting plans shall show layout, anchor bolts sizes and grades, embedment, and template construction.
      b. Erection Drawings shall show layout, marking and position of each member, and field connections.
      c. Fabrication Drawings shall show details of members, including sizes, grades, connections, spacing of bolts and welds, designation of Architecturally Exposed Structural Steel, and the limits of paint applications.
   3. Partial submittals shall be clearly identified by the contractor.
   4. The omissions from the shop and installation drawings of any materials shown on the Specifications shall not relieve the contractor of the responsibility of furnishing and installing such materials, even though such drawings may have been returned and reviewed.
   5. Shop drawings and calculations for temporary shoring and bracing shall be submitted for review. The shop drawings shall show layout, size of members and connection details. Calculations shall show all stresses in members and connections, from dead, live, and lateral loads in accordance with the requirements of the C.B.C. current governing edition. Shop drawings and calculations for temporary shoring and bracing shall be stamped and signed by a civil engineer registered in the State of California.
   6. Contract drawings shall not be reproduced in whole or in part. Contract drawings modified into shop drawings will be returned without review.
   7. Revised submittals shall have clear indications of revised or new information. Clouding is an acceptable form of identification.

C. Mill Certificates:
   1. The Contractor shall provide Mill Certificates for each grade of steel for each heat to be used on project.
   2. Mill Certificates shall meet the requirements of AISC 360 and all applicable ASTM standards.
   3. Mill Certificates shall be furnished with each lot of material shipped to the site and shall be signed by the Contractor which will serve to certify that all structural steel materials installed comply with specified requirements.
   4. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance of each type of material to be used and provide laboratory test reports. The cost of testing shall be paid for by the Contractor.

D. Laboratory Test Reports:
   1. Laboratory test reports shall show the name of testing agency, date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered

civil engineer in the State of California.

2. When required by other portions of these specifications, laboratory test reports shall be submitted for each type of steel for each heat to show compliance with appropriate ASTM Standards and these specifications.

E. Welding Procedure Specifications:
   1. Welding procedure specifications for all prequalified joints shall be submitted per AWS D1.1, 5.1.2 to the Engineer and reviewed prior to beginning fabrication. Non prequalified joints shall be qualified per AWS requirements.

1.06 DEFINITIONS

A. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.
   1. Provide “AESS” as follows: Exposed structural steel that is within 16 feet vertically and 10 feet horizontally of a walking surface and is visible to a person standing on that walking surface.

PART 2 PRODUCTS

2.01 MATERIAL

A. Structural Steel Wide Flange and Tee Shapes: Shall be new and shall conform to the requirements of ASTM A992.

B. Structural Steel Channels and Angles: Shall be new and shall conform to the requirements of ASTM A36.

C. Structural Steel Plate: Shall be new and shall conform to the requirements of ASTM A572.

D. Structural Steel Tubes: Shall be new and shall conform to the requirements of ASTM A500, Grade C.

E. Steel Pipe: ASTM A53, Types E or S, Grade B, with sulphur not exceeding .05%.

F. Arc-welding Electrodes: Arc-welding electrodes shall be E70 series electrodes for A36, A572 and A992 material, E80 Series for A706 reinforcing steel and E90 series for A615 reinforcing steel. Electrodes shall be as recommended by their manufacturers for the positions and conditions of actual use. All welds used in members and connections in the seismic Force Resisting System shall be made with filler metals meeting the requirements specified in AWS D1.8 clause 6.3.

G. High Strength Bolts: High strength bolts (HSB) shall conform to ASTM F3125 Grade A325.

H. Machine Bolts: Machine bolts (MB) and sag rods shall conform to ASTM A307, manufactured to American Standard Bolt and Nut dimensions with "Free Fit - Class 2" threads. All unfinished bolts shall have an approved lock washer under nut.

I. Prime Coat: Prime coat for interior members shall meet the requirements of SSPC-Paint 25 or

acceptable equal. Prime coat for exterior members shall meet the requirements of SSPC-Paint 20 or acceptable equal.

J. Smooth Rods: Smooth Rods shall conform to ASTM A36.

K. Anchor Bolts: Anchor bolts shall conform to ASTM F1554 grade 36.

L. Headed Studs, Deformed Bar Anchors, and Threaded Studs: Headed Studs shall be H4L or S3L; Deformed Bar Anchors shall be D2L and Threaded Studs shall be CPL as manufactured by TRW Nelson Stud or equal.

M. High Strength Rods: High strength rods shall conform to ASTM F1554 grade 55, unless noted otherwise.

N. Nuts shall be as shown below and finish shall match fastener.

	Fastener Grade & Size	Nut Class	Nut Style
Bolts:			
ASTM F3125 Gr A325	Type 1, Uncoated	ASTM A563-C,C3,D,DH, DH3	Heavy Hex
	Type 1, Zinc Coated	ASTM A563-DH	Heavy Hex
	Type 3, Uncoated	ASTM A563-C3,DH3	Heavy Hex
ASTM F3125 Gr A490	Type 1, Uncoated	ASTM A563-DH,DH3	Heavy Hex
	Type 3, Uncoated	ASTM A563-DH3	Heavy Hex
Rods:			
ASTM F1554	¼" to 1½" Uncoated	ASTM A563-A	Heavy Hex
	Over 1½" to 3" Uncoated	ASTM A563-DH	Heavy Hex
	¼" to 3" Zinc Coated	ASTM A563-DH	Heavy Hex

O. Washers shall be flat circular, rectangular or square beveled washers and shall conform to ASTM F436 Type 1. Finish shall match nut. Washers shall be installed under the element being turned for A325 bolts and under both the head and the nut for A490 bolts.

2.02 FABRICATION

A. Welding: Welding shall be by operators who are qualified by test as per AWS "Standard Qualification Procedure" to perform type of work required.

B. High Strength Bolting: All high strength bolted connections shall be bearing type connections unless otherwise noted on the plans. Where noted on the plans, high strength bolted connections shall be slip critical type connections.

C. Bolts, rods, washers and nuts exposed to weather shall be hot dipped galvanized steel in compliance with ASTM A153.

D. Straightness (camber and sweep) Tolerance:
1. Unless otherwise noted, straightness tolerances shall be per ASTM A6.

2. Sweep tolerance for channels and angles: Maintain a maximum variation of 1/8" times the number of feet of total length divided by 5, unless alternate criteria is approved by the Engineer.

E. Painting:
   1. Priming: Painting under this section is limited to priming.
      a. The prime coat shall be applied in the shop and touched up after erection. Anchor bolts and column assemblies 2 inches and more below finish floor shall be left unpainted. High strength bolted connections shall be left unpainted within 3" of connection.
      b. Paint shall be delivered to shop in original sealed containers marked with manufacturer's name and brand identification.
      c. Use paint as prepared by the manufacturer without thinning or other admixture unless so stated by the manufacturer. Execute painting on a dry clean surface, free from rust, loose scale or grease. Do not do any painting in temperatures lower than 45 degrees F.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. The workmanship shall be in accordance with AISC Standard Specifications, and shall be of the highest quality found in contemporary structural work.

B. All exposed gaps or bolt holes resulting from installation of slotted gusset plates or erection bolts shall be filled and ground smooth. Erection bolts shall be removed after welding. Exposed ends of pipes and hollow sections shall be sealed with a cap plate and ground smooth unless noted otherwise on the architectural drawings.

C. For Architecturally Exposed Structural Steel (AESS) shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection. Handle and fabricate AESS with special care including the following:
   1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
   2. Grind sheared, punched, and flame-cut edges of AESS to remove burrs and provide smooth surfaces and edges.
   3. Fabricate AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.
   4. Fabricate AESS with exposed surfaces free of seams to maximum extent possible.
   5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
   6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
   7. Fabricate AESS to the tolerances specified in AISC 303 Section 10.2 for steel that is designated AESS.
   8. Seal-weld open ends of hollow structural sections with 5/16-inch closure plates for AESS.
   9. Ease exposed edges to a radius of approximately 1/32 inch radius, unless otherwise shown on the drawings. Miter exposed corner joints and machine fit to a hairline joint.

10. Coping and Blocking Tolerance: Maintain a uniform gap of 1/8”+/- 1/32” at all copes and blocks.
11. Joint gap Tolerance: Maintain a uniform gap of 1/8”+/- 1/32”.
12. Straightness (camber and sweep) Tolerance: Maintain one half the standard camber and sweep tolerances for rolled shapes in ASTM A6, per AISC 303 Section 10.2.2.

3.02 ERECTION

A. The Contractor will be responsible to erect the complete structural frame plumb and true to line and grade, in conformance with the AISC Code of Standard Practice.

B. Temporary Bracing and Shoring:
   1. The Contractor shall temporarily brace the frame in both directions and shall maintain columns plumb until the final connections of the framework and construction of diaphragms are complete.
   2. The Contractor shall provide such temporary shoring and additional bracing of steel frame as required to adequately and safely support any or all loads imposed upon the structure during construction.
   3. Submit shop drawings for temporary bracing and shoring in accordance with the requirements of Part 1.05 "Submittals", of this specification section.

C. Field Painting:
   1. After erection, all field welds, field bolts and abraded or scratched surfaces shall be cleaned and given an additional spot coat of the same paint used for the shop coat. The entire work shall be left in a neat, clean and acceptable condition.

3.03 FIELD QUALITY CONTROL

A. Inspections: The Owner's agent will perform the inspections shown on the contract drawings.

B. Contractor:
   1. The Contractor shall hire the Engineer responsible for the design of temporary bracing and shoring to inspect the work as detailed on the reviewed shop drawings.
   2. The Engineer responsible for design, temporary bracing and shoring shall write a letter to the Architect certifying construction of temporary bracing and shoring is in accordance with the reviewed shop drawings, prior to start of construction requiring temporary bracing or shoring.

END OF SECTION

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Section 05 2100
Steel Joist Framing

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. LH- and DLH-series long-span steel joists.
   2. Joist accessories.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:
   1. Include layout, designation, number, type, location, and spacing of joists.
   2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.03 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

D. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
   1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Vulcraft – a Division of Nucor Corporation

2.02 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

2.03 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction.

D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

E. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
   1. Before installation, splice joists delivered to Project site in more than one piece.
   2. Space, adjust, and align joists accurately in location before permanently fastening.
   3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.02 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

END OF SECTION 05 2100

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Section 05 3000
Metal Decking

PART 1 GENERAL

1.01 GENERAL

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. Summary: The work included under this section consists of furnishing all materials, supplies, equipment, tools, transportation and facilities and performing all labor and services necessary for, required in connection with or properly incidental to installing all metal floor and roof deck as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.

B. Work Included:
   1. Provide and install metal floor and roof decking.
   2. Fastening the metal deck to the structural steel framework.

C. Related Work Specified Elsewhere:
   1. Cast-in-place concrete; Section 03 3000
   2. Structural Steel & Miscellaneous Iron; Section 05 1200

1.03 REFERENCE STANDARDS

A. The following is a list of reference standards referred to in this portion of the specifications:
   1. ASTM A653, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process"

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with all Federal, State, and Local codes and safety regulations. In addition, the fabrication and erection of metal decking shall comply with all the applicable provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
   1. "California Building Code," current governing edition.
   2. "Code of Recommended Practice," Steel Deck Institute, current edition.
   3. "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members", American Iron and Steel Institute.
   4. "Steel Products Manual- Carbon Steel Sheets", American Iron and Steel Institute.

B. Mill Certificates: The Contractor shall provide Mill Certificates for metal decking in accordance with the requirements of Part 1.05, "Submittals", of this specification section. When Mill Certificates cannot be provided, laboratory test reports shall be provided in

accordance with the requirements of Part 1.05, "Submittals", of this specification section.

C. ICC Approvals: Each type of metal decking proposed for use on project shall have ICC approval for vertical load and diaphragm rating capacities in accordance with the requirements shown on the structural drawings or required by these specifications. The Contractor shall provide I.CC. Reports in accordance with the requirements of Part 1.05, "Submittals", of this specification section.

D. Sampling, Testing and Inspection:
   1. General:
      a. All materials and work shall be subject to inspection at the mill, the fabricating shop, and at the building site. Material or workmanship not complying fully with the drawings, and/or specifications will be rejected.
      b. If the inspector, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
   2. Contractor:
      a. The Contractor shall identify and tag each lot of decking to be shipped to the site by heat number in such a manner that it can be accurately identified at the job site.
      b. The Contractor shall remove all unidentified metal decking received at the site.

1.05 SUBMITTALS

A. General Requirements
   1. Submittals shall be made to Architect in accordance with the requirements of Division 1, General Requirements of these specifications.
   2. Construction, and fabrication or ordering of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Shop Drawings: Shop Drawings shall be submitted that show diagrammatic plan layout of all metal decking, at a scale sufficiently large to show clearly the positions and erection marks of the pieces. All decking attachment and necessary shoring should be noted. Shop Drawings used in field must be reviewed copies.

C. Product Data: Manufacturer's catalog sheets including instruction for use and description of application shall be provided for each type of metal decking. ICC approval of each type of metal decking for vertical load capacity and diaphragm rating capacity shall also be included.

D. Mill Certificates:
   1. The Contractor shall provide Mill Certificates for each heat of each type of metal decking to be used on project.
   2. Mill Certificates shall include name of mill, date of rolling, date of shipping, yield point and minimum tensile strength.
   3. Mill Certificates shall be provided with each lot of material shipped to the site and shall be signed by the Contractor which will serve to certify that all metal decking materials installed comply with specified requirements.
   4. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance and provide laboratory test reports. The cost of testing shall be paid for by the Contractor.

E. Laboratory Test Reports:
   1. Laboratory test reports shall show the name of testing agency, date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California.
   2. When required by other portions of these specifications, laboratory test reports shall be submitted for each deck type tested to show compliance with appropriate ASTM Standards and these specifications.

F. ICC Certificates: The Contractor shall provide ICC Certificates for each type of metal decking proposed that includes vertical and lateral load capacities.

PART 2 PRODUCTS

2.01 METAL FLOOR DECK

A. Metal floor deck shall conform to the requirements shown on the plans and have current ICC reports for vertical and lateral load resistance per the requirements of the California Building Code. Metal deck and all flashing shall be formed of zinc-coated (galvanized) steel sheets of the size and gage called for on the structural drawings. Furnish minimum lengths called for on the structural drawings. Metal Deck supporting concrete shall be vented. Subject to compliance with requirements provide one of the following:
   1. W2 Formlok; Verco [IAPMO ER #2018].
   2. W3 Formlok; Verco [IAPMO ER #2018].
   3. Epicore; Epic Metals [IAPMO ER #226].
   4. Approved Equal.

B. Zinc Coating: Zinc coating (galvanizing) shall be in accordance with ASTM A653, G60 commercial coating class for interior use or G90 commercial coating class for external use.

2.02 METAL ROOF DECK

A. Metal roof deck shall conform to the requirements shown on the plans and have current ICC reports for vertical and lateral load resistance per the requirements of the California Building Code. Metal deck and all flashing shall be formed of zinc-coated (galvanized) steel sheets of the size and gage called for on the structural drawings. Furnish minimum lengths called for on the structural drawings. Subject to compliance with requirements provide one of the following:
   1. HSB 36; Verco [IAPMO ER #2018].
   2. N-24; Verco [IAPMO ER #2018].
   3. ER2RA; Epic Metals [IAPMO ER #226].
   4. ER3.5A; Epic Metals [IAPMO ER #226].
   5. Approved Equal.

B. Zinc Coating: Zinc coating (galvanizing) shall be in accordance with ASTMA653, G60 commercial coating class for interior use or G90 commercial coating class for external use.

PART 3 EXECUTION

3.01 ERECTION

A. Erection shall be by an installer fully familiar with the manufacturer's product and having previous experience in its installation.

B. Erection shall be in strict accordance with the manufacturer's standard requirements. Alignment, end lap, side lap, bearing, closures, field cutting, field welding, and other like items concerned with a proper installation shall be in accordance with the manufacturer's recommended construction specifications. Care shall be exercised to properly fit male-female units of side laps before crimping or connecting.

C. The Contractor shall determine construction shoring requirements, construction load deck deflections, and construction load carrying capacities for the steel deck. At the Contractor's option and expense, the Contractor may increase the deck gage if beneficial for construction. If the Contractor determines temporary shoring is necessary, it shall be noted in the shop drawings.

D. Metal decking shall be installed in lengths as called on the structural drawings. End joints shall occur at points of support only.

E. Attachment of the metal deck to the steel frame and side lap connections shall be as shown on the structural drawings and as recommended by the manufacturer.

F. Furnish and install diagonal supports at columns and any other miscellaneous structural supports which are required to carry the metal deck and are not shown on the plans.

G. Cut and reinforce penetrations of the metal decking with loose angles or tubes for pipes, conduits, ducts, shafts, etc., that are shown on the architectural or structural drawings.

H. All other holes or penetrations of the metal decking required by the various trades shall be cut and the decking reinforced by the subcontractor for the respective trade.

I. Concrete fill thicknesses shown on the plans are minimum thicknesses. The Contractor shall provide additional concrete fill as required to compensate for framing and deck deflection to maintain surface tolerances and minimal concrete cover.

J. The Contractor shall protect the metal decking during transport, on site storage, and erection. Any decking which is found to be damaged shall be removed and replaced at the Contractor's expense.

K. No conduits or utilities shall be placed within the concrete topping unless specifically noted on the structural plans or approved by the engineer.

3.02 PATCHING

A. Repair abraded areas of the shop-applied coating, areas of weld where the shop-applied coating has been damaged and rust spots on the bottom surfaces of the decking units with a galvanizing repair compound in accordance with the metal decking manufacturer's printed instructions.

3.03 FIELD QUALITY CONTROL

A. Inspections: The Owner's agent will perform the inspections shown on the contract drawings.

END OF SECTION 05 3000

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Section 05 5133
Metal Ladders

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated ladders.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and backing for ladder.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

E. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

F. OSHA 1910.23 (d) - Occupational Safety and Health Standards: 1910.23 Subpart D: Walking-Working Surfaces: Ladders.; 2024.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
      a. Provide templates for anchors and bolts specified for installation under other Sections .
      b. Provide reaction loads for each hanger and bracket.

C. Design Data: Provide reaction loads for each hanger and bracket when applicable.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.

B. Product design shall comply with OSHA 1910.23 (d) for fixed ladders.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a four year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.

B. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209

C. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

E. Bolts, Nuts, and Washers: Stainless steel.

2.02 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
   3. Finish: Mill finish aluminum.
   4. Configurations
      a. Fixed Access: Heavy duty tubular rail
         1) Bracket: Floor, Top
         2) Ladder safety post
         3) Model: 501
      b. Parapet Ladder
         1) Brackets: Wall mount only, no penetrations of horizontal roof membrane
         2) Model: 503
   5. Manufacturers:
      a. O'Keeffe's Inc: www.okeeffes.com/#sle. (Basis of Design)
      b. Precision Ladders, LLC: www.precisionladders.com/#sle.

2.03 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I natural anodized.

B. Interior Aluminum Surfaces: Class I natural anodized.

C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.03 TOLERANCES

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

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

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 5133

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Section 05 5213
Pipe and Tube Railings

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ramp handrails and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

G. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

B. Fabricator Qualifications:

1. A company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

E. Straight Splice Connectors: Steel concealed spigots.

F. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Where handrails are to be hot dip galvinized locate vent holes for each portion of the railing where they will not be readily visible when installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Replace defective or damaged components as directed by Architect.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

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

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 5213

Section 06 1000
Rough Carpentry

PART 1 GENERAL

1.01 GENERAL

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation and facilities and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing rough carpentry, as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom.

B. Work Included:
1. Furnishing and installing wood framing and sheathing
2. Furnishing and installing glu-lam beams
3. Furnishing and installing plywood sheathing
4. Furnishing and installing light gage metal connectors
5. Furnishing and installing bolts, lag screws, washers, spikes and nails necessary for connecting wood framing and sheathing
6. Installing miscellaneous metal connectors
7. Temporary bracing

C. Related Work Specified Elsewhere:
1. Concrete Formwork; Section 03 1000
2. Structural Steel and Miscellaneous Iron; Section 05 1200

1.03 REFERENCE STANDARDS

A. The following is a list of reference standards referred to in this portion of the specifications.
1. ASTM A307, "Specification for Carbon Steel Externally Threaded Standard Fasteners"
2. W.C.L.I.B., "Standard Grading and Dressing Rules No. 17."
3. Federal Specification FF-N-105B with Interim Amendment 4.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
1. California Building Code, current governing edition.
2. National Forest Products Association, "National Design Specification for Wood Construction", current edition.

3. American Plywood Association, "U.S. Product Standard PS1-19"
4. American Institute of Timber Construction, American National Standard ANSI/AITC A190.1-2012 for Wood Products-Structural Glued Laminated Timber"

B. Grade marks:
1. All framing lumber shall be identified by the grade stamp of the West Coast Lumber Inspection Bureau.
2. All plywood shall be identified as to species, grade, and glue type, and shall bear the identification grade mark of the American Plywood Association.
3. All glu-lam beams shall be stamped with an AITC product quality mark.

C. Certificates of Conformance: The Contractor shall provide AITC Certificate of Conformance for glu-lam beams in accordance with the requirements of Part 1.05, "Submittals", of this Specification Section.

D. Testing and Inspection:
1. The Owner shall employ an independent testing laboratory or the Engineer as the Owner's agent to perform the inspections and tests shown on the contract drawings and submit certified test results. The Contractor will cooperate with and notify Owner's agent at least 24 hours in advance of inspections required:

1.05 SUBMITTALS

A. General Requirements
1. Submittals shall be made to Architect in accordance with the requirements of Division 1 General Requirements of these specifications.
2. Construction of wood framing, glu-lam erection, and sheathing shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Shop Drawings: Shop drawings for glu-lam beam fabrication shall be submitted that show beam lengths, sizes, camber, seat cuts, notches, and all details of fabrication including, grade, type of glue, combination type, appearance grade, and type of wrapping.

C. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following materials:
1. Light gage metal connectors

D. Certificates of Conformance: The Contractor shall provide a Certificate of Conformance meeting the requirements of AITC for all glu-lam beams.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver and store lumber glu-lam beams on sleepers and cover for protection. See general conditions for additional delivery and storage requirements.

B. Glu-lam beams shall be individually wrapped for delivery.

1.07 SEQUENCING AND SCHEDULING

A. Obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be installed prior to or in conjunction with rough carpentry so provision for their work can be made without delaying the project.

B. Do any cutting and repairing made necessary by failure or delay in complying with these requirements, at no cost to Owner.

PART 2 PRODUCTS

2.01 FRAMING

A. General: Framing shall be Douglas Fir Coast Region, conforming to West Coast Lumber Inspection Bureau Standard Grading and Dressing Rule No. 17, as amended to date.
   1. 2x, 3x, 4x, plates, joists, purlins and beams, No. 1 and better (1200F-b), Para. 123-b, unless noted otherwise on the drawings.
   2. 2x, 3x, 4x, joists, purlins and beams, Select Structural (1500F-b), 123-a, where noted on the drawings.
   3. 6x beams, Dense No. 1 (1550F-b). Para 130-bb.
   4. 2x, 3x, 4x ledgers, No. 1 (1000F-b), Para. 123-b, unless noted otherwise on the drawings.
   5. 4x4 posts, No. 1 (1500F-c), Para. 124-b, unless noted otherwise on the drawings.
   6. 4x6 posts, No. 1 (1500F-c), Para. 123-b, unless noted otherwise on the drawings.
   7. 6x6 and larger posts, Dense No. 1, (1200F-c), Para. 131-bb.
   8. 2x, 3x studs and blocking, No. 1 (1000F-b), Para. 123-b.
   9. Foundation plates: Pressure treated Douglas Fir No. 1.

B. All framing lumber 6" or larger in the least dimension shall be F.O.H.C.

2.02 PLYWOOD

A. General: Plywood shall conform to U.S. Product Standard PS 1-09, American Plywood Association. Each sheet shall be stamped with the PS and/or APA grademark.

B. Roof Plywood
   1. Shall be 5 ply exposure 1, CDX, span rating 32/16, Species Group 2 or better.
   2. Shall be 5 ply exposure 1, Structural I span rating 32/16, Species Group 1.

C. Wall Plywood
   1. Shall be exterior type, T1-11 A-C span rating 16 o.c. Species Group 1 with grooves at 8" o.c.
   2. Shall be 3 ply exposure 1, CDX, span rating 24/0, Species Group 2 or better.
   3. Shall be 4 ply exposure 1, Structural I, span rating 32/16, Species Group 1.

D. Floor Plywood
   1. Shall be exposure 1, Sturd-I-Floor, span rating 24 o.c.
   2. Shall be exposure 1, Sturd-I-Floor, span rating 48 o.c.
   3. Shall be exposure 1, Sturd-I-Floor, span rating 20 o.c.

2.03 LAMINATED MEMBERS

A. Laminated members not exposed to weather shall be Douglas Fir Coast Region unless noted otherwise on contract drawings. Members shall be in conformance with the Standard Specifications for Structural Glued Laminated Timber per ANSI A190.1 - 2012. Laminations shall conform to West Coast Lumber Inspection Bureau Standard Grading and Dressing Rule No. 17, as amended to date.
   1. Glu-lam beams shall be industrial grade unless noted otherwise on the contract drawings.
   2. AITC combination symbol 24F-V4, laminations DF/DF for simple span beams.
   3. AITC combination symbol 24F-V8, laminations DF/DF at continuous span beams and cantilevers.

B. Laminated members exposed to weather shall be Alaska Cedar in conformance with the Standard Specifications for Structural Glued Laminated Timber per ANSI A 190.1-2012.
   1. Glu-lam beams shall be appearance grade.
   2. AITC combination symbol 2OF-V12, laminations AC/AC for simple span beams.

2.04 ENGINEERED WOOD MEMBERS

A. Laminated-Veneer Lumber: A composite of wood veneers with grain primarily parallel to member lengths, manufactured with an exterior-type adhesive complying with ASTM D2559. Product has the following allowable design values as determined according to ASTM D5456:
   1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal-depth members.
   2. Modulus of Elasticity, Edgewise: 2,000,000 psi.

B. Parallel-Strand Lumber: A composite of wood strand elements with grain primarily parallel to member lengths, manufactured with an exterior-type adhesive complying with ASTM D2559. Product has the following allowable design values as determined according to ASTM D5456:
   1. Headers, Beams, and Joists:
      a. Extreme Fiber Stress in Bending, Edgewise: 2900 psi
      b. Modulus of Elasticity, Edgewise: 2,200,000 psi
   2. Columns:
      a. Extreme Fiber Stress in Bending, Edgewise: 2400 psi
      b. Modulus of Elasticity: 1,800,000 psi

C. Laminated Strand Lumber: A composite of flaked wood strands with grains primarily parallel to member lengths, manufactured with an exterior-type adhesive complying with ASTMD 2559. Product has the following allowable design values as determined according to ASTM D5456:
   1. Headers, Beams, and Joists:
      a. Extreme Fiber Stress in Bending, Edgewise: 2325 psi typical or 1700 psi where noted.
      b. Modulus of Elasticity, Edgewise: 1,550,000 psi typical or 1,300,000 psi where noted.
   2. Rim and Blocking:
      a. Extreme Fiber Stress in Bending, Edgewise: 1700 psi typical or 2325 psi where noted.
      b. Modulus of Elasticity, Edgewise: 1,300,000 psi typical or 1,550,000 psi where noted.
   3. Columns:
      a. Extreme Fiber Stress in Bending, Edgewise: 1700 psi.
      b. Modulus of Elasticity, Edgewise: 1,300,000 psi.

2.05 LIGHT GAGE METAL CONNECTIONS

A. Light gage metal connectors shall be Simpson Company Strong Tie Connectors, or equal unless noted otherwise on the drawings.

2.06 NAILS

A. Nails shall be bright common wire nails, galvanized for exterior work and conform to Federal Specification FF-N-105B.

B. Nailing shall conform to CBC Table 2304.10.2 unless otherwise noted.

C. Nails in pressure treated lumber shall be hot dipped galvanized steel in compliance with ASTM A153.

2.07 SCREWS

A. Lag screws shall conform to ANSI/ASME Standard B18.2.1.

B. Wood screws shall conform to ANSI/ASME Standard B18.6.1.

2.08 BOLTS

A. Bolts: Bolts shall conform to ASTM A307, manufactured to American Standard Bolt and Nut dimensions with "Free Fit - Class 2" threads.

B. Anchor Bolts: Anchor bolts shall conform to ASTM F1554 grade 36.

C. Bolts in pressure treated lumber shall be hot dipped galvanized steel in compliance with ASTM A153.

2.09 PRESERVATIVE TREATMENT FOR WOOD

A. Preservative Treatment for Wood: Water-borne, non-arsenic, non-chromium type complying with AWPA Standard U1. Preservative treatment shall not contain pentachlorophenol, arsenic compounds, or creosote. In addition, the preservative treatment shall comply with the following:
   1. Material: Paintable.
   2. Comply with CARB limit on VOCs of 350 g/L using EPA Test Method 24.
   3. Moisture Content: After treatment, re-dry wood to be used in enclosed locations to a moisture content of 19% or less.
   4. Retreat all field cut ends and surfaces.

2.10 FIRE-RETARDANT-TREATED WOOD

A. Fire Retardant Treatment: Waterborne chemical treatment to comply with AWPA Standard P-5, achieve a flame spread index of 25 or less when tested in accordance with ASTM E84, and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than 10.5

feet beyond the centerline of the burners at any time during the test. Use of ammonium phosphates is prohibited.

B. Apply in compliance with the applicable AWPA Standard for type of wood and application.

C. Provide fire retardant treatment for all wood noted on the Drawings to receive it.

D. Where treated items are indicated on the Drawings to receive a transparent or opaque paint finish, use a fire retardant treatment which will not bleed through or adversely affect the bond of the finish material.

E. Structural performance of fire retardant wood shall meet requirements of ASTM D5664 for lumber & ASTM D5516/D6305 for plywood.

F. Provide labeling in conformance with CBC Section 2303.2.4 on all fire treated material delivered to the job site.

G. Acceptable manufactures and products:
   a. Koppers Performance Chemicals FirePRO
   b. Hoover Treated Wood Products, Inc. Pyro-Guard
   c. Hoover Treated Wood Products, Inc. Exterior Fire-X
   d. Approved Equal

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. All framing operations shall conform to the requirements of the California Building Code.

B. Set horizontal and sloped members with crown up. Do not notch, bore or cut members for pipes, ducts, conduits, or other reasons except as shown on the drawings or as specifically approved by the Architect/Engineer. Make all bearings full and all blocking solid unless otherwise indicated on the drawings. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

C. Joists shall be set with the crowning edge up except at cantilevers.

D. Solid blocking shall be placed at ends of spans and over supports. Cross-Bridging or solid blocking in spans shall not exceed 8 feet or less if shown on structural drawings.

E. Furnish and set all columns and studs to size, centers, and locations indicated on the drawings. Unless marked otherwise, studs for furring and partitions shall be 2x4 or 2x6, set 16" o.c. plates on concrete floors shall not be set until the concrete is finished. Cripples shall be run to the floor plates.

F. Remove all wood, including form lumber, scrap lumber, shavings and sawdust in contact with

ground. Leave no wood buried in any fill or backfill.

G. Furring and blocking shall be furnished and installed where required for reception of wallboard, formation or architectural features, concealment of pipes, conduits, ducts, attachment of supports for towel holders, toilet paper holders, and other fixtures. Contractor shall consult with the trades concerned and set furring and blocking they require.

H. Fire Blocking shall be installed as shown on drawings and in accordance with the applicable Building Code.

I. Framing of openings through walls, floors, attics, and roofs shall be provided for roof vents, mechanical equipment, lighting fixtures, ducts, etc. Where one or more joists are cut, the joists supporting the trimmers shall be framed in accordance with the drawings or if not detailed shall be doubled and well spiked. Where continuation of three or more joists is interrupted, the abutting headers and joists shall be reinforced with approved type of joists hangers.

J. Center joints or plywood accurately over supports and nail into solid wood. Protect all plywood from moisture by use of all required waterproof covering until the plywood has in turn been covered by the next succeeding component or finish.

K. Lumber not grade stamped, and lumber of improper grade, shall be removed from the job site and immediately replaced by grade stamped lumber of the proper grade.

L. Other Materials: All other lumber materials, not specifically described but required for the proper completion of the work, shall be new, first quality of their respective kinds and subject to the approval of the Architect/Engineer.

M. Where the plans do not require solid blocking or a tongue and groove connection at edges of plywood or OSB sheathing, the sheathing edges shall be supported with ply clips or ply cleats.

3.02 EXAMINATION

A. Surface Conditions: Prior to the work of this section, carefully inspect the installed work of other trades and verify that all such work has been so installed as to allow rough carpentry to produce surfaces to the required design.

3.03 WORKMANSHIP

A. All rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the drawings and with all pertinent regulations.

B. Cut all wood members to fit. Do not shim.

C. Erect all members straight, plumb and accurately located.

D. Carefully select all structural members. Select individual pieces so that knots and obvious defects will not interfere with making proper connections. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, or crook, or for mildew, fungus or mold as well as for improper cutting or fitting. Cut out and discard all defects which render a piece unable to serve its intended function.

3.04 INSTALLATION

A. Plates: Plates for partitions and walls shall be single at bottom and double at top. Splices in top plates shall be staggered not less than 48". Where plates are cut for passing pipes and similar items, they shall be reinforced on both sides with 1/8"x3"x18" steel plates punched for 10d nails 6" on center, staggered.

B. Power Driven Inserts: Wherever furring of any kind is attached to concrete or masonry, including lower plates to floors, the members shall be secured with 1/4" power driven inserts. Plates anchored to concrete floors shall be attached with pins not over 3 feet on center. All studs on vertical furring shall be attached with pins not over 4 feet on center. Each insert shall penetrate the concrete to a minimum of 1-1/2". Use washers with all inserts.

3.05 ERECTION

A. The Contractor will be responsible to erect the wood framing true to line and grade.

B. Temporary Bracing and Shoring:
   1. The Contractor shall temporarily brace the wood framing in both directions and shall maintain walls, joists, beams, and other framing members plumb until the final connections of the framework and construction of diaphragms are complete.
   2. The Contractor shall provide such temporary shoring and additional bracing of wood framing as required to adequately and safely support any or all loads imposed upon the structure during construction.

3.06 CLEAN UP

A. In addition to the requirements of General Conditions, keep premises clean and clear of debris caused from this portion of the work. Failure to perform clean up within 24 hours notice by the Architect or General Contractor shall be considered adequate grounds for having the work done by others at this subcontractor's expense.

3.07 FIELD QUALITY CONTROL

A. Inspections: The Owner's agent will perform the inspections as shown on the contract drawings.

END OF SECTION 06 1000

Section 06 1960
Prefabricated Wood I-Joists

PART 1 GENERAL

1.01 APPLICABLE SECTIONS

A. The requirements/provisions of the General and Supplementary Conditions and Division 1 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of designing, fabricating, and installing OSB web joists as described in this section of the specifications, shown on the accompanying drawings or reasonably implied therefrom, except as hereinafter specifically excluded, including, but not limited to these major items.

B. Work Included:
   1. Design of all Wood I-Joists.
   2. Fabrication and erection of all Wood I-Joists as shown or called on the contract drawings.
   3. All loose material such as bolts, clips, nails, and bridging required in connection with the installation of Wood I-Joists.
   4. All material that is supported by or attached to Wood I-Joists as required to trim openings shown on the architectural and structural drawings.

C. Related Work Specified Elsewhere:
   1. Rough Carpentry; Section 06 10 00

1.03 REFERENCE STANDARDS

A. The following is a list of reference standards referred to in this portion of the specification:
   1. ASTM A307, "Specification for Carbon Steel Externally Threaded Standard Fasteners"
   2. W.C.L.I.B. "Standard Grading and Dressing Rules No. 17"

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with all Federal, State, and Local codes and safety regulations. In addition, the fabrication and erection of Wood I-Joists shall comply with all the applicable provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
   1. "California Building Code", current governing edition.
   2. National Forest Products Association, "National Design Specification for Wood Construction."

B. Qualifications:
   1. Fabrication and erection of Wood I-Joists shall be by a manufacturer with 5 years minimum experience in the design, fabrication and erection of Wood I-Joists. The manufacturer shall also have been in business to fabricate and erect Wood I-Joists

continuously over the past 5 years.

2. The design and detailing of Wood I-Joists shall be prepared, stamped, and signed by a registered civil engineer of the state of California.

C. Testing and Inspection:
   1. General:
      a. All materials and work shall be subject to inspection at the fabricating shop, and at the building site. Material or workmanship not complying fully with the drawings and specifications will be rejected.
      b. If the inspector, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
   2. Owner: The Owner shall employ an independent testing agency or the Engineer as the Owner's agent to perform the inspections and tests shown on the contract drawings and submit certified test results. The contractor will cooperate with and notify Owner's agent at least 48 hours in advance of inspections required.

1.05 SUBMITTALS

A. General Requirements:
   1. Submittals shall be made to Architect in accordance with the requirements of Division 1, General Requirements of these specifications.
   2. Construction, and fabrication or ordering of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Shop Drawings:
   1. Shop drawings shall show the complete I-joist plan layout. The shop drawings shall provide an elevation of each different type of joist showing dimensional layout, member sizes, type of material and connection details. The shop drawings shall also show all miscellaneous details including continuous bridging and diagonal bracing details. The shop drawings shall include specifications for all materials to be used in joist fabrication and erection. The allowable stresses for each type of material shall also be shown.
   2. Complete design calculations and/or design verification tests shall be furnished along with the shop drawings. The calculations shall show all stresses in members and connections for design loads including dead loads, live loads, wind loads, etc. specified by the California Building Code and these specifications. Deflections for all members due to design loads shall also be included.
   3. Calculations and shop drawings shall be prepared and signed by a civil or structural engineer, registered in the State of California.
   4. Joist manufacturer shall obtain all necessary approvals from the public agencies governing construction.

PART 2 PRODUCTS

2.01 DESIGN

A. Design of Wood I-Joists, bridging, and diagonal bracing shall be in strict accordance with the California Building Code.

B. Wood I-Joist depths and layout shall be as called or shown on the structural drawings. Diagonal or continuous bridging shall be of a size and layout required by design and shown on the shop drawings. The joist designer shall coordinate the size and location of bridging as required to brace joists.

C. Wood I-Joists shall be supplied by the same fabricator (manufacturer) to insure uniformity of details and appearance.

D. It is the intent of the drawings and these specifications that the Wood I-Joists provide a neat uniform appearance as accepted by the Architect.

E. Design Loads: See Contract Drawings

F. Maximum Allowable Deflections:

Level	Location	Live Load	Dead + Live Load	Maximum
Roof	Cantilever Span	L/300	L/180	1”
	Interior Span	L/360	L/240	1”
Floor	Cantilever Span	L/600	L/240	1"
	Interior Span	L/600	L/240	1”

G. Cantilever spans shall have identical limitations with L=2x overhang. 1 inch maximum

2.02 MATERIALS

A. Materials for fabrication of Wood I-Joists shall be in accordance with the Specifications shown on the shop drawings prepared by the joist design engineer.

B. All lumber shall conform to the “Standard Grading and Dressing rules #17", and as specified by the truss design engineer.

C. Flanges shall be laminated veneer lumber; machine stress rated and shall have a moisture content of between 7 and 16 percent at time of fabrication.

D. Joists shall be manufactured to the following tolerances:
1. Joist Depth = +/- 1/16 inch
2. Flange Width = +/- 1/16 inch

PART 3 EXECUTION

3.01 WORKMANSHIP

A. The workmanship shall be of the highest quality found in contemporary structural work.

3.02 ERECTION

A. The Contractor will be responsible to erect the Wood I-Joists plumb and true to line and grade.

B. Handling and erection shall be in accordance with these specifications and the referenced standards. Wood I-Joists and accessories shall be protected from harmful elements when stored at the job site. Store above the ground on platforms, pallets, or similar support. Keep trusses free of dirt and other deleterious matter.

C. Replace all joists damaged by shipping, storage, or erection.

D. Erection shall be by an installer fully familiar with the manufacturer's product and having previous installation experience.

E. Temporary Bracing and Shoring:
   1. The Contractor shall temporarily brace the Wood I-Joists in both directions until the final connections of the framework and construction of diaphragms are complete.
   2. The Contractor shall provide such temporary shoring and additional bracing of structural frame as required to adequately and safely support any or all loads imposed upon the structure during construction.

END OF SECTION 06 1960

Section 06 2000
Finish Carpentry

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 4100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI A208.1 - American National Standard for Particleboard; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. NHLA G-101 - Rules for the Measurement and Inspection of Hardwood and Cypress; 2023.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.

C. Samples: Submit two samples of wood trim 12 inch long.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

B. Handle materials and products to prevent damage to edges, ends, or surfaces.

1.08 PROJECT CONDITIONS

A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

B. Coordinate the work with installation of associated and adjacent components.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
   2. Window Sills: Clear fir; prepare for transparent finish.

2.02 LUMBER MATERIALS

A. Softwood Lumber: pine species, smooth sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
   1. Grading: In accordance with rules certified by ALSC; www.alsc.org.

B. Hardwood Lumber: Teak species, smooth sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.
   1. Grading: In accordance with NHLA G-101 Grading Rules; www.nhla.org.

2.03 FASTENINGS

A. Fasteners: Of size and type to suit application; _____ finish in concealed locations and _____ finish in exposed locations.

2.04 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 2000

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Section 06 4100
Architectural Wood Casework

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Plastic laminate countertops.

C. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications - supports and brackets

B. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 08 8000 - Glazing: Glass for casework.

D. Section 07 9005 - Joint Sealers

E. Section 12 3600 - Countertops.

F. Division 22 Plumbing

G. Division 23 Mechanical

H. Division 26 Electrical

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

D. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

E. WI (MCP) - Monitored Compliance Program (MCP); Current Edition.

F. ASTM D 1037 - 99 Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes. Shop Drawings shall have WI, Certified Compliance Label affixed to first page of drawing set.

C. Product Data: Provide data for hardware accessories. Provide MSDS Sheets for all composite wood and agrifiber products, adhesives, and sealants used.

D. Samples: Submit actual sample items of proposed pulls, _____, hinges, plastic laminates, shelf standards, plastic laminates, locksets, and _____, demonstrating hardware design, quality, and finish.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with WI Manual of Millwork, Custom quality, unless other quality is indicated for specific items. The millwork supplier shall issue a W.I. Certificate Compliance Certificate indicating the grade of millwork products to be furnished for this job and certifying that they will fully meet all the requirements of the grade specified. Each unit of casework shall bear the W.I. Certificate Compliance label. Each plastic laminate countertop shall bear the W.I. Certified Compliance label. Upon the completion of the installation, a W.I. Certified Compliance shall be issued for the installation. The type of construction used must meet the seismic force requirements of Title 24.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

B. Delivery shall only be made when the area of operation is enclosed, all wet work is dry, all overhead work is complete, and the area broom clean.

1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

B. The HVAC system shall be on and functioning, and the architectural millwork shall be acclimated to these conditions for 72 hours prior to installation.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Cabinets:
1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Semi-Exposed Surfaces: Wood
4. Finish - Concealed Surfaces: Manufacturer's option.
5. Door and Drawer Front Edge Profiles: Radius edge with thick applied band.
6. Casework Construction Type: Type A - Frameless.
7. Cabinet Design Series: As indicated on drawings.
8. Adjustable Shelf Loading: 50 psf.
9. Cabinet Doors and Drawer Fronts: Flush style.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood, certified or labeled; see Section 01 6000.

C. Provide wood that is FSC certified

D. Hardwood Faced Plywood: HPVA HP-1; graded in accordance with WI Manual of Millwork, core of lumber; exterior glue ; thickness 3/4";
1. Exposed Open Shelving
2. Semi Exposed Shelving

E. Particleboard shall not be used

F. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in WI Manual of Millwork; composed of wood fibers pressure bonded with moisture resistant formaldehyde free adhesive to suit application; sanded faces; thickness as required.
1. Medex, as manufactured by Sierra Pine or approved equal
2. Located at all casework construction, except as identified above.

2.03 Panel Core Materials

2.04 LAMINATE MATERIALS

A. Manufacturers:
1. Formica Corporation; ____: www.formica.com/#sle.
2. Panolam Industries International, Inc; _____: www.panolam.com/#sle.

3. Wilsonart LLC; ____: www.wilsonart.com/#sle.
4. Or approved equal, prior to bidding

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for all exposed applications as scheduled.
1. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, through color, _____ color, finish as indicated.

D. Melamine finish at all semi-exposed cabinet shelving, divisions an faces.

E. Interior faces of cabinet doors to be faced with the same material as exposed surfaces.

2.05 COUNTERTOPS

A. Countertops: See Section 12 3600.

2.06 ACCESSORIES

A. Adhesive: Type recommended by WI to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
1. Color: As selected by Architect from manufacturer's standard range.
2. Use at all exposed shelf edges.
3. Use at door and drawer edges.
4. All adhesives must meet or exceed the VOC limits of the South Coast Air Quality Management District Rule # 1168 (http://www.aqmd.gov/rules/reg/reg11_tofc.html)

C. Glass: Type A, see Section 08 8000.

D. Fasteners: Size and type to suit application.

E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

F. Concealed Joint Fasteners: Threaded steel.

G. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

2.07 HARDWARE

A. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

1. Standards, SP-1820, manufactured by Sugatsune or approved equal.
2. Supports; SP-15, manufactured by Sugatsune or approved equal.

B. Drawer and Door Pulls: matte chrome zinc alloy pull handle.
   1. Product: EG-36160 MC manufactured by Sugatsune or approved equal

C. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.
   1. Pin tumbler cylinder cam lock, National Lock 8102 Series or approved equal.
   2. Keying as selected. All locks shall be installed in a hole shaped the same shape as the cylinder of the lock to eliminate rotation. Round lock cylinders installed in round holes will not be allowed.
   3. Cabinet locks are to be installed at the following cabinet doors with the following requirements:
      a. All locks will be keyed with one master key and one unique key.
      b. Provide 4 copies of each unique key and a total of eight copies of the master key.
      c. Bunkroom Lockers: Unique keys for each locker door.
      d. Kitchen Pantry Cabinets: Unique keys for each separate full height "pantry" cabinet door.

D. Cabinet Catches and Latches:
   1. Product: MC0099 manufactured by Sugatsune
   2. Product: 323A92 manufactured by Ives
   3. Substitutions: See Section 01600 - Product Requirements.

E. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
   6. Manufacturers:
      a. Accuride International, Inc; Light-Duty Drawer Slides: www.accuride.com/#sle.
      b. Hettich America, LP; _____: www.hettich.com/#sle.
      c. Knape & Vogt Manufacturing Company; Light-Duty Drawer Slides: www.knapeandvogt.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

F. Hinges: European style concealed self-closing type, steel with polished finish.
   1. Manufacturers:
      a. Rockford Process Control, Inc: rockfordprocess.com - 450 series.
      b. Or approved equal,
      c. Substitutions: See Section 01 6000 - Product Requirements.

G. Silencers: Clear vinyl silencers to be installed at each cabinet door

H. Countertop Cable Grommets:
   1. Color: Black, Verify with Architect
   2. Diameter: 3"

3. Features: Grommet to include cap

I. Wardrobe Hook
1. # 582 Double, Aluminum, Manufactured by Ives or approved equal.

2.08 FABRICATION

A. Cabinets shall be fabricated to Woodwork Institute standards
1. Grade: Premium

B. Exceptions to WI standards
1. Wall Hung Cabinets : Depth 14 inches
2. Storage, Janitor, Closet and Utility Room Cabinets shall be of the same construction as typical cabinets.
3. Shelves shall be designed as per schools and libraries, for a 50lb per square foot live load as per table 15-1.
4. Exterior Edges: Include doors, drawer fronts, and front edge of vertical end panels and leg panels. Exterior edges are to be edged with heavy-duty 3mm PVC edgebanding, color to match door or drawer front.
5. Locate grommets as directed by Owner. Assume one per workstation

C. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

D. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

E. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

F. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 CASEWORK INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

G. Cabinets set on slab on grade concrete or in wet or damp locations shall be placed on water resistant base material only.

H. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

I. Secure upper cabinets, counter bases, full height cabinets, and counter partitions to floor and wall using appropriate angles and anchorages to obtain seismic restraint per Title 24 Section 2336

3.03 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

B. Defective work shall be repaired or replaced as directed by the Owner or his representative upon completion of installation.

C. Shop finished surfaces shall be cleaned, touched-up as required and damaged or unrepairable areas shall be refinished or replaced as directed.

D. Clean cabinetry free of debris. Installer shall be responsible for the immediate removal of all trash, crating, etc., associated with the cabinet installation.

END OF SECTION 06 4100

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Section 06 8316
Fiberglass Reinforced Paneling

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

E. FM 4880 - Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials; 2017.

F. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water; 2017.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Marlite, Inc; _____: www.marlite.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.09 inch.
   3. Surface Design: Embossed.
   4. Color: White.
   5. Attachment Method: Adhesive only, sealant joints, no trim.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Class 1 fire rated when tested in accordance with FM 4880.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   4. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.

B. Trim: Vinyl; color coordinating with panel.

C. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION 06 8316

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Section 07 2100
Board and Batt Insulation

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, over roof deck, over roof sheathing, exterior wall behind _____ wall finish, and interior wall with facer providing exposed finish.

B. Thermal batt insulation and vapor retarder in exterior wall construction.

C. Thermal batt insulation at sloped roof areas.

D. Rigid foam board insulation at low slope (Flat) roof areas.

E. Rigid foam board insulation - tapered for roof drainage.

F. Thermal batt insulation at low slope (Flat) roof areas.

G. Sound insulation at all interior demising walls not otherwise thermally insulated - size to fill void 3 5/8" min.

H. Sound insulation at all t-bar ceilings at demising partitions of offices.

I. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

J. Thermal batt insulation at low slope roof area (In addition to rigid insulation)

1.02 RELATED REQUIREMENTS

A. Section 07 5400 - Thermoplastic Membrane Roofing: Installation requirements for board insulation over low slope roof deck.

B. Section 09 5100 - Acoustical Ceilings

C. Section 21 1313-Wet-Pipe Sprinkler System

1.03 DEFINITIONS

A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
   1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also

considered a mineral.

2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

1.04 QUALITY ASSURANCE

A. Installer - Work to be performed only by workers thoroughly skilled and specially trained in the techniques of insulation, and who are completely familiar with the published recommendations of the manufacturer of the material being used. Installer to take care that facing material of batt insulation is not torn or punctured.

B. Materials of this section shall provide continuity of thermal barrier at building enclosure elements.

1.05 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

E. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2017.

F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

I. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

1.06 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.07 PRODUCT HANDLING

A. Protection
   1. Insulating materials to be stored at the job site in a safe, dry place with all labels intact and legible at time of installation.
   2. Comply with manufacturer's recommendations for handling, storage and protection during installation. Use all means to protect insulating materials before, during, and after installation. Do not allow products to become wet, damp, or punctured.

B. Replacements - In the event of damage, including water intrusion, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.08 SEQUENCING

A. Sequence work to ensure fireproofing and firestop materials are in place before beginning work of this section.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation in Wood Framed Walls: Batt insulation with integral vapor retarder.

B. Insulation in Wood Framed Ceiling Structure: Batt insulation with integral vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board with Facers Both Sides: Complying with ASTM C1289.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Roof Insulation to conform to HH-I-1972
   4. Board Size: 48 inch by 96 inch.
   5. Board Thickness: As required to achieve R value specified.
   6. Board Edges: Square.
   7. Product: Thermax by Dow Chemical Company as a standard of quality.
   8. Products:
      a. Atlas Roofing Corporation; ACFoam-II GRF Roof Insulation: www.atlasroofing.com/#sle.
      b. GAF; EnergyGuard Polyiso Insulation: www.gaf.com/#sle.
   9. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
   1. Surface Burning Characteristics: Flame spread index of 25 or less; smoke developed index of 50 or less, when tested in accordance with ASTM E 84.
   2. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   3. Formaldehyde Content: Zero.
   4. Thermal Resistance: (Unless otherwise noted on plans with an increase value)
      a. At Pitched Roof Area (including: mansard roofing areas) : R-30 FSK faced batts (with vapor not exceeding 1 perm- installed on the warm side of the attic insulation)
      b. At Flat (Low Slope) Roof Areas: R-30 FSK faced batts (with vapor not exceeding 1 perm- installed on the warm side of the attic insulation)
      c. At Exterior Walls: R-19 Kraft Face Batts.
      d. Interior Wall Sound Insulation: fiberglass sound control batts 3-5/8" thick
   5. Manufacturer shall certify that a minimum of 25% of content of insulation is of recycled materials.
   6. Facing: Asphalt treated Kraft paper, one side.
   7. Products:
      a. CertainTeed Corporation: www.certainteed.com.
      b. Johns Manville: www.jm.com.
      c. Owens Corning Corp: www.owenscorning.com.
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Provide all other materials and products necessary for the proper completion of the work.

B. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.
   1. Products:

C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

D. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where installation can properly begin.

C. Verify that specified products may be installed in accordance with the original design and the manufacturer's recommendations.

3.02 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Staple or nail facing flanges in place at maximum 6 inches on center.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.03 ACOUSTIC BATT INSTALLATION

A. On first floor install accoustic batt insulation over all t-bar ceilings.

B. On second floor install acoustic batt insulation over the t-bar ceiling for a minimum of 3 feet of either side of partition.

C. Install acoustic batt insulation at walls indicated on plans.

End of Section 07 2100

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Section 07 2500
Weather Barriers

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.03 DEFINITIONS

A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

1.04 REFERENCE STANDARDS

A. ASTM D779 - Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method; 2016.

B. ASTM D779 - Standard Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry Indicator Method; 2003.

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

G. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2018.

H. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 MOCK-UPS

A. Construct weather barrier mock-up, 10 feet long by 10 feet wide, indicating installation at penetrations, top of wall, and base of wall..

B. Locate where directed.

C. Mock-up may remain as part of work.

1.07 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIER MATERIALS

A. Drainable Barrier Sheet: Multi-layer nonwoven and nonperforated polpropylene with rain screen matrix bonded on back side.
   1. Width: 4.4 feet, minimum.
   2. Water Vapor Permeance: 19 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
   4. Drainage gap: 3 mm minumum passing ASTM E2273
   5. Products:
      a. VaproShield: WrapShield RS: vaproshield.com
      b. Tamlyn; TamlynWrap Rain Screen 6.3: www.tamlyn.com
      c. www.kingspaninsulation.us

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Width: 4 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.

C. Thinners and Cleaners: As recommended by water-resistive barrier manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Water-Resistive Barriers: Install continuous water-resistive barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
   1. Seal joint between slab or curb and wall above.

D. Mechanically Fastened Exterior Sheets:
   1. Install sheets shingle-fashion to shed water, with seams aligned horizontal.
   2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
   3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
   4. Attach to framed construction with fasteners extending through sheathing into framing, and space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.

5. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
6. Install water-resistive barrier over jamb flashings.
7. Install head flashings under water-resistive barrier.
8. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

E. Openings and Penetrations in Exterior Water-Resistive Barriers:
1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches beyond face of jambs; seal water-resistive barrier to flashing.
5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
1. Allow access to work areas and staging.
2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
3. Do not cover work of this section until testing and inspection is accepted.

C. Do not cover installed water-resistive barriers until required inspections have been completed.

D. Take digital photographs of each portion of installation prior to covering up weather barriers.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 07 2500

Section 07 4213
Metal Wall Panels

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, interior liner panels, soffit panels, retrofit panels, subgirt framing assembly, and perforated panels for mechanical screening, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 06 1000 - Rough Carpentry: Wall panel substrate.

C. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.

D. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, profiles, finishes, and methods of anchorage.

C. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture. Include fasteners, closures, and other metal panel

access

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.06 MOCK-UPS

A. Construct mock-up, ____ feet long by ____ feet wide; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, _____, and related insulation in mock-up.

B. Build mockup; to verify selections made under sample submittals and to demonstrate aestheric effects and set quality standards for fabrication and installation.

C. Mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver components, metal panels and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

C. Store metal panels in a manner to prevent bending, warping, twisting and surface damage.

D. Stack metal panels horizontally on platforms or pallets, covered with suitable weather tight and ventilated covering. Store metal panels to ensure dryness with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting or other surface damage.

E. Retain strippable protective covering on metal panels during installation.

F. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

G. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

H. Prevent contact with materials that may cause discoloration or staining of products.

1.08 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Exposed Fasteners:
   1. MBCI; 7.2 Panel: www.mbci.com/#sle.
   2. Western States Decking, Inc. DBA - Western States Metal Roofing.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels, interior liner panels, soffit panels, retrofit wall panels, and subgirt framing assembly.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.

B. Exterior Wall Panels:
   1. Profile: _____; style as indicated.
   2. Metal Panel Designation: Western Rib Panel
   3. Steel Sheet: A-606-4 Weathering Steel: ASTM A 606-04 High Strength Low Alloy Weathering Steel
   4. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
   5. Panel Width: 36 inches.
   6. Panel Height: 1.5 inches.

C. Interior Liner Panels:
   1. Profile: Vertical; style as indicated.
   2. Side Seams: Interlocking, sealed with continuous bead of sealant.
   3. Panel Width: ___ inch.

D. Soffit Panels:
   1. Profile: Style as indicated, with venting provided.

E. Retrofit Wall Panels:
   1. Profile: Vertical; style as indicated.
   2. Side Seams: Lapped.

3. Condensation Control: Factory-applied membrane to reduce drips resulting from backside condensation.
4. Panel Width: ___ inches.

F. Perforated Panels for Mechanical Screening
1. Material: 24 guage Galvalume
2. Color: Unpainted Galvalume Plus
3. Size: 48-3/8"
4. Perforation size: 30.5% Open Area

G. Subgirt Framing Assembly:

H. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

I. Expansion Joints: Same material, thickness and finish as exterior sheets; ___ gauge, ___ inch thick; manufacturer's standard brake formed type, of profile to suit system.

J. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

K. Anchors: Galvanized steel.

2.03 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify weather barrier, see Section 07 2500, has been installed over wall panel substrate; see Section 05 4000.

3.02 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

3.03 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION 07 4213

Section 07 4646
Fiber-Cement Siding

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Water-resistive barrier under siding.

B. Section 06 1000 - Rough Carpentry: Siding substrate.

C. Section 07 2500 - Weather Barriers: Water-resistive barrier under siding.

D. Section 09 9113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022, with Editorial Revision (2023).

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified in this section with not less than three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for years as indicated under Fiber-Cement Siding article sub-headings for "Warranty". Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Panel Siding: Horizontally oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: As indicated on drawings.
   2. Length (Height): 96 inches, nominal.
   3. Width: 48 inches.
   4. Thickness: 5/16 inch, nominal.
   5. Finish: Factory applied stain.
   6. Color: As indicated on drawings.
   7. Warranty: 30 year limited; transferable.
   8. Products:
      a. James Hardie Building Products, Inc; _____: www.jameshardie.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Trim: Architectural Trim.
   1. Metal Trim: Extruded aluminum alloy 6063-T5 temper.

a. Finish: Clear anodized.
   1) Color: As selected by Architect.
b. Metal Trim, Multi-Purpose:
   1) Dimensions, Profile, Type, and Layout: As indicated on drawings.
   2) Products:
      (a) James Hardie Building Products, Inc; Metal Trim for Fiber-Cement Siding: www.jameshardie.com/#sle.
      (b) Substitutions: See Section 01 6000 - Product Requirements.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches, minimum.

C. Joint Sealer: As specified in Section 07 9005.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistant barrier has been installed over substrate completely and correctly; see Section 05 4000.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces during execution of this work.

B. Install Sheet Metal Flashing:
   1. Above door and window trim and casings.
   2. Above horizontal trim in field of siding.

3.03 INSTALLATION

A. Install siding in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
   3. Use trim details as indicated on drawings.
   4. Touch up field cut edges before installing.
   5. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

D. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

E. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.04 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean faced panels in accordance with manufacturer's maintenance instructions, using cleaning materials and methods acceptable to manufacturer.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 07 4646

Section 07 5400
Thermoplastic Membrane Roofing

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mechanically attached system with thermoplastic roofing membrane.

B. Deck sheathing.

C. Cover boards.

D. Flashings.

E. Roofing stack boots and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Plywood roof deck

1.03 REFERENCE STANDARDS

A. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2023.

B. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2017.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

E. ASTM D751 - Standard Test Methods for Coated Fabrics; 2019.

F. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

H. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).

I. FM (AG) - FM Approval Guide; Current Edition.

J. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2024).

K. NRCA (RM) - The NRCA Roofing Manual; 2023.

L. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

M. UL (DIR) - Online Certifications Directory; Current Edition.

N. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one month before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and fasteners.

C. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

D. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

E. Manufacturer's qualification statement.

F. Installer's qualification statement: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

G. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Installer shall be authorized by the manufacturer to install the roof system, and eligibile to obtain the specified warranty.

C. Final Inspection: Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

D. Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 25 years.
   2. For repair and replacement include costs of both material and labor in warranty.
      a. Scope of coverage:
         1) Ordinary wear and tear of the elements
         2) Manufacturing defect in roofing materials.
         3) Defective workmanship used to install these materials.
         4) Damage due to winds up to design speed indicated on drawings per code

b. Exclusions, not covered:
   1) Damage due to winds in excess of those indicated on drawings.
   2) Damage due to hail
   3) Intentional Damage

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
   1. Carlisle SynTec Systems; Sure-Weld TPO: www.carlisle-syntec.com/#sle.
   2. Elevate; UltraPly Platinum TPO: www.holcimelevate.com/#sle.
   3. GAF; EverGuard Extreme TPO 60 mil: www.gaf.com/#sle.
   4. Johns ManvilleJM TPO - 60 mil: www.jm.com/#sle.
   5. Mule-Hide Products Co, Inc; Standard TPO: www.mulehide.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation:
   1. Carlisle SynTec Systems; SecurShield Insulation: www.carlisle-syntec.com/#sle.
   2. GAF; Energy Guard Ultra: www.gaf.com/#sle.
   3. ROCKWOOL; TopRock DD: www.rockwool.com/#sle.
   4. Versico Roofing Systems; SecurShield Insulation: www.versico.com/#sle.

2.02 ROOFING

A. Thermoplastic Membrane Roofing: One ply membrane, induction welded, over insulation.

B. Roofing Assembly Requirements:
   1. Roof assembly shall have ICC Evaluation report with a listed assembly for the specified roof class and wind uplift over the roof assembly shown on the drawings.
   2. Solar Reflectance Index (SRI): Minimum of 81 based on three-year aged value; if three-year aged data is not available, minimum of 94 initial value.
      a. Calculate SRI in accordance with ASTM E1980.
      b. Field applied coating may not be used to achieve specified SRI.
   3. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.

C. Acceptable Insulation Types - Constant Thickness Application:
   1. Minimum 2 layers of polyisocyanurate or mineral wool board board.

D. Acceptable Insulation Types - Tapered Application:
   1. Uniform thickness polyisocyanurate or mineral wool board covered with tapered polyisocyanurate or mineral wool board.

E. Insulation Values: Provide the following minimum R values for rigid insulation. If R value information on drawings is in conflict with these minimum values provide the greater R value provided.
   1. Minimum R value: 35

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:
   1. Heat Aging: 128 weeks when tested per ASTM D573
   2. Puncture Resistance: 380 minimum per FTMS 101C - Method 2065
   3. Membrane breaking strength: 335 lbf per ASTM D751

B. Seaming Materials: As recommended by membrane manufacturer.

C. Induction Welding Equipment:
   1. Minimum 5,000-watt, continuous generator per two portable bonding machines
   2. 100' (2.5 m) maximum length, #12 minimum gauge electrical cords
   3. Cooling clamps (stand-up magnets that put pressure on the newly-welded plate)

D. Membrane Fasteners: As recommended and approved by membrane manufacturer.
   1. 3 inch (76 mm) diameter Galvalume steel plate with a special thermoplastic polyolefin (TPO) coating as recommended by membrane manufacturer and per listing.
   2. Polyamide tube insert compatible with plate system.
   3. Truss head corrosion resistant screws per manufacturer's listing.

E. Flexible Flashing Material: Same material as membrane.

2.04 DECK SHEATHING

A. Deck Sheathing: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 5/8 inch, Type X, fire-resistant.
   2. Products:
      a. Georgia-Pacific; DensDeck: www.densdeck.com/#sle.
      b. USG Corporation; Securock Ultralight Glass-Mat Roof Board: www.usg.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.05 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 1/4 inch, fire-resistant.
   2. Products:
      a. Georgia-Pacific; DensDeck: www.densdeck.com/#sle.
      b. Gold Bond Building Products, LLC provided by National Gypsum Company; DEXcell Glass Mat Roof Board: www.goldbondbuilding.com/#sle.

2.06 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.

1) Class 2 - Faced with coated glass fiber mat facers on both major surfaces of the core foam.
2) Compressive Strength: Classes 1-2-3, Grade 2, 20 psi (138 kPa), minimum.
3) Thermal Resistance, R-value: At 1 1/2 inches thick; Class 2, 8.0 (1.41), minimum, at 75 degrees F.

2. Board Size: 48 by 96 inches.
3. Board Thickness: 1.5 inches.
4. Tapered Board: Slope as indicated; minimum thickness ____ inch; fabricate of fewest layers possible.
5. Board Edges: Square.
6. Products:
   a. GAF; EnergyGuard Ultra Polyiso Insulation: www.gaf.com/#sle.
   b. Mule-Hide Products Co, Inc; Poly ISO Flat: www.mulehide.com/#sle.
   c. Versico Roofing Systems; SecurShield Insulation: www.versico.com/#sle.

B. Mineral Wool Board Insulation: Rigid mineral wool fiber complying with ASTM C726; top surface coated with asphalt and Kraft paper.
1. Board Size: 48 by 48 inches.
2. Board Thickness: 1 inch.
3. Board Edges: Square.
4. Compressive Resistance (at 25 percent deformation): Per ASTM C165 .
   a. Top Layer: Minimum 37 psi
   b. Entire Board: Minimum 15 psi
5. Products:
   a. Rockwool: Multifix; rockwool.com

2.07 FLASHING MATERIAL AND ACCESSORIES

A. Flashing Material - Note: All Flashing touching thermoplastic roof system is to be provided as part of this specification by the roofing contractor.
1. Wall/Curb Flashing
   a. Membrane
      1) A reinforced membrane adhered to approved substrate using adhesive. Consult manufacturer for adhesive options and additional information.
      2) Thickness: Thickness as specified above and as required for specified warranty.
2. Perimeter Edge Flashing
   a. Coated Flashing
      1) A coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Flashing is a minimum 20-gauge, G90 galvanized metal sheet with a 25 mil (1 mm) unsupported membrane laminated on one side.
3. Miscellaneous Flashing
   a. Pipe Flashings
      1) A molded prefabricated vent pipe flashing made from 65 mil thick membrane.
      2) A molded split pipe flashing made from 45 mil thick membrane.
      3) A molded square tube wrap flashing made from 45 mil thick membrane.
   b. Corners
      1) Prefabricated outside and inside flashing corners made of 70 mil thick membrane that is heat-welded to membrane or clad base flashings.

Section 09 5100
Acoustical Ceilings

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Decorative suspended ceiling canopies, cable, and hangers.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Board and Batt Insulation: Acoustical insulation.

B. Section 28 3100 - Fire Sprinkler Monitoring and Alarm: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Indicate layout and details for decorative suspended canopies.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 12 by 12 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: 120 sq ft of each type and size.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
   2. Certainteed Architectural; ____: www.certainteed.com/ceilings-and-walls/#sle.
   3. USG Corporation; ____: www.usg.com/ceilings/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Manufacturers:

1. Armstrong World Industries, Inc: www.armstrong.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Units - General: ASTM E1264, Class A.

C. Acoustical Panels Type A: Painted mineral fiber, with the following characteristics:
1. Classification: ASTM E1264 Type III.
2. Size: 24 by 24 inches.
3. Thickness: 3/4 inch.
4. Light Reflectance: 87 percent, determined in accordance with ASTM E1264.
5. NRC Range: 0.70 to 0.80, determined in accordance with ASTM E1264.
6. Panel Edge: Square.
7. Color: White.
8. Suspension System: Exposed grid.
9. Products:
   a. Armstrong World Industries, Inc; Optima Concealed: www.armstrongceilings.com/#sle.
   b. Armstrong World Industries, Inc; Lyra Concealed: www.armstrongceilings.com/#sle.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System Type A: Hot-dipped galvanized steel grid with steel cap.
1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
2. Profile: Tee; 15/16 inch face width.
3. Color: White.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09 5100

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Section 09 5153
Direct-Applied Acoustical Panels

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Direct applied wood fiber plank panel system.

1.02 RELATED REQUIREMENTS

A. 06 1000 - Rough Carpentry: Substrate for direct applied wood fiber plank ceiling.

B. 21 1300 - Fire Sprinkler System

C. 26 5100 - Interior Lighting

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers; 1998a (Reapproved 2022).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustic panels are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustic units after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data on acoustic units.

C. Shop Drawings: Indicate tile layout and related junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system.

D. Samples: Submit two samples, 6 by 6 inch in size, illustrating material and finish of acoustic units.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.07 WARRANTY

A. Direct Applied Wood Fiber Plank System: Provide manufactuer's standard warranty agreeing to repair or replace panels that fail due to sagging or warping for a period of 30 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Direct Applied Wood Fiber Acoustical Ceilings:
1. Armstrong World Industries, Inc; Tectum: www.armstrong.com. (Basis of Design)
2. Acoustical Surfaces, Inc.; Envirocoustic Wood Wool: www.acousticalsurfaces.com
3. Or equal.

2.02 MATERIALS

A. Direct Applied Wood Fiber Acoustical Ceilings
1. Surface Texture: Coarse
2. Composition: Aspen wood fibers bonded with inorganic hydraulic cement
3. Color: As specified in the drawings
4. Size: Standard 23 ¾ x 96 inches
5. Thickness: 1 inch
6. Edge Profile: Long edge beveled, short edge square
7. Line Design: Horizontal
8. Noise Reduction Coefficient (NRC): 0.85 per ASTM C423 ; Mounting C-40
9. Flame Spread: Class A per ASTM E1264
10. Light Reflectance: 0.75 per ASTM E1477 for white panel

B. Direct Applied Wood Fiber Acoustical Wall Panel
1. Surface Texture: Coarse
2. Composition: Aspen wood fibers bonded with inorganic hydraulic cement
3. Color: As specified in the drawings.
4. Size: Standard 23 ¾ x 96 inches
5. Thickness: 1 inch
6. Edge Profile: Long edge beveled, short edge square
7. Line Design: Horizontal
8. Noise Reduction Coefficient (NRC): 0.85 per ASTM C423 ; Mounting C-40
9. Flame Spread: Class A per ASTM E1264

10. Light Reflectance: 0.75 per ASTM E1477 for white panel

C. Adhesive: Waterproof, gun grade; type recommended by tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION

A. Install system in accordance with manufacturer's instructions.

B. Kerf tile edges at intersection of ceiling and vertical surfaces.

C. Center tile on room axis leaving equal border units.

D. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

E. Install acoustic units level in uniform plane.

END OF SECTION 09 5153

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Section 09 5446
Acoustic Panel Blades

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Linear blades.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

F. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2; 2017.

1.04 DESIGN REQUIREMENTS

A. Design components to ensure light fixtures will not induce eccentric loads. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.

B. Provide seismic restraint as required by building code.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

1.06 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Furnish for materials.

C. Shop Drawings: Indicate reflected ceiling plan, location of mechanical and electrical components, details of junction with dissimilar materials, and points of suspension.

D. Samples: Submit two samples 6 by 6 inch in size illustrating color and finish of exposed to view components.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Blades: Two, of each type, color, and length in the project.

1.07 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at California.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for polyester felt components. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 Polyester Felt CEILING ASSEMBLIES

A. Ceiling Assembly Type Felt (Recycled PET):
   1. Ceiling System: Include blades; suspension members, trim, and accessories as required to provide a complete installation.
      a. Layout: As indicated on drawings.
   2. Blades:
      a. Manufacturer:
         1) CSI Creative; Acoustic Baffles; www.https://www.csicreative.com (Basis of design).
         2) Armstrong; Feltworks Blades; https://www.armstrongceilings.com
      b. Shapes: As indicated on drawings.
      c. Nominal Blade Thickness: 3/8" thick.
      d. Colors: As indicated on drawings.

2.02 CEILING Systems

A. Performance Requirements:

1. Design to support imposed loads of indicated items without eccentric loading of supports.
2. Design for maximum deflection of 1/360 of span.
3. Design to resist seismic load by using practices specified in ASTM E580.
4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.03 COMPONENTS

A. Polyester Felt Elements: Manufacturer's standard.
   1. Blades: Individual single-thickness linear elements mounted on factory-installed metal support framework modules.

B. Polyester Felt Material: Manufacturer's standard 100 percent integrally colored polyester with high recycled material content.

C. Suspension Systems:
   1. Direct Suspension Hanger Wire System: Wire hangers selected and spaced to comply with heavy-duty classification requirements of ASTM C635/C635M.

D. Moldings and Trim: Manufacturer's standard for specified assemblies.
   1. Perimeter (Wall) Moldings: Same metal and finish as grid.
      a. Size: As required for installation conditions.
      b. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

2.04 Accessories

A. Edge Molding, Expansion Joints, and Splices: Same material, thickness, and finish as linear panels.

B. End Caps: Manufacturer's standard; same color and finish as baffles.

C. Accessories: Stabilizer bars as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.

D. Suspension Wire: Size and type as required for application, seismic requirements, and ceiling system flatness requirement specified.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Verify that field measurements are as indicated on shop drawings.

D. Start of installation constitutes acceptance of project conditions.

3.02 Preparation

A. Coordinate the location of hangers with other work.

B. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

C. Install after major above-ceiling work is complete.

3.03 INSTALLATION - Suspension System

A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented by this section.

B. Install hangers and inserts coordinated with overhead work. Provide additional hangers and supports as required.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Seismic Suspension System, Seismic Design Category C: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Maintain a 3/8 inch clearance between grid ends and wall.

F. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

G. Where ducts. facility services, or equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. Edge Moldings: Install at intersection of ceiling and vertical surfaces and penetrations, using components of maximum length, set level. Provide edge moldings at junction with other ceiling finishes. Miter corners. Provide preformed edge closures to match bullnosed cornered

partitions.

1. Use longest practical lengths.

3.04 INSTALLATION - LINEAR COMPONENTS:

A. Install linear polyester felt components and system supports and accessories in accordance with manufacturer's instructions.

B. Butt interior end joints tight.

C. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.

D. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

3.05 INSTALLATION - Directly-Suspended Panels:

A. Install panels and other system supports and accessories in accordance with manufacturer's instructions.

END OF SECTION 09 5446

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Section 09 6466
Wood Athletic Flooring

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardwood sports flooring system complete including subflooring and cushion blocks

B. Vented wall base

C. Sheet vapor retarder.

D. Surface finishing and game markings.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions - Volatile Organic Compound (VOC) Content Restrictions.

B. 03 0516 - Underslab Vapor Barrier: Vapor barrier placed under concrete slab.

C. Section 03 3000 - Cast-in-Place Concrete: Concrete subfloor surface; recessed.

D. Section 03 3000 - Cast-in-Place Concrete: Formed depressions for deep floor sockets and inserts.

E. Section 06 1000 - Rough Carpentry: Wood subfloor surface at stairs.

F. Section 08 7100 - Door Hardware: Thresholds

G. Section 11 6623 - Gymnasium Equipment: Inserts for volleyball standards

H. Section 26 2726 - Wiring Devices: Electrical floor vaults or cover plates

1.03 REFERENCE STANDARDS

A. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2011.

B. ASTM F2157 - Standard Specification for Synthetic Surfaced Running Tracks; 2009.

C. ASTM F2569 - Standard Test Method for Evaluating the Force Reduction Properties of Surfaces for Athletic Use; 2011.

D. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).

E. MFMA (SPEC) - Guide Specifications for Maple Flooring Systems; current edition.

F. MFMA PUR - Maple Flooring Manufacturer's Association Performance and Uniformity Rating Sport Specific Standards; 2017.

G. NWFA (IG) - Installation Guidelines; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data for flooring.

C. Shop Drawings: Indicate floor joint pattern and termination details.
   1. Indicate provisions for expansion and contraction.
   2. Indicate location, size, design, and color of game markings.

D. Samples: Submit two samples 12 by 12 inch in size illustrating floor finish, color, and sheen.

E. Installation Instructions: Indicate standard and special installation procedures.
   1. Concrete guidelines
      a. Submit MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.
      b. Submit Technical Services “Concrete Guide Specification” for further information regarding conditions and requirements of concrete prior to installation.

F. Maintenance Data: Include maintenance procedures and recommended maintenance materials.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 10 square yards matching installed flooring.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with MFMA (SPEC).

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
   1. Manufacturer shall be ISO 9001 certified.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, marble and terrazzo work is complete, and all overhead mechanical work, lighting, backstops, scoreboards are installed. **Room temperature of 55-80 degrees Fahrenheit (13 to 27 degrees Celsius) and relative humidity of 35-50 % are to be maintained.** In- Slab Relative Humidity shall be 85% or less using ASTM F 2170 In-Slab Relative Humidity test. Ideal installation/storage conditions are the same as those that will prevail when building

is occupied.

B. Materials shall not be stored at the installation location if the In-Slab relative humidity level for the concrete slab is above 85% using ASTM F 2170 In-Slab Relative Humidity test.

1.07 FIELD CONDITIONS

A. Do not install floor system until concrete has been cured 60 days.

B. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.

C.

D. After floors are finished, area to be kept locked by general contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of gym, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner's agent) of complete gymnasium floor.

1.08 WARRANTY

A. Manufacturer shall provide a one year warranty that the flooring supplied is free from defects in materials and workmanship.

B. Installer shall provide a one year warranty for defects in installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hardwood Sport Flooring
   1. Aacer Sports Flooring: www.aacerflooring.com
   2. Action Floor Systems LLC:www.actionfloors.com (Excel NR)
   3. Connor Sports: www.connorsports.com
   4. Horner Sports Flooring: www.hornerflooring.com
   5. Robbins Sports Flooring: www.robbinsfloor.com (Eclipse Floating Floor System Basis of Design)
   6. Sports Floors Inc: www.sportsfloorsinc.com

2.02 PERFORMANCE

A. Sports flooring system shall meet the following criteria:
   1. MFMA PUR: Aerobics
      a. Shock absorbtion: 65% minimum per ASTM F2569
      b. Area of deflection: 25% maximum average per ASTM F2157
      c. Vertical deflection: 2.3 mm minimum average per ASTM F2157
      d. Surface friction 0.6 minimum per ASTM D2047

2.03 MATERIALS

A. Vapor Retarder: As specified in section 03 0516 - Underslab Vapor Barrier

B. Subfloor Construction: Manufacturer subfloor panels with factory attached resilient pads.

C. Wood Strip Sports Flooring:
1. Species: Northern hard maple. Eco-Friendly
2. Grade: Second and better.
3. Actual Thickness: 25/32 inch.
4. Actual Width: 2-1/4 inches.
5. Factory Sanded

D. Flooring Nails: Type recommended by flooring manufacturer.

E. Subfloor Fastener: Type recommended by flooring manufacturer.

F. Channel anchors: Type recommended by flooring manufacturer.

2.04 ACCESSORIES

A. Gamelines: Paint as recommended by the flooring manufacturer and must be compatible with the finish.

B. Ventilating Base: Molded rubber, 4 inch high with a 3 inch toe, ventilating type, with adhesives and accessories; black color.

C. Floor Finish: Polyurethane, to achieve high gloss surface; type recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the general contractor and architect in writing. Slab will be level to within 1/8” (3mm) in a 10’ (3m). Moisture content of the concrete slab shall not exceed 85% using ASTM F 2170 In-Slab Relative Humidity test.

B. All work required to put the concrete subfloors in acceptable condition shall be the responsibility of the general contractor.

C. Subfloor shall be broom cleaned by general contractor.Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

D. Verify existing conditions before starting this work.

E. Verify that required floor-mounted utilities are in correct location.

3.02 INSTALLATION

A. Vapor Barrier: Install vapor barrier as per manufacturer's requirements on top of concrete slab if required.
   1. Install polyethylene with joints lapped a minimum of 6” (150mm) and turned up 4” (100mm) at the walls.

B. Subfloor:
   1. Position subfloor panels per manufacturer’s instructions, integrating top layer with adjacent panels. Allow for a ¼” (6mm) gap at subfloor panel end joints. Provide 1-½” to 2" (40 to 50mm) expansion void at the perimeter and all vertical obstructions.
   2. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
   3. Install Bleacher Blocking per manufacturer’s recommendations.
   4. Properly anchor subfloor panels at each factory designated location.

C. Wood Flooring:
   1. Machine nail maple flooring along each edge of the panel’s upper layer, driving up all end joints and proper spacing provided for humidity conditions in specific regions.
   2. Provide 2” (50mm) expansion voids at the perimeter and at all vertical obstructions.
   3. Machine nail maple flooring along each edge of the Eclipse panel’s upper layer, driving up all end joints and proper spacing provided for humidity conditions in specific regions. Consult your local Robbins “Certified” contractor. Provide 2” (50mm) expansion voids at the perimeter and at all vertical obstructions.Install in accordance with manufacturer's, MFMA, and NWFA instructions; blind nail to wood sub-floor.
   4. Lay flooring parallel to length of room areas. Verify alignment as work progresses.
   5. Arrange flooring with square ends set flush and tight.
   6. Terminate flooring at door openings per manufactuter and as indicated.
   7. Provide 1 1/2 inch expansion space at fixed walls and other interruptions.
   8.

D. Install floor sockets and inserts to a depth sufficient to ensure flush top surface with floor surface.

3.03 FINISHING

A. Sanding
   1. Sand flooring to smooth even finish with no evidence of sander marks. Take precautions to contain dust. Remove dust by vacuum.
   2. After sanding, buff entire floor using 100 grit screen or equal grit sandpaper, with a heavy-duty buffing machine.
   3. Inspect entire area of floor to insure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
   4. Vacuum and/or tack floor before first coat of seal.
   5. Floor should be clean and completely free of dirt and sanding dust.
   6. Apply finish in accordance with floor finish manufacturer's and MFMA instructions.
   7. Apply first coat, allow to dry, then buff lightly with steel wool to remove irregularities. Vacuum clean and wipe with damp cloth before applying succeeding coat.

8. Lightly buff between coats with steel wool and vacuum clean before applying succeeding coat.
9. Apply colored game lines 2 inches wide to layout indicated on drawings.
10. Apply last coat of finish.

B. Floor Access Covers: Install floor access covers specified in Section 26 2726 in accordance with cover manufacturer's installation instructions.

C. Gymnasiums:
1. Apply specified combination of seal, gameline paint, and finish in accordance with manufacturer’s instructions.
2. Buff and vacuum and/or tack between each coat after it dries.Apply game lines accurately after the buffing and vacuuming the coated surfaces. Game lines shall be painted between seal coats and finish coats. Layout in accordance with drawings. For game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors selected by architect.

D. Wall Base:
1. Install vent cove base anchored to walls with base cement or screws. Use pre-molded outside corners and neatly mitered inside corner.

3.04 CLEANING

A. Clean and polish floor surfaces in accordance with floor finish manufacturer's instructions.

3.05 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Place protective coverings over finished floors; do not remove coverings until Date of Substantial Completion.

END OF SECTION 09 6466

Section 09 6500
Resilient Flooring

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine; 2022.

B. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

E. NSF 332 - Sustainability Assessment for Resilient Floor Coverings; 2022.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: Equal to 5 percent of total installed of each color and pattern installed.
   3. Extra Wall Base: 12 linear feet of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.07 WARRANTY

A. Manufacturer shall provide 15 year standard LVT Warranty.

B. Contractor to warranty installation for 3 years.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile - Type High Performance Luxury Vinyl Tile: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Manufacturers:
      a. Architessa; Luxury Vinyl Plank: www.architessa.com/#sle.
      b. Dal-Tile Corporation; Luxury Vinyl Flooring: www.daltile.com/#sle.
      c. Interface; www.interface.com (Basis of Design)
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, Class III.
   3. VOC Content Limits: As specified in Section 01 6116.
   4. Plank Tile Size: 9.845 by 39.38 inch.
   5. Wear Layer Thickness: 0.020 inch.
   6. Total Thickness: 0.18 inch.
   7. Product: Shantung
   8. Color: Black Rose.

2.02 RESILIENT BASE

A. Resilient Base - Type ____: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle, basis of design
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Height: Roppe 6″ Vinyl No Toe Base
   3. Thickness: 0.125 inch.
   4. Style: A. Straight
   5. Finish: Satin.
   6. Color: 100 black.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   1. VOC Content Limits: As specified in Section 01 6116.

C. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is fully cured.

3.03 Installation - General

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.04 Installation - Tile Flooring

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 Installation - Resilient Base

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

END OF SECTION 09 6500

Section 09 6813
Tile Carpeting

FIRE STATION SPEC

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Matching roll carpet for direct glue installation on base wainscot.

2.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 6500 - Resilient Flooring: Wall Base

2.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

B. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2021a, with Editorial Revision.

C. CAL Title 24 P2 - California Code of Regulations, Title 24, Part 2 (California Building Code); 2016.

D. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

2.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.
3. Extra Roll Carpet: 12 sq ft of each type, color, and pattern installed.

2.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

2.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

2.07 WARRANTY

A. Manufacturer shall provide 15 year standard Carpet Warranty.

B. Contractor to warranty installation for 3 years.

PART 2 PRODUCTS

3.01 MANUFACTURERS

A. Tile Carpeting:
1. Interface, Inc; ____: www.interface.com/#sle, Basis of Design
2. Mannington Commercial; _____: www.manningtoncommercial.com#sle.
3. Milliken & Company; ____: www.milliken.com/#sle.
4. Mohawk Group; ____: www.mohawkgroup.com/#sle.
5. Shaw Contract Group; www.shawcontractgroup.com.
6. Substitutions: See Section 01 6000 - Product Requirements.

3.02 MATERIALS

A. All carpet tile shall be compliant with the provisions of CAL Title 24 P2 chapter 11B-302.2 Carpet.
1. Carpet or carpet tile shall be securely attached and shall have a firm cushion, pad, or backing, or no cushion or pad.
2. Carpet or carpet tile shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture.
3. Pile height shall be 1/2 inch maximum.
4. Exposed edges of carpet shall be fastened to floor surfaces, and shall have trim on the entire length of the exposed edge.
5. Carpet trim shall comply with CBC 11B-303.

B. Tile Carpeting: Tufted, manufactured in one color dye lot.
1. Product:

a. Bitrate manufactured by Interface. Color: Dark Yellow.
b. On Line manufactured by Interface. Color: Marigold.

2. Tile Size: 9.845 by 39.38 inch, nominal.
3. Color: Dark Yellow.
4. Pattern: DK166.
5. Style: Faculty IV.
6. Flammability: Class I when tested in accordance with ASTM E648 or NFPA 253.
7. Smoke: < 450 when tested in accordance with ASTM E662 NBS smoke chamber.
8. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
9. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.
10. Recycled Content: 40% minimum. Carpet to be 100% recyclable including fiber and backing. Contact information for recycling shall be permanently affixed to tiles.
11. Gage: 1/10 inch.
12. Stitches: 8.5 per inch.
13. Construction: Pattern loop
14. Yarn: 100% Solution dyed
15. Treatment: Tiles to be treated with soil protective treatment and antimicrobal treatment.
16. Primary Backing Material: synthetic.
17. Secondary Backing Material: thermoplastic polyolefin.

C. Roll Carpet: Same manufacturer, type, color and pattern, and face fiber characteristics as carpet tile, 1.5 feet wide, manufactured in same color dye lot as tile.

3.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Rubber Base: 4" High Rubber Base by Burke Mercer or equal. Color to be selected from the manufacturer's standard line.

C. Rubber Base: Refer to Section 09 6500.

D. Edge Strips: Rubber, color as selected by Architect.

E. Stair Nosing: Rubber type, square nose, ribbed top surface, one piece per stair tread width. By Burke Mercer or equal. Color to be selected from the manufacturer's standard line.

F. Adhesives:
1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.

G. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

4.01 EXAMINATION

A. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

4.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

4.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction alternating to next unit, set parallel to building lines.

F. Installation method: Ashlar (Basis of Design: Interface)

G. Color Blend: 90% Bitrate and 10% On Line. Varied mixture per contractor.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

4.04 INSTALLATION ON STAIRS

A. Adhere carpet tight to stair treads and risers.

4.05 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION 09 6813

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Section 09 7833
Tackable Interior Wall Paneling

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tackable wall paneling.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 26 0500 - Common Work Results for Electrical: Electrical boxes set flush with finish surface of paneling

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's data on tackboard, tackboard surface covering, trim, and accessories.

C. Samples: Color charts for selection of color and texture of tackboard surface covering and trim.

D. Samples: Two, 6" by 6" in size illustrating materials and finish, color and texture of tackboard, tackboard surfacing, and trim.

E. Test Reports: Show compliance to specified surface burning characteristics requirements.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.

B. Chatfield-Clarke Co.; "Vinyl Tackboard Panels": www. chatfieldclarke.com

C. G&S Acoustics "Tackable Wall Panels TW": www.gsacoustics.com/

2.02 TACKABLE WALL PANELING

A. Fabric: Vinyl-coated fabric.

B. Color, Pattern, and Texture: As selected from manufacturer's full range.

C. Backing: Fiber board, 1/2 inch thick, laminated to tack surface.

D. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

E. Panel Width: 48 inches.

F. Edge Treatment: Square edge unless detailed otherwise.

G. Edge Molding: Provide metal "J-mold" type edge trim for exposed edges at door and window openings and similar conditions.

H. Adhesives: Provide manufacturer's recommended adhesive, primer, and sealer, produced for use on substrate shown on drawings. Provide materials which are mildew-resistant and non staining to wallcovering.

2.03 MATERIALS

A. Vinyl-Coated Fabric: Roll stock, complying with the following:
   1. Total Weight: 20.0 oz/lin yd.
   2. Roll Width: 52-54 inches.
   3. Fire Testing: Class A with flame spread 10, smoke developed 5 per ASTM E84
   4. Indoor Air Quality: Meets California emissions standards for schools and offices

B. Fiber Board: ASTM C208, cellulosic fiber board.

C. Adhesives: Type used by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify flat wall surface adhesive-applied paneling.

3.02 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Remove switchplates, wall plates, and surface-mounted fixtures where tackable wall paneling is applied. Reinstall items on completion of installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

D. Carefully cut holes in boards for thermostats, wall switches, and other device requiring penetrations through wall.

E. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.
   1. Fabricate re-wrapped edges where partial panels about each other, or adjacent surfaces or trim.
   2. Re-wrap top, bottom or side edges for cutting panels around door or window openings, abutting trim, protruding objects, and at other openings, including x-cut at receptacles, light switches, and other openings.
      a. Wrap minimum 2 inches around back of panel.
      b. Carefully cut fiber board, leaving vinyl wallcovering intact. Wrap wallcovering tightly around edge of board and adhere continuously around back of panel with manufacturer's recommended vinyl wallcovering adhesive.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION 09 7833

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Section 09 8414
Acoustic Stretched-Fabric Wall Systems

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustic stretched-fabric wall system.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 8430 - Sound-Absorbing Wall and Ceiling Units: Prefabricated, fabric-covered wall panels and ceiling baffles.

C. Section 10 1100 - Visual Display Units: Prefabricated, framed tackboards and markerboards.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM D2261-13 Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).

C. ASTM D5034-09(2013) Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

F. ASTM E2573 - Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics; 2019.

G. Commercial Standard (CS) 191-53: Flammability of Clothing Textiles

H. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Specimen warranty.

C. Verification Samples:
   1. For each fabric specified, minimum size 12 inch square, representing actual product in color, texture, and pattern.
   2. Actual samples of each frame profile to be used, including transitions between dissimilar profiles.
   3. Acoustic material, minimum size 12 inch square.

D. Warranty Documentation: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Firm specializing in acoustic stretched-fabric systems, with not less than 2 years of documented experience in installing systems of the type specified, and approved by the manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect fabric, acoustical backing, and track from excessive moisture in shipment, storage, and handling.

B. Do not deliver materials to project until wet work such as concrete and plaster has been completed.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Do not begin installation until interior conditions have reached temperature and humidity that will be maintained during occupancy.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within one year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for but not limited to, fabric sagging, distorting, or releasing from panel edge; or warping of core.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Stretched-Fabric Wall Systems:
   1. Fabricmate Systems; Basis of Design: www.fabricmate.com.
   2. FabriTRAK Systems, Inc: www.fabritrak.com.
   3. Novawall: novawall.com
   4. Whisper Walls: www.whisperwalls.com

2.02 ACOUSTIC STRETCHED-FABRIC SYSTEM

A. Acoustic Stretched-Fabric System: Field installed, fabric is stretched and set into framework and laid over acoustic material anchored to substrate. Framework consists of continuous perimeter and intermediate mounting frames anchored to substrate, and designed to permit removal and replacement of fabric within framed areas without affecting adjacent areas.
   1. Surface Burning Characteristics: Flame Spread Index of 25, maximum; Smoke Developed Index of 450, maximum; when whole system is tested in accordance with ASTM E84 using mounting specified in ASTM E2573 for stretched systems.
   2. Noise Reduction Coefficient (NRC): 0.80, minimum, when tested in accordance with ASTM C423, Type A mounting per ASTM E795.
   3. Prefabricated, fabric covered and individually framed panels are not permitted.
   4. Install fabric over acoustic material and into framework without use of adhesives, tapes, or fasteners.
   5. Seams in fabric are not permitted; base the frame layout dimensions on fabric at least 72 inch wide.

B. Verify that adhesives and sealants used in installation of acoustic stretched-fabric system have acceptable low VOC emission ratings.

2.03 MATERIALS

A. Frame: Extruded polymer framing system with serrated jaws of sufficient strength to hold fabric in place after repeated applications.
   1. Wall Frame Size: 1 inch height from wall substrate with minimum 1 inch wide base.
      a. Wall Frame Shape: Bevel at perimeter, and bevel at intermediate abutting joints.
      b. Stretched fabric panel system shall consist of continuous perimeter and intermediate mounting extrusions that are site fabricated, and applied directly to the wall surface.
      c. Fabric face shall be stretched over core materials and tucked into the track's locking jaws, leaving fabric floating above core surface. Installation of fabric facing shall not utilize any adhesives, nails, tacks, screws or tape, except at small openings such as electrical outlets.
      d. Systems shall allow for removal and replacement of fabric from individual panels.
      e. Removal of fabric shall provide access to surface behind fabric. Fabric shall be easily replaceable for future remodeling or replacement of damaged panels. Fabric shall be removable and replaceable without dismantling, removal, damaging, or replacement of the track extrusions or core material.

f. Framework: Multi-piece and 1 piece extruded polymer track system with jaws of sufficient strength to securely hold fabric in place after repeated applications. Minimum wall thickness shall be 1".
g. Stretching system components are to be engineered to match with all perimeter, midwall, outside and inside corners manufactured in single piece construction.
h. Tracks:
   1) Outside Edge Detail: Beveled, FS-260, unless noted otherwise on Drawings.
   2) Intermediate Detail: Beveled, FS-280, unless noted otherwise on Drawings.
   3) Inside Corner Detail: Square, FS-150, unless noted otherwise on Drawings.

B. Acoustic Material:
1. Ensure that thickness of acoustic material fills depth of frame as necessary for application without use of support blocking.
2. Polyester Board: Minimum of 60 percent recycled materials and 100 percent formaldehyde free, Class A fire rated in accordance with ASTM E84, with square edge.
   a. Overall Thickness: 1 inch.
   b. VOC content: 0 percent
   c. Density: 6.0 Pounds per cubic foot
   d. NRC: .070
   e. Product: Recore as Basis of Design

C. Fabric:
1. Manufacturer: Guilford of Maine.
2. Style Number: 2299 Bailey
   a. Wall Color: Belmont Silver 7010
3. Style Number: 2100 FR701
   a. Wall Color: Quartz 380
   b. Wall Color: Silver Papier 538
4. Style Number: 2966 Studio 54
   a. Wall Color: Shimmer 7041.
5. Flammability: Class I or A per ASTM E84
6. ASTM D2261, Tear Strength, 30 pounds minimum, wrap and fill.
7. ASTM D5034, Tensile Strength, 150 pounds minimum, wrap and fill.
8. ASTM E84-91a, Tunnel Test, Class 1 or A.
9. NFPA 701, large scale - 1989, passes.
10. State of California, tech bulletin 117 sec E (CS-191-53), passes.
11. AATCC 16E, Colorfastness to light, 40 hours.
12. Each color shall be from the same dye lot.
13. Fabric shall be made of recycled material.
14. Width: 66 inches usable

D. Adhesives: Low VOC or water-based, approved by acoustic stretched-fabric system manufacturer, and complying with requirements of Section 01 6116.

PART 3 EXECUTION

3.01 EXAMINATION

A. Begin installation only after substrates have been properly prepared.

B. Verify that casework, markerboards, door and window jambs, finished ceiling, and other finished items adjacent or abutting the acoustic stretched-fabric system have been properly installed.

C. When preparation of substrate is the responsibility of another installer, notify Architect of unsatisfactory preparation prior to proceeding with this work.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation of this work.

B. Prepare substrate surfaces using methods as recommended by the manufacturer for achieving acceptable result as required for this work.

C. Remove wall plates and other obstacles, and properly prepare substrates to receive frames and acoustic material in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install acoustic stretched-fabric system at locations indicated in accordance with approved shop drawings and manufacturer's instructions.

B. Frames: Install perimeter and intermediate frames using appropriate fasteners for prepared substrate, firmly secured to ensure frames do not separate from substrate.
   1. Follow contours of wall and scribe to adjoining work at borders, penetrations, and imperfections.
   2. Install framing around openings and penetrations.
   3. Allow for spacing of framework to accommodate insertion of installation tool.

C. Acoustic Material: Cut and trim acoustic material to fit snugly within perimeter and intermediate framework.
   1. Apply adhesive and press acoustic material into place, maintaining constant plane.
   2. At fixtures mounted within areas of acoustic stretched-fabric system, install rigid blocking for backing and maintain plane of fixture surface flush with face of acoustic stretched-fabric system.

D. Fabric: Stretch fabric over acoustic material, locking edges of fabric into frame's serrated jaws using manufacturer's recommended tool. Maintain fabric weave plumb, level and true, in proper relation to building lines, without ripples, waviness, hourglass, or other deleterious effects.
   1. Upon fabric installation, do not employ adhesives or mechanical fasteners of any type, and ensure fabric is free-floating and in contact with acoustic material as necessary.
   2. Stapling or gluing of fabric to cores or channel framework is not permitted.
   3. Provide tension in fabric sufficient to prevent sagging under anticipated changes in temperature and humidity.

3.04 CLEANING

A. Clean exposed surfaces of acoustic stretched-fabric system in compliance with manufacturers instructions for cleaning and repair of minor damage to exposed surfaces.

B. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage to system.

3.05 PROTECTION

A. Protect installed materials upon completion of this work, using methods that will ensure that the finished work is without damage or deterioration upon Date of Substantial Completion.

END OF SECTION 09 8414

Section 09 9113
Exterior Painting

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Exposed steel surfaces such as structural steel elements
   3. Exposed galvanized metal surfaces such as sheet metal flashing, vents, and trim.
   4. Mechanical and Electrical:
      a. On the roof and outdoors, paint exposed conduits or pipes exposed to weather or to view.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
   6. Floors, unless specifically indicated.
   7. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored acrylic plaster and stucco.
   8. Glass.
   9. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting.

B. Section 32 1723 - Pavement Markings: Painted pavement markings.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

G. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

I. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals and flooring, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished

surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 MOCK-UPS

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer.

B. Paints:
   1. Dunn Edwards Paints, www.dunnedwards.com
   2. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. SCAQMD 1113 Rule.
      c. Architectural coatings VOC limits of California.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.

2.03 PAINT SYSTEMS - EXTERIOR

A. Galvanized Metals
   1. Surface Preparation: Clean and acid etch galvanized surfaces that have not weathered at least six (6) months prior to beginning painting operations.
   2. Dunn Edwards
      a. Primer: ULTRASHIELD, Galvanized Metal Primer (ULGMOO-O-WH)
      b. Second Coat: ARISTOSHIELD, Interior/Exterior Semi-Gloss Paint (ASHL50)
      c. Third Coat: ARISTOSHIELD, Interior/Exterior Semi-Gloss Paint (ASHL50)
   3. Sherwin Williams

a. Primer: Pro-Cryl Pro Industrial Universal Primer (B66W310)
b. Second Coat: Sher-Cryl HPA High Performance Acrylic Semi-Gloss (B66W300)
c. Third Coat: Sher-Cryl HPA High Performance Acrylic Semi-Gloss (B66W300)

B. Ferrous Metals - Non Galvanized
1. Dunn Edwards
a. Primer: ENDURAPRIME, Interior/Exterior Acrylic Rust Preventative Metal Primer (ENPROO)
b. Second Coat: ARISTOSHIELD, Interior/Exterior Semi-Gloss Paint (ASHL50)
c. Third Coat: ARISTOSHIELD, Interior/Exterior Semi-Gloss Paint (ASHL50)
2. Sherwin Williams
a. Primer: Pro-Cryl Pro Industrial Universal Primer (B66W310)
b. Second Coat: Sher-CryI HPA High Performance Acrylic Semi-Gloss (B66W300)
c. Third Coat: Sher-CryI HPA High Performance Acrylic Semi-Gloss (B66W300)

C. Concrete and CMU
1. Dunn Edwards
a. Primer: Smooth BLOCFIL Premium, Interior/Exterior Concrete Block Filler (SBPROO)
b. Second Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSI-ILI 0)
c. Third Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSI-ILI 0)
2. Sherwin Williams
a. Primer: Loxon XP Exterior Waterproofing System, 6.4 — 8.3 mils dry per coat
b. Second Coat: Loxon XP Exterior Waterproofing System 14-18 mils wet

D. New Concrete & Stucco
1. Dunn Edwards
a. Primer: EFF-STOP Select Masonry Primer/Sealer (ESSLOO)
1) For pH up to 11
2) For pH up to 13: SUPER-LOCO
b. Second Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSHLI 0)
c. Third Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSHLI 0)
2. Sherwin Williams
a. Primer: Loxon XP Exterior Waterproofing System
b. Second Coat: A-IOO Acrylic Semi-Gloss (A8 ser.)
c. Third Coat: A-IOO Acrylic Semi-Gloss (A8 ser.)

E. Wood
1. Dunn Edwards
a. Primer: ULTRA-GRIP Select, Interior/Exterior Multi-surface Primer (UGSLOO)
1) For Redwood or Cedar apply two coats of EZ-PRIME
b. Second Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSHLI 0)
c. Third Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSHLI 0)
2. Sherwin Williams
a. Primer: A-IOO Latex Wood Primer (B42W41)
b. Second Coat: A-IOO Acrylic Semi-Gloss (A8 ser.)
c. Third Coat: A-IOO Acrylic Semi-Gloss (A8 ser.)

F. Fiber-Cement
1. Dunn Edwards

a. Primer: ULTRA-GRIP Premium, Acrylic Multi Purpose Primer (UGPROO Series)
b. Second Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSHLI 0)
c. Third Coat: SPARTASHIELD, Exterior 100% Acrylic Semi-Gloss (SSHLI 0)

2. Sherwin Williams
   a. Primer: Loxon Masonry Primer (A24W300)
   b. Second Coat: A-IOO Acrylic Semi-Gloss (A8 ser.)
   c. Third Coat: A-IOO Acrylic Semi-Gloss (A8 ser.)

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Exterior Plaster and Stucco: 12 percent.
   2. Fiber Cement Siding: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete:
   1. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

J. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions.

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9113

Section 09 9123
Interior Painting

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Glass.
   10. Acoustical materials, unless specifically indicated.
   11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 5000 - Metal Fabrications: Shop-primed items.

C. Section 09 9113 - Exterior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. South Coast Air Quality Management District (SCAQMD) Rule 1113.

G. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

I. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect.
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals and wood cabinets, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.07 MOCK-UP

A. Provide panel, 8 feet long by 8 feet wide, illustrating paint color, texture, and finish.

B. Provide door and frame assembly illustrating paint color, texture, and finish.

C. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer.

B. Paints:
1. Base Manufacturer: Dunn Edwards Paints. www.dunnedwards.com
2. Behr Paint Company: www.behr.com/#sle.
3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. CARB (SCM).
   c. Architectural coatings VOC limits of California.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Allow for minimum of two colors for each system, unless otherwise indicated, without additional cost to Owner.

3. Extend colors and sheens to surface edges; colors may change at any edge as directed by Architect.
4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, shop primed steel, galvanized steel, and aluminum.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
      a. Products:
         1) Dunn Edwards, SPARTAZERO, Interior Flat Paint (SZRO10)
         2) Dunn Edwards, SPARTAZERO, Interior Velvet Sheen Paint (SZRO20)
         3) Dunn Edwards, SPARTAZERO, Interior Eggshell Sheen Paint (SZRO30)
         4) Dunn Edwards, SPARTAZERO, Interior Low Sheen Paint (SZRO40)
         5) Dunn Edwards, SPARTAZERO, Interior Semi-Gloss Paint (SZRO50)
         6) Dunn Edwards, SPARTASHIELD, Interior - Exterior Gloss Paint (SSHL60)
         7) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
         8) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
         9) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss.
   3. Top Coat Sheen:
      a. Eggshell: MPI gloss level 3; use this sheen at all locations.
      b. Semi-Gloss: MPI gloss level 5; use this sheen at bath and kitchen areas walls, door trim, doors, base boards.
   4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
   1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
   2. Two top coats and one coat primer.
   3. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

J. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

K. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer if not otherwise factory sealed.

L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 Schedule - Paint Systems

A. Gypsum Board: Finish surfaces exposed to view.

B. Steel Doors and Frames: Finish surfaces exposed to view; MI-OP-3A, gloss.

C. Steel Fabrications: Finish surfaces exposed to view and to concealed surfaces where required to conform to performance requirements and resist corrosion.

D. Shop-Primed Metal Items: Finish surfaces exposed to view, except _____.

1. Interior: MI-OP-2A.

END OF SECTION 09 9123

Section 10 1100
Visual Display Units

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI A208.1 - American National Standard for Particleboard; 2022.

C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

D. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, trim, and accessories.

C. Samples: Color charts for selection of color and texture of map rail insert.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Manufacturers:
      a. AJW Architectural Products; N102-2C: www.ajw.com/#sle.
      b. ASI Visual Display Products; 9800 series: www.asi-visualdisplayproducts.com/#sle.
      c. Claridge Products and Equipment, Inc; Series 2: www.claridgeproducts.com/#sle.
      d. Nelson Adams NACO; 2000 Series: www.nelsonadamsnaco.com/#sle.
   2. Color: White.
   3. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
   4. Core: Particleboard, 1/2 inch thick, laminated to face sheet.
   5. Backing: Aluminum foil, laminated to core.
   6. Size: As indicated on drawings.
   7. Frame: Extruded aluminum , with concealed fasteners.
   8. Frame Profile: 3/4" wide, flat.
   9. Frame Finish: Anodized, natural.
   10. Accessories: Provide box style marker tray and map rail 2 inches tall
      a. Map rail insert to be colored cork, color as selected by Architect from manufacturer's full range of available colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with top of marker tray at 30 inches above finished floor.

C. Secure units level and plumb.

D. Butt Joints: Install with tight hairline joints.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

Section 10 1423
Panel Signage

PART 1 GENERAL

1.01 Section Includes

A. Panel signage.

1.02 Reference Standards

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 Submittals

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's qualification statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.04 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 Delivery, Storage, and Handling

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.06 Field Conditions

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 Manufacturers

A. Panel Signage:
1. Best Sign Systems, Inc; MP Blast: www.bestsigns.com/#sle. (Basis of Design)
2. FASTSIGNS International, Inc: www.fastsigns.com/#sle.
3. Seton Identification Products: www.seton.com/aec/#sle.

2.02 Regulatory Requirements

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 Panel Signage

A. Panel Signage Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.:
1. Application: Room and door signs.
2. Description: Flat signs with engraved panel media, tactile characters.
3. Sign Size: 4 inches by 6 inches typical, larger if required.
4. Total Thickness: 1/8 inch.
5. Sign Edges: Squared.
6. Corners: Radiused.
7. Color and Font, unless otherwise indicated:

a. Character Font: Helvetica, Arial, or other sans serif font.
b. Character Case: Upper case only.
c. Background Color: As scheduled.
d. Character Color: Contrasting color.

8. Material: Laminated colored plastic engraved through face to expose core as background color.
9. Profile: Flat panel without frame.
10. Tactile Letters: Raised 1/32 inch minimum.
11. Braille: Grade II, ADA-compliant.
12. One-Sided Wall Mounting: Tape adhesive.

2.04 SIGNAGE APPLICATIONS

A. Room and Door Signs:
1. Office Doors: Identify with room names and numbers to be determined later, not those indicated on drawings.
2. Conference and Meeting Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
3. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
4. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN" and braille.

B. ***Exterior Signs:***
1. ***Provide 5 (five) No Smoking within 20 feet of main entrances, exits and operable windows.***

PART 3 EXECUTION

3.01 Examination

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 Installation

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

End of Section 10 1423

Section 10 2113.19
Plastic Toilet Compartments

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.
   2. Hadrian: www.hadrian-inc.com/#sle.
   3. Partition Systems International of South Carolina: www.psisc.com/#sle.
   4. Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle. (Basis of Design)

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor and ceiling anchored.

B. Doors:
   1. Thickness: 1 inch.
   2. Width: 26 inch.
   3. Width for Handicapped Use: 36 inch.
   4. Height: 58 inch.

C. Panels:
   1. Thickness: 1 inch.
   2. Height: 58 inch.

D. Pilasters:
   1. Thickness: 1 inch.
   2. Width: As required to fit space; minimum 3 inch.
   3. Height: Floor to ceiling

E. Urinal Screens:
   1. Thickness: 1 inch.
   2. Height: Floor to ceiling.
   3. Depth: 18 inches unless otherwise indicated on drawings.

2.03 ACCESSORIES

A. Pilaster Shoes: Plastic, to match compartments, 3 inches high; concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

B. Wall and Pilaster Brackets: Stainless steel; continuous type.

C. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

D. Hinges: Stainless steel; satin finish.
   1. Continuous-type hinge, self closing.

E. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

F. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

B. Adjust adjacent components for consistency of line or plane.

END OF SECTION 10 2113.19

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Section 10 2600
Wall and Door Protection

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 09 6500 - Resilient Flooring: Wall base

1.03 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Indicate physical dimensions, features, and anchorage details.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
1. Inpro: www.inprocorp.com/#sle.
2. CAP Industries: www.capcornerguards.com
3. Seton Industries: www.seton.com
4. The Corner Guard Store: www.thecornerguardstore.com

2.02 PRODUCT TYPES

A. Corner Guards - Flush Mounted:
1. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, _____ inch thick.
2. Width of Wings: 2 inches.
3. Corner: Square.
4. Color: As selected from manufacturer's standard colors.
5. Length: 48 inches

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Position corner guard 4 inches above finished floor, flush with top of wall base, to 52 inches high.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

3.05 SCHEDULE

A. Provide corner guards at all outside facing corners. See plan.
   1. Lobby 100
   2. Open Office 101
   3. Teen Study Room 107
   4. Teen Game Room 108

END OF SECTION 10 2600

Section 10 2800
Toilet, Bath, and Laundry Accessories

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Electric hand/hair dryers.

D. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Supports for accessories, including in wall framing and plates.

B. Section 09 3000 - Tiling

C. Section 10 2113.19 - Plastic Toilet Compartments.

D. Section 22 0000 Plumbing: Toilet and lavatory fixtures

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Bobrick.

B. Commercial Toilet, Shower, and Bath Accessories:
1. ASI - American Specialties, Inc: www.americanspecialties.com.
2. Bradley Corporation: www.bradleycorp.com.
3. Impact Products: impact-products.com
4. San Jamar: https: www.sanjamar.com
5. Solaris Paper: SolarisPaper.com

C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

C. Plastic: Black or dark gray if black is not available

2.04 Commercial Toilet Accessories

A. Toilet Paper Dispenser: Single roll, surface mounted, for coreless type jumbo rolls.
   1. Products:
      a. San Jamar: Single 9" JBT Toilet Tissue Dispenser, Oceans, 10 x 10.5 x 5.75, Transparent Black Pearl # SJM R2090TBK

B. Paper Towel Dispenser: Manual, roll paper type.
   1. Cover: Semi-Transparent.
   2. Paper Discharge: Manual dispense by pulling towel.
   3. Capacity: 8-inch diameter roll 8 inches wide
   4. Mounting: Surface mounted.
   5. Refill Indicator: Semi-transparent cover.
   6. Products:
      a. San Jamar: Simplicity Mechanical Roll Dispenser, 12.38 x 9.5 x 14.63, Black Pear # SJM T7490TBK

C. Electric Dryers: Traditional fan-in-case type, with downward nozzle.
   1. Style: High speed, energy efficient, fixed nozzle.
   2. Cover: Stainless steel with brushed finish.
   3. Heater: Capible of rasing 70 degree ambient air to 130 degrees.
   4. Fan Control: Hi/low speed switch
   5. Total Wattage: 950, maximum.
   6. Air Filter: HEPA to remove contaminants 0.3 microns or larger
   7. Warranty: 5 years.
   8. Product: Verdedri by Workd Dryer as Basis of Design

D. Hand Sanitizer Dispenser: Liquid sanitizer dispenser, wall-mounted, surface, with plastic cover and blader tank ; push type valve, check valve, and window refill indicator.
   1. Minimum Capacity: 1250 mL.
   2. Color:
      a. Faceplate: White
      b. Lever: Black
      c. Housing: Black
   3. Product: Buckeye Symmetry Stealth A #BI-9961-0001

E. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with plastic cover and blader tank ; push type soap valve, check valve, and window refill indicator.
   1. Minimum Capacity: 1250 mL.
   2. Color:
      a. Faceplate: Black
      b. Lever: Black
      c. Housing: Black
   3. Product: Buckeye Symmetry #99600001

F. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Tempered Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: 24 inches wide by 36 inches tall.

3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
5. Product: B-2908 manufactured by Bobrick.

G. Seat Cover Dispenser: Plastic, surface-mounted, reloading by front.
1. Minimum capacity: 250 seat covers.
2. Color: Smoke
3. Products:
a. Impact Products: Rest Assured Plastic ½ Fold Seat Cover Dispenser #25131900

H. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
a. Push/Pull Point Load: 250 pound-force, minimum.
b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
c. Length and Configuration: As indicated on drawings.
d. Products: B-5806 as manufactured by Bobrick

I. Sanitary Napkin Disposal Unit: Plastic, surface-mounted, self-closing door, removable receptacle.
1. Product: 1103 black manufactured by Impact.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
a. Comply with ICC A117.1.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
6. Products:
a. Plumberex Specialty Products, Inc; Plumberex Trap Gear: www.plumberex.com/#sle.

2.06 Utility Room Accessories

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
1. Hooks: 4, 0.06 inch stainless steel rag hooks at shelf front.
2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
3. Length: 34 inches.
4. Product: B-239 manufactured by Bobrick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 2800

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Section 10 4400
Fire Protection Specialties

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
1. Ansul, a Tyco Business; Sentry: www.ansul.com/#sle.
2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
3. Nystrom, Inc: www.nystrom.com/sle
4. Amerex Copr: www.amerex-fire.com

B. Fire Extinguisher Cabinets and Accessories:
1. Ansul, a Tyco Business; Sentry: www.ansul.com/#sle.
2. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
4. Nystrom, Inc: www.nystrom.com/sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Stored Pressure Operated: Deep Drawn.
   2. Class: A:B:C type.
   3. Finish: Baked polyester powder coat red color.
   4. Model: B500/B500T as manufactured by Amerex
   5. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Trim: Flat rolled edge, with ____ inch wide face.

B. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

C. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

D. Finish of Cabinet Exterior Trim and Door: Satin .

E. Lettering: Vertical, Red

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, with midpoint of door handle at 39 inches above finished floor.

C. Place extinguishers in cabinets.

END OF SECTION 10 4400

Section 11 6623
Gymnasium Equipment

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor sleeves for net and goal posts.

C. Wall mounted protection pads.

D. Volleyball nets and posts.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.

B. Section 05 1200 - Structural Steel Framing: Structural members supporting basketball systems.

C. Section 05 5000 - Metal Fabrications: Secondary structural members supporting gymnasium equipment.

D. Section 09 6466 - Wood Athletic Flooring: Gymnasium flooring.

E. Section 26 0583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Fire rating certifications.
   3. Manufacturer's installation instructions.

C. Erection Drawings: Detailed dimensional requirements for proper location of equipment.

D. Samples: Submit samples of wall pad coverings in manufacturer's available range of colors.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. All gymnasium wall padding components and accessories shall be products of a single manufacturer.

B. Coordinate fabrication of wall padding with size and location of switches, electrical outlets, and other wall mounted items; structural framing and bracing projecting from wall surface; and door and other wall openings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. Jaypro Sports: jayprosports.com
   2. Draper, Inc; -: www.draperinc.com/sle.
   3. IPI by Bison, Inc; _____: www.ipibybison.com/#sle, basis of design.
   4. Performance Sports Systems; -: www.perfsports.com.

2.02 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

C. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

D. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

E. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL

A. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
   1. Framing: Center strut; forward folding framing.
   2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
   3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
      a. Height Control System: Manual screw
   4. Framing Color: Manufacturer's standard.
   5. Manufacturers:
      a. Draper, Inc; EZ Fold Ceiling Suspended Forward-Folding: www.draperinc.com/#sle.
      b. IPI by Bison, Inc; IP1360FF Forward Fold, Front Braced: www.ipibybison.com/#sle.
      c. Jaypro Sports; J849-FFFB; www.jaypro.com, Basis of Design.

B. Backboards: Tempered glass, rectangular shaped.
   1. Frame: Brushed aluminum edge, steel mounting.
   2. Markings: Painted.
   3. Color: Manufacturer's standard.
   4. Manufacturers:
      a. Jaypro Sports; GBRUB-42; www.jaypro.com, Basis of Design.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
   1. Net Attachment Device: Tube-tie.
   2. Finish: Powder coat orange.
   3. Manufacturers:
      a. Jaypro Sports; GBA-642; www.jaypro.com, Basis of Design.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 FLOOR-MOUNTED EQUIPMENT

A. Volley Ball Nets and Posts: One court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
   1. Posts: 3-1/2 inch O.D. schedule 80 aluminum tube with 1 inch height adjustments between 42 and 96 inches.
   2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
      a. Top Hem Reinforcing: 2000 pound minimum break strength galvanized aircraft cable in nylon coating.

b. Bottom Hem Reinforcing: 1/4 inch diameter braided nylon rope with spring loaded, pressure type rope tensioner.
c. Size: Regulation size.

3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
4. Antenna and boundary marker.
5. Protective Pads: Polyethylene foam covered with polyester reinforced vinyl fabric.
   a. Color: As selected by architect from manufacturer's full line..
6. Vertical Post Storage Bracket: Provide secure vertical storage for each pair of posts
   a. Material: Steel
   b. Finish: Powder coated
   c. Product: Draper # 501015 or equal
7. Manufacturers:
   a. Draper, Inc; Power Volleyball System (PVS): www.draperinc.com/#sle.
   b. IPI by Bison, Inc; VB1000NS Centerline Aluminum: www.ipibybison.com/#sle.
   c. Substitutions: See Section 01 6000 - Product Requirements.

B. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
   1. Latch Cover: Brass, round; tamper resistant lock with key.
   2. Sleeve: Aluminum.
   3. Depth of Sleeve: __ inches from floor surface to bottom, including latch cover.

2.05 WALL PADDING

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
   1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
   2. Flammability: Comply with NFPA 286.
   3. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
      a. Color: As selected from manufacturer's standard range.
      b. Texture: Embossed leather-look.
      c. Fabric Weight: 14 oz/sq yd, minimum.
   4. Foam, Fire-Rated: Open cell polychloroprene (Neoprene), with 5.5 pcf nominal density.
   5. Foam Thickness: 2 inches.
   6. Backing Board: Plywood.
      a. Thickness: 7/16 inch.
   7. Panel Dimensions: 24 inches wide by 96 inches long, including nailing margins.
   8. Fastening Margins: 1 inch wide, covered by fabric covering.
   9. Mounting: Removable; Z-clips fixed to wall and to padding.
   10. Manufacturers:
      a. IPI by Bison, Inc; Indoor Solid Color Vinyl Padding: www.ipibybison.com/#sle, Basis of Design
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:

1. Wall corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION 11 6623

Section 11 6643
Scoreboards

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior, electronic, multi-sport basketball scoreboard[s] including control center, and other accessories for complete functional installation.

1.02 RELATED REQUIREMENTS

A. Section 10 1400 - Signage

B. Section 11 6623 - Gymnasium Equipment

C. Section 26 0583 - Wiring Connections.

D. Section 27 4116 - Integrated Audio-Video Systems and Equipment

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

F. National Electrical Code.

G. Federal Communications Commission, Part 15 Rules & Regulations.

H. UL and C-UL Standard for Electric Signs

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Product data for scoreboards, controls, and accessories shall include descriptions of control functions etc.

C. Installation drawings, face layout, dimensions, construction, electrical wiring diagrams, and method of anchorage.

D. Manufacturer's installation instructions.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 10 years of documented experience.

B. Scoreboards and other electrical components shall be certified for use in United States and Canada by Underwriter Laboratories, (UL), Inc. and shall bear either UL or C-UL label only.

C. Scoreboards and other electrical components shall be electrically grounded in accordance with National Electrical Code (NEC), Article 600.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 5 year manufacturer warranty for defects in materials and workmanship.

C. Provide 1 year manufacturer warranty for handheld controls.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Scoreboards:
   1. All American Scoreboards; https://www.allamericanscoreboards.com/
   2. Electro-Mech Scoreboards; https://www.electro-mech.com/
   3. Nevco Scoreboard Company; https://nevco.com/, Basis of Design

4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Aluminum face and perimeter frame: Fabricated from 0.050 inch minimum thickness, ASTM B221 aluminum sheet.

B. Finish: Acrylic polyurethane paint.

C. Color as selected by Architect from manufacturer's standard range.Electronics: Low voltage, solid state, 2-wire cable, multiplex system, quartz crystal controlled.

D. Electronics: Low voltage, solid state, 2-wire cable, multiplex system, quartz crystal controlled.

E. Provide fiber optic communication interface to reduce threat of damage from electrical storms.

F. LED (light emitting diode) units: Seven-bar, segmented digits in protective aluminum cover, rated typical life 100,000 hours, and designed to provide excellent visibility from all angles and sides.

2.03 SCOREBOARDS

A. Type: Interior, electronic, basic basketball scoreboard with two integral horns, and LED displays for time, scores, period, bonus and double bonus indicators, and possession arrows
   1. Size: 12 feet long x 4 feet high x 8 inches deep.
   2. Approximate hanging weight: 150 poundsCaptions: [6 inches] [152 mm] high "Home", "Guests", and "period".
   3. Captions: 6 inches high "Home", "Guests", and "period".
   4. LED Displays
      a. Timing: Super Bright Red or White [18 inches] [457 mm] high digits with lit colon.
      b. Team scores: Super Bright Amber or White [18 inches] [457 mm] high digits.
      c. Period: Super Bright Amber or White [13 inches] [330 mm] high digits.
      d. Next possession: Super Bright Amber or White arrow for each team.
      e. Include bonus and double bonus in the form of a [4 inch] [101 mm] Super Bright Red or White LED “B”.
      f. Provide Advertising /Team logo area, 18” x 18” minimum.
      g. Suspension mounting attachments will be included.
      h. Power requirement: All options included: 168 Watts, MAX, 100-240 Volts AC w/Power Factor Correction.

2.04 ACCESSORIES/OPTIONS

A. Provide each scoreboard or accessory with control cable of length required. Electrical junction boxes, conduits, mounting hardware, and other accessories as required for installation are to be provided by others.

B. Additional accessories include but are not limited to;
   1. Two (2) Shot Clocks / End of Period (EOP) system.
   2. Additional options as provided by manufacturer and approved by owner.

2.05 CONTROL CENTER

A. Type: Wired, Wireless, or Handheld operator's control center designed to operate different models of scoreboard per manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify exact scoreboard and control center quantities and junction box locations with Architect

B. Coordinate requirements for electrical power, wall blocking, auxiliary framing and supports, suspension cables, and other components to be provided under other Specification Sections to ensure adequate provisions are made for complete, functional installation of scoreboards.

C. Coordinate scoreboard electrical requirements to ensure proper power source, conduit, wiring, and boxes are provided. Prior to installation, verify type and location of power supply.

3.02 INSTALLATION

A. Install scoreboards and accessories in accordance with manufacturer's instructions and approved installation drawings.

B. Before installation, field test scoreboards and accessories for operating functions. Ensure that scoreboards accurately perform all operations. Correct deficiencies.

C. Rigidly mount scoreboards and accessories level and plumb with brackets and fasteners.

D. Clean exposed surfaces.

E. Protect scoreboards and finishes from other construction operations.

3.03 DEMONSTRATING AND TRAINING

A. provide demonstration and training session for Owner's representative covering operation and maintenance of electronic scoreboard.

END OF SECTION 11 6643

Section 11 6813
Playground Equipment

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Playground layout (staking).

B. Concrete footings for playground equipment.

C. Playground equipment.

D. Challenge Course equipment.

E. Climbing Boulder

F. Fitness Equipment

G. Location of each item of playground equipment is indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Footings for playground equipment.

B. Section 31 2200 - Grading: Shaping subgrade to specified grade levels.

C. Section 32 1313 - Concrete Paving: Footings for playground equipment.

D. Section 32 1816.13 - Playground Protective Surfacing: Protective surfacing in playground area.

1.03 DEFINITIONS

A. Play Event: A piece of playground equipment that supports one or more play activities.

B. Use Zone: Area under and around a play event within which the ground surfacing must meet fall impact attenuation requirements of ASTM F1292 when tested at the fall height specified for the play event.

C. Fall Height: Vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it, as defined in ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing, specified in Section 32 1816.13. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related

performance.

E. Subgrade: Surface of the ground on which the protective surfacing is installed; the subbase for the protective surfacing is installed over the subgrade.

1.04 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

D. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing; 2020a.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position; 2018.

H. ASTM D6662 - Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards; 2022.

I. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment; 2022.

J. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use; 2021.

K. CPSC Pub. No. 325 - Public Playground Safety Handbook; 2015.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.
   1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
   2. Include representatives of Contractor.
   3. Notify Architect at least 2 weeks prior to meeting.

1.06 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Proposals for Substitutions: Substitutions that will increase fall height, platform height, or maximum equipment height will not be considered; submit shop drawings with proposed modifications clearly identified and sufficient information to determine compliance with specified criteria.

C. Product Data: For manufactured equipment, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, safety limitations, and the number of users permitted.

D. Shop Drawings: Detailed scale drawings showing play event layout, Use Zone perimeters, and fall height for each play event.
   1. Show locations and dimensions of footings and anchorage points.
   2. Show locations of related construction such as walkways and roadways, fences, site furnishings, and plantings.

E. Samples: For each item that a color must be selected, provide color chart showing full range of colors and finishes.

F. Maintenance Data: Provide manufacturer's recommended maintenance instructions and list of replaceable parts for each equipment item, with address and phone number of source of supply.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing materials and products specified in this section, with not less than 5 years of experience.
   1. Provide documentation showing that playground equipment similar to that specified has been installed in at least ten sites and in successful service for at least five years; provide addresses.

C. Installer Qualifications: Company certified by manufacturer for training and experience installing play events and equipment.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

PART 2 PRODUCTS

2.01 PLAYGROUND EQUIPMENT - GENERAL

A. Design Assumptions: Because the safety of the playground depends on strict compliance with design criteria, this information is provided for Contractor's information.
   1. Playground has been designed for children ages 2 through 12.
   2. If deviations from specified dimensions, especially fall heights, is required, obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

B. Mount equipment on concrete footings, unless otherwise indicated.
   1. Playground protective surfacing constitutes a resilient layer installed over a subbase (non-resilient) that is installed over subgrade; top of footings and anchorage devices is to be covered by full depth of resilient portion of protective surfacing.
   2. Protective Surfacing Depth: As indicated on drawings.
   3. Provide supports as required to mount equipment at proper height above finish and sub-grades to allow installation of sufficient depth of protective surfacing; portion of support below top of surfacing must comply with specified requirements for equipment.
   4. Paint portion of support that is intended to be installed below top surface of protective surfacing a different color, or mark in other permanent way, so that installers and maintainers of protective surfacing can easily determine whether sufficient depth has been installed.

C. Provide permanent label for each equipment item stating age group that equipment was designed for, manufacturer identification, and warning labels in accordance with ASTM F1487.

2.02 MANUFACTURED PLAYGROUND EQUIPMENT

A. Manufacturer: Gametime. - www.gametime.com
   1. Contact/Sales Representative: Jenn Peterson (800) 922-0070 x 1071, jpeterson@mrcrec.com
      a. Payground Quote Reference No. 111480-01-06
         1) Play Components (model number in parentheses where applicable); quantities per Drawings:
            (a) Gametime - PowerScape Custom Designed 2-5 Unit
            (b) Saucer Swing
      b. Challenge Course Quote Reference No. 111480-03-04
         1) Play Components
            (a) 13608 Agility Trainer (QTY: 4)
            (b) 13654 Ninja Steps Youth
            (c) 13657 Floating Boards (Youth)
            (d) 13652 U-Turn Ramp
            (e) 13617 Traverse Wall (Youth)
            (f) 13655 Vault Wall (QTY: 3)
            (g) 13659 Sway Steps (Youth)

c. Colors: TBD. Provide full range of colors in submittal.

B. Manufacturer: ID Sculpture. - www.idsulpture.com.com
1. Contact: jason@idsculpture.com
a. Pagosa Climbing Boulder
1) Components Part #PB006

C. Manufacturer: Greenfields Outdoor Fitness. - www.greenfieldsfitness.com
1. Contact: info@greenfieldsfitness.com
a. Fitness Equipment Quote Reference No. S25846
1) Components (model number in parenthesis where applicable); quantities per Drawings:
(a) Professional Series Model (UBx255) Arm Curl (Adjustable Resistance)
(b) Professional Series Model (UBx293) Bench Press (Adjustable Resistance)
(c) Professional Series Model (UBx290) Rower (Adjustable Resistance)
(d) Professional Series Model (UBx223) Sit-Up Bench (Adjustable Resistance)
(e) Professional Series Model (UBx292) Stepper (Adjustable Resistance)
2) Colors: TBD. Provide full range of colors in submittal.

D. Comply with ASTM F1487 and CPSC Pub. No. 325; provide equipment complying with specified requirements for relevant age group(s).
1. Provide components having factory-drilled holes; do not use components with extra holes that will not be filled by hardware or covered by other components.

2.03 MATERIALS

A. Steel Pipe and Tube: Comply with ASTM A135/A135M, ASTM A500/A500M, or ASTM A513/A513M; hot-dipped galvanized and free of excess weld and spatter.
1. Tensile Strength: 45,000 psi, minimum.
2. Yield Point: 33,000 psi, minimum.
3. Galvanizing: Hot-dip metal components in zinc after fabrication, in accordance with ASTM A123/A123M; remove tailings and sharp protrusions and burnish edges.

B. Extruded Aluminum: ASTM B221 or ASTM B221M, Alloy 6061, 6062, or 6063.
1. Tensile Strength: 39,000 psi, minimum.
2. Yield Point: 36,500 psi, minimum.

C. Hardware: Provide without hazardous protrusions, corners, or finishes, and that require tools for removal after installation; countersunk fasteners are preferred.
1. Use stainless steel for metal-to-metal connections; select type to minimize galvanic corrosion of materials connected by hardware.
2. Use stainless steel for wood-to-wood and wood-to-metal connections.
3. Use stainless steel with plastic components.
4. Bearings: Self lubricating.
5. Hooks, Including S-Hooks: Closed loop; maximum gap 0.04 inches, less than the thickness of a dime.
6. Rails, Loops, and Hand Bars: Same metal as item is mounted on or aluminum; with powder coating.

7. Anchors: In accordance with manufacturer's recommendations.

D. Boards and Timbers: Free of holes, cracks, and loose knots; do not use wood or wood coatings that contain pesticides; do not utilize used lumber.

E. Transparent Plastic: Clear polycarbonate plastic sheets, flat; shatterproof; resistant to crazing, cracking, and fogging.
   1. Sheet Thickness: 3/16 inch, minimum.

F. Opaque Plastic: Molded homogeneous plastic or wood-polymer composite lumber; do not use plastic as major load bearing members; use as deck boards, panels, and railings is acceptable.
   1. Homogeneous Plastic: Ultraviolet (UV) and color stabilized polyethylene without applied surface coating; color through entire thickness.
   2. Wood-Polymer Composite Lumber: Comply with ASTM D6662; factory finished.
   3. Decks and Platforms: Non-slip surface texture.
   4. Maximum Deflection: 1/360 of span, when tested in accordance with ASTM D648, with a uniform live load of 40 pounds/ft.
   5. Deck Board Span: 12 inches on center, maximum, spanning minimum of 3 joists.
   6. Panel Thickness: 3/16 inch, minimum.
   7. Panel Edges: 3/16 inch radius, minimum.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that playground area has been graded to subgrade elevations required and that excess soil, rocks, and debris have been removed.

B. Verify that playground equipment footings have been installed in proper locations and at proper elevations.

C. Verify location of underground utilities and facilities in playground area; damage to underground utilities and facilities will be repaired at Contractor's expense.

3.02 PREPARATION

A. Stake location of playground elements, including Use Zone perimeters, perimeter of protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.

B. Stake layout of entire Use Zone perimeter before starting any work and before subbase under resilient surfacing is laid.
   1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
   2. Verify that Use Zones are free of obstructions that would extend into resilient portion of protective surfacing.
   3. If conflicts or obstructions exist, notify Architect.

4. Do not proceed until revised drawings have been provided, showing corrected layout, and obstructions have been removed.

3.03 INSTALLATION

A. Coordinate work with preparation for and installation of protective surfacing specified in Section 32 1816.13; install protective surfacing after playground equipment installation.

B. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

C. Anchor equipment securely below bottom elevation of resilient surfacing layer.

D. Install without sharp points, edges or protrusions, entanglement hazards, pinch, crush, or shear points.

E. Do not modify play events on site without written approval of manufacturer.

F. Install required signage if not factory-installed.

3.04 FIELD QUALITY CONTROL

A. Owner or Owner's representative will inspect playground equipment after installation to verify that playground meets specified design safety and accessibility requirements.

B. Repair or replace rejected work until compliance is achieved.

3.05 CLEANING

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation; clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction (AHJ).

3.06 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION 11 6813

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Section 11 6833
Athletic Field Equipment

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mini Pitch Kit: including 50'x90' soccer field, goals, fence and panels, netting, corner posts, artificial turf, shock pad, and lighting.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Footings for field equipment.

B. Section 31 2200 - Grading: Shaping subgrade to specified grade levels.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Convene a meeting one week before starting this work to discuss coordination between various installers.
   1. Require attendance by personnel responsible for grading and installers of athletic field equipment, footings, and adjacent work.
   2. Include representatives of Contractor.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide athletic field equipment manufacturer's product data indicating materials of construction, compliance with specified standards, installation procedures, and necessary safety limitations.

C. Shop Drawings: Submit detailed scale drawings showing athletic field equipment and perimeter layout.
   1. Indicate locations and dimensions of footings and anchorage points.
   2. Identify mounting elevations in relation to fixed survey point on site, and subgrade elevation.
   3. Indicate location of related construction such as walkways and roadways, fences, _____, and site furnishings.

D. Samples: Submit color chart for each item that color must be selected showing full range of colors and finishes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment on project site in accordance with manufacturer's recommendations.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Athletic Field Equipment:
   1. Urban Soccer Park, www.urbansoccerpark.com.; Contact George Hunt, george@UrbanSoccerPark.com. Phone: 303-579-5601.
      a. Quote Reference: Fourth Street Mini Pitch
         1) 50'x90' Urban Soccer Field
            (a) 2: 9.5'w x 6.5'h x 18"d Five-A Side Futsal Goals
            (b) 1: Oxford-style doors
            (c) 28: Stanchions
            (d) 4: 18' Corner Posts
            (e) 25: Triple wire mesh wall panels
            (f) 12': 360 degree Nylon Containment Netting for Endline and Sideline
         2) Vandal Proof Netting - Endlines
            (a) 10' sections of Vandal Proof netting along each endline plus 10' wrap on each side.
         3) Vandal Proof Netting - Sidelines
            (a) 10' sections of sideline netting upgraded to Vandal Proof Netting
         4) Triple Wire Mesh Wall Panels
            (a) Up to 24 per field: Opt for steel triple wire mesh panels for increased strength, field visibility, and airflow.
         5) Urban Soccer Park Turf: 50'x90'
            (a) Engineered, recyclable turf certified for small-sided soccer
            (b) Silica Sand and Safeshell infill
            (c) Channeled shock pad that ensures soft landings and aids drainage
            (d) G-Max compliance in accordance with ASTM standards
         6) LED Light Package: 50'x90'
            (a) LED Flood Light System
            (b) 4 Poles with 4x480w Light Package
            (c) Dark Sky compliant

2.02 ATHLETIC FIELD EQUIPMENT - GENERAL

2.03 MATERIALS

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that athletic field equipment area has been graded to subgrade elevations required and that excess soil, rocks, and debris has been removed as necessary for installation of footings.

B. Verify that athletic field equipment footings have been installed in proper locations and at proper elevations.

C. Verify location of underground utilities and facilities in athletic field equipment area; damage to underground utilities and facilities will be repaired at Contractor's expense.

3.02 PREPARATION

A. Stake location of athletic field equipment elements, including necessary athletic field perimeters, surfacing, access and egress points, hard surfaces, walls, fences, _____, and/or structures.

B. Stake layout of athletic field equipment perimeter in accordance with approved shop drawings before starting any work.
   1. Verify that athletic field perimeters do not overlap hard surfaces, whether currently installed or not.
   2. Verify that athletic fields are free of obstructions.
   3. If conflicts or obstructions are found, notify Architect.
   4. Do not proceed with this work until revised drawings have been provided, showing corrected layout, and that any obstructions have been removed or corrections to layout have been made.

3.03 INSTALLATION

A. Install athletic field equipment in accordance with manufacturer's instructions, and rules and regulations of specified athletic association indicated for this work.

B. Install athletic field equipment without sharp points, edges, or protrusions; entanglement hazards or pinch, crush, or shear points.

3.04 CLEANING

A. Clean athletic field equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation; clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

B. Clean athletic field area of excess construction materials, debris, and waste.

C. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION 11 6833

Section 12 2400
Window Shades

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023.

C. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

D. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum 5 years of documented experience with shading systems of similar size and type.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: 10 years.
   2. Fabric: 25 years.

PART 2 PRODUCTS

2.01 Manufacturers

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
   2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle.
   3. MechoShade Systems LLC; Mecho/7 System: www.mechoshade.com/#sle. [Basis of Design]

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 Roller Shades

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades:
   1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Roll Direction: Roll down, closed position is at window sill.
      c. Fabric: As indicated under Shade Fabric article.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   3. Roller Tubes: As required for type of shade operation.
   4. Hembars: Designed to maintain bottom of shade straight and flat.
      a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
   5. Manual Operation for Interior Shades:
      a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
      b. Drive Chain: Continuous loop beaded ball chain, 95 lb minimum breaking strength. Provide upper and lower limit stops.
      c. Chain Retainer:
         1) Chain tensioning device complying with WCMA A100.1.
         2) Manufacturer's standard clip.
   6. Accessories:
      a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; Architect to select from standard range of finishes..
         1) Profile: Square.
      b. End Caps: Provide manufacturer's standard end caps to cover exposed ends of brackets.
      c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 Shade FABRIC

A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Material: Vinyl coated polyester.
   2. Material Certificates and Product Disclosures:
      a. Low-Emitting Material Certification: Greenguard Gold certified and listed in UL (GGG).
   3. Performance Requirements:
      a. Flammability: Pass NFPA 701 large and small tests.

b. Fungal Resistance: No growth when tested according to ASTM G21.
4. Openness Factor: 1% for light filtering.
5. Color: As selected by Architect from manufacturer's full range of colors.

2.04 Roller Shade FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
2. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tollerances: Maximum Offset from Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 12 2400

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Section 12 3600
Countertops

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 DESCRIPTION OF WORK

A. Replacement of existing kitchen and restroom countertops over existing or new casework including caulk where new countertops abut wall.

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.

F. California Green Building Code2013: Residential Mandatory Measures; Section 4.504 Pollution Control.

G. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

I. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

J. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168 Adhesive and Sealant Applications; current edition; www.aqmd.gov.

K. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 3 inches square, representing actual product, color, and patterns.

E. Installation Instructions: Manufacturer's installation instructions and recommendations.

F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

G. Materials must be compliant with the VOC restrictions of California Green Building Standards Code, Section 4.504
   1. Adhesive, adhesive bonding primers, adhesive primer, sealants, sealant primers, and caulks shall comply with local or regional air pollution control or air quality management district rule where applicable or SQAQMD Rule 1168 VOC limits, as shown in Table 4.504.1 or 4.504.2, as applicable. Such products also shall comply with the Rule 1168 prohibition on the use of cetain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene and trichloroethylene), except for aerosol products, as specified in subsection 2 below.
   2. Aerosol adhesives, and smaller unit sizes of adhesives, and sealant or caulking compounds (in units of product, less packaging, which do not weigh more than 1 pound and do not consist of more that 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of *California Code of Regulations*, Title 17, commencing with Section 94507.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience.

B. Fabricator Qualifications: Skilled workers who custom-fabricate specified countertops similar to the work of this project. Minimum 10 years experience in work of this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver no components to Project site until areas are ready for installation.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Handle materials to prevent damage to finished surfaces.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Formica Corporation: www.formica.com/#sle.
         2) Panolam Industries International, Inc: www.panolam.com/#sle.
         3) Wilsonart: www.wilsonart.com/#sle.
         4) Substitutions: See Section 01 6000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
      e. Finish: Matte or suede, gloss rating of 5 to 20.
      f. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.
   2. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch thick with raised radiused edge, integral coved backsplash with radiused top edge.
      a. Location: Break Room
   3. Exposed Edge Treatment: Molded PVC edge with T-spline, sized to completely cover edge of panel.
      a. Color: As selected by Architect from the manufacturer's full line.
      b. Location: Study Room

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Dupont: www.corian.com/#sle.

2) LG Hausys America, Inc; HI-MACS 12mm: www.lghausysusa.com/#sle., basis of design
3) Wilsonart: www.wilsonart.com/#sle.
4) Substitutions: See Section 01 6000 - Product Requirements.

b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
d. Color and Pattern: As selected by Architect from manufacturer's full line.

3. Other Components Thickness: 1/2 inch, minimum.
4. Counter Depth: 26 inch
5. Exposed Edge Treatment: Built up to minimum 1 inch thick net; eased edge.
6. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
7. Skirts: Locate where open below and as indicated on drawings.

C. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
1. Flat Sheet Thickness: 3/4 inch, minimum.
2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISSFA-2 and NEMA LD 3; orthopthalic polyester resin, mineral filler, and pigments; homogenous, non-porous; no surface coating; color and pattern consistent throughout thickness.
a. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
b. Surface Burning Characteristics: Class 1 rating, Flame spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E84.
c. Sinks: Separate units for undercounter mounting; minimum 3/4 inch wall thickness; comply with IAPMO Z124.
d. Finish on Exposed Surfaces: Polished.
e. Edges: Double sheet thickness with waterfall or T edge with tight radiused edges
f. Color and Pattern: As selected by Architect from manufacturer's full line.
3. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
4. Back and End Splashes: Same sheet material, eased edge top; minimum 4 inches high.
5. Skirts: As indicated on drawings.

2.02 ACCESSORY MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Cove Molding for Top of Splashes: Rubber with semi-gloss finish and T-spline to fit between splash and wall; 1/2 inch by 1/2 inch.

D. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
   1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

D. Cutouts and Holes:
   1. Under-Counter Fixtures: Make cutouts for under-counter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
   2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations.
   3. Fittings: Drill countertops in shop for plumbing fittings, such as counter-mounted soap dispensers and similar items.

E. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Plumber to provide cut out templates and countertop fabricator to prepare cut out for sink, whether rim set or bottom mounted, as well as fixtures.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 1/2 inch.

C. Attach stainless steel countertops using stainless steel fasteners and clips.

D. Seal joint between back/end splashes and vertical surfaces.
   1. Where indicated use rubber cove molding.
   2. Where applied cove molding is not indicated use specified sealant.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 3600

Section 12 6613
Telescoping Bleachers

Telescoping Bleachers

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Telescoping bleachers.
   1. **Wall-attached telescoping stands.**

B. Electric motor operators, controls, and internal wiring.

1.02 RELATED REQUIREMENTS

A. Section 26 0583 - Wiring Connections: Connection of electric motors and controls.

1.03 REFERENCE STANDARDS

A. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

C. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

D. NFPA 102 - Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures; 2021.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: : Engineer, fabricate and install telescopic gym seating systems to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connections. Apply each load to produce maximum stress in each respective component of each telescoping stand unit according to ICC 300

B. Manufacturer's System Design Criteria:
   1. Gymnasium seat assembly; Design to support and resist, in addition to its own weight, the following forces:
      a. Live load of 120 lbs. per linear foot (1.75 kN/m) on seats and decking
      b. Uniformly distributed live load of not less than 100 psf (4.79 kN/m^2) of gross horizontal projection.
      c. Parallel sway load of 24 lbs. per linear foot (0.35 kN/m) of row combined with (b.) above
      d. Perpendicular sway load of 10 lbs. per linear foot (0.15 kN/m) of row combined with uniformly distributed live load above.
      e. Parallel and Perpendicular sway loads are not applied concurrently.

2. Hand Railings, Posts and Supports: Engineered to withstand the following forces applied separately:
   a. Concentrated load of 200 lbs. (0.89 kN) applied at any point and in any direction.
   b. Uniform load of 50 lbs. per foot (0.73 kN/m) applied in any direction.
3. Guard Railings, Post and Supports: Engineered to withstand the following forces applied separately:
   a. Concentrated load of 200 lbs. (0.89 kN) applied at any point and in any direction along top rail.
   b. Uniform load of 50 lbs. per foot (0.73 kN/m) applied in any direction at top rail
   c. Uniform load of 50 lbs. (0.22 kN) applied on an area equal to 1 ft^2 (0.09 m^2) applied on all guardrail infill panels.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage handling and requirements.
   3. Installation methods.

C. Shop Drawings: Complete layout with dimensions, seat heights, row spacing and rise, aisle widths and locations, points of connection to substrate, assembly dimensions, and material types and finishes.
   1. Provide drawings customized to this project.
   2. Include Professional Engineer certification.
   3. Wiring Diagrams: Show locations of motors, electrical wiring, and rough-in connections.
   4. Graphics Layout Drawings.

D. Selection Samples: For each material for which color selection is required, submit samples, 2 by 2 inches in size, illustrating colors and finishes available.

E. Verification Samples: For each custom colored finish, submit samples of actual finish or product, for verification of color selection.

F. Operation and Maintenance Data: Manufacturer's operation and maintenance instructions, including annual inspection and maintenance and bi-annual inspection by a Professional Engineer or manufacturer factory service personnel.

G. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Manufacturer's installation crew.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M, AWS D1.3/D1.3M, and no more than 12 months before the start of scheduled welding work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store, in original packaging, under cover and elevated above grade.

B. Deliver the telescoping stands at a scheduled time for installation that will not interfere with other trades operating in the building when at all possible.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Structural components shall have a 10 year warranty.

C. Decking system, seating collections, electrical, portable and integral dolly systems, end closure curtains, surface material finishes shall ave a five year warranty.

D. Correct defective Work within a five year period after Date of Substantial Completion. Replace parts that fail under normal use at no extra charge to Owner.

PART 2 PRODUCTS

2.01 TELESCOPING BLEACHERS

A. Telescoping Bleachers: Factory assembled tiered benches that retract horizontally into depth approximately the same as a single row depth, with fixed seats mounted on leading edge of platforms.
   1. Design to comply with applicable requirements of NFPA 102 and requirements of code authorities having jurisdiction; where conflicts between requirements occur, comply with whichever is more stringent.
   2. Design with solid fascia (riser) or seat fronts that conceal interior mechanisms when fully retracted, fitting tightly enough to prevent climbing up face; at front row provide key locked, hinged fascia (skirt) to cover gap between seat riser/fascia and floor.
   3. Operation: Motor operated.

B. Design Loads: Design to withstand the following loading conditions:
   1. Live Load on Structural Supports: 100 psf, minimum, of gross horizontal projection.
   2. Live Load on Seats and Walking Surfaces: 120 pounds per linear foot.
   3. Lateral Sway Stress on Structural Supports: 24 pounds per linear foot of seat plank.
   4. Perpendicular Sway Stress on Structural Supports: 10 pounds per linear foot of seat plank.

C. Dimensions:

1. Rows: __.
2. Rise Per Row: 10 inches.
3. Row Depth: 22 inches.
4. Seat Height Above Tread: 6 inches.

D. Structural Supports: Steel or aluminum; manufacturer's standard wheeled carriages supporting each tier separately, with moving parts permanently lubricated and metal parts cushioned to prevent metal-to-metal contact during operation.
   1. Design so that each row carriage so that it will individually support the design loads and is self supporting when fully assembled without dependence on platform panels or boards, seats, or fascia.
   2. Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M.
   3. Bolting: Use lock-washers or locknuts.
   4. Wheels: Minimum 5 inch diameter by 1-1/8 inch wide, with non-marring rubber tires; ball, roller, or oil-impregnated metal bearings; minimum of 2 wheels at each floor support.
   5. Finish: Manufacturer's standard enamel or powder coating.
   6. Row Locking: Automatically mechanically lock each carriage to adjacent carriages when fully extended.
   7. Unlocking: Automatically unlock all rows before engaging retraction mechanism.

E. Motor Operation: Manufacturer's standard drive mechanism, using motor adequately sized for the purpose.
   1. Provide UL listed electrical components and wiring.
   2. Controls: Start, Stop, Forward, and Reverse in a single control unit.
   3. Control Station: Removable plug-in low-voltage pendant station, with first-row plug-in location for each motor.
   4. Limit Switches: Automatically stop operation when unit has reached fully open or fully closed position.
   5. Provide all wiring internal to bleacher units, to junction box located where indicated; ensure that wiring is not energized except during operation.
   6. Electrical Characteristics: 120V, single phase, 60 Hz.
   7. Provide access to motor from front side of bleachers; a hinged front skirt or hinged section at least 30 inches wide is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are consistent with those on the shop drawings.

B. Verify that electrical rough-ins have been installed and are accessible.

C. Do not begin installation until substrates have been properly prepared and area has been cleared of obstructions.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Do not field cut or alter seats, fascia, or structural members without approval.

C. Provide manufacturer's field representative to inspect completed installation.

3.03 ADJUSTING

A. Lubricate, test, and adjust each moving assembly to ensure proper operation in compliance with manufacturer's recommendations.

END OF SECTION 12 6613

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Section 13 1400
Aquatic Facilities

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated aquatic play products.
   1. The aquatic play products shall be suitable for installation in municipal and commercial aquatic facilities and public play areas.
   2. Products shall be specifically designed for the use by children and adults and follow the ASTM F2461-09 norm. The manufacturer should have the following standards and certifications: ISO 9001:2015, EN 1090-1, CWB / CSA W47.1, UL 508A, FCC, EN 17232, EN 1069-1, CE, CSA Z614, ASTM F2376, GB/T 18168, GB 8408 and AS 4685. In addition, products shall be manufactured by a company that has at least five (5) years of experience in the design and engineering of children's aquatic play areas.
   3. Any aquatic play product belonging to a new product line or series should demonstrate meeting the effective norm or show the conformity and resistance of the prescribed materials if it is proposed equivalency. The contractor or manufacturer must demonstrate meeting specifications by providing technical documents and drawings to be included in their bid proposal.

B. Product Construction
   1. **Play Products:** All aquatic play structural posts installed above ground shall be manufactured from 304/304L stainless steel. The anchoring system shall be manufactured from 304/304L stainless steel. Please refer to individual product specifications for play product material information.
   2. **Mounting and Assembly Hardware:** All hardware and anchoring systems shall be 304/304L or 316 stainless steel. All play products and ground spray systems shall include an integrated anchoring and leveling system facilitating installation and a flush surface finish. Exposed and accessible hardware shall be tamper resistant, requiring a special tool for removal to deter vandalism and theft.
   3. **Spray nozzles, caps and heads:** Shall be manufactured from lead free brass, UHMWPE or Polyurethane and shall use tamper resistant tools for installation and removal. PVC, Nylon, and Delrin™, shall not be utilized. All grade level play products are to be furnished with appropriate winterization caps.
   4. **Painted Finish:** Shall be a polyester smooth glossy heat-cured powder coat that is UV and chemical resistant and suitable for public spaces.
   5. **Elastomer:** The Toeguard™ and other accessories shall be made of elastomers resistant to chlorinated water and be ultraviolet stabilized to inhibit sunlight fading.
   6. **Safety & Craftsmanship:** All accessible edges shall be machined to a rounded finish. All welds shall be watertight, buffed smooth or polished to a non-visible finish and factory pressure tested. Accessible nozzles and spray heads shall be recessed to ensure a completely safe play environment with no pinch points, head entrapments or protrusion hazards. All products shall be designed in accordance with ASTM F1487, ASTM F-2461 and CSA Z614-98 regulations for public playgrounds.
   7. **Seeflow™ Polymer:** The Seeflow™ Polymer shall be specially selected for aquatic play products and shall have the following characteristics: translucent, highly resistant to shock

and impact vandalism, and non-flammable. The polymer shall present dimensional stability, high resistance towards chemical products, and ultra violets rays. All reachable Seeflow™ components (under 8 feet) are permeated with color and are manufactured with up to 40% pre-consumer recycled materials.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

1.05 SPLASHPAD® QUALITY ASSURANCE

A. Provide evidence of commitment of quality craftsmanship as demonstrated by the following:

B. Splashpad® Manufacturer Qualifications:
1. The products shall be designed and produced at a facility owned and directly supervised by the manufacturer.
2. All products shall be shipped from a single source.
3. All play product designs are verified by a licensed engineer.
4. All play product anchoring systems are designed to withstand a maximum of 125MPH (200KMH) wind load.
5. A full-time licensed engineer must be on-staff.
6. A full-time quality control manager must be on-staff.
7. All play products shall be designed, developed and water tested following a rigorous process.

1.06 EQUIVALENCIES CLAUSES

A. To enable all tenders to be judged equitably, they shall be based on the specified products in this document and shown on the drawings.
1. The proposal for any substitute products must be attached to the bid or tender separately, identifying the substitute product by its trade name along with any savings it may represent for the client.
2. Following the opening of the bid or tender, only those substitutes proposed by the lowest bidder of the specified products, will be considered.
3. All substitute approval requests shall be accompanied by manufacturing drawings, including spray zones, sequencing, plumbing and electrical schematics and complete salt spray resisting testing data produced by an independent laboratory for coatings and a written warranty from the manufacturer.
4. No substitution or equivalency submitted will be considered if the products proposed are not part of manufacturers standard existing product line. Written proof that the product has been manufactured previously by the substitute manufacturer and pictures of the

manufactured product must be provided. Please refer to General Clauses 1.1.

5. Each substitute sample must be presented to the owner/consultant within seven days following the opening of tenders. The sample must be completely operational. After this time period, the bidder will be required to supply the original specified product.
6. The owner/consultant reserves the right to grant or deny approval for proposed substitutions without prejudice to his rights and his decision shall be final. The above conditions apply to this section independently of any other clauses on the subject found in this document.

B. If applicable the products must be interchangeable and of equivalent quality to the materials already installed.

1.07 SPLASHPAD® EQUIPMENT WARRANTIES

A. **Minimum Warranty periods**
   1. **Splashpad® Play Events/Products**
      a. A 25-year warranty on stainless steel tubing.
      b. A 10-year warranty on structural stainless steel (stainless steel used for climbable structures or used to hold a minimum weight of 240 lbs.), weld workmanship, and Spraylink™ underground system.
      c. A 5-year warranty on aluminum, brass, polymer panels, and spray nozzles.
      d. A 2-year warranty on finishes, galvanized steel structures, plumbing components, mechanism and hardware, polymer, and elastomer.
      e. A 1-year warranty on concrete components, electrical components, paint graphic and decal, and fiberglass composite.
      f. All warranties are to be managed by the equipment supplier.

B. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Splashpad Equipment
   1. Vortex USA Inc.; _____: https://www.vortex-intl.com
      a. Contact: Everette Lathan, elathan@vortex-intl.com
         1) Phone: +1 514 694 3868, ext. 513
   2. Substitutions: See Section 1.06 Equivalencies Clauses.

2.02 EQUIPMENT

A. Play Product Structure: The Activator No3 VOR-611 shall be constructed of 304/304L stainless steel structural tubing with an outside diameter of 4½" (11.4cm) and a wall thickness of 0.120" (3mm). The upper part of the feature is constructed with a 45° elbow. The activator shall have no moving parts and run on a low voltage electrical supply. A capacitive sensorswitch to be used as an interface for processing user input activation. The activation cap shall consist of a high impact-resistant protective cap. The protective cap shall be constructed of 316 Stainless steel and powder coated, the s Steel Button integrated and shall be secured in place using tamper-resistant fasteners. The SAFESWAP™ anchoring and leveling system shall be used.

1. Overall play product dimensions: The Activator shall have an overall height of 36” (91cm) above the final grade.
2. Play Product Interactivity: The Activator shall be the direct interface between the users of the aquatic play area and the aquatic Play Products. The pre-programmed sequences of the aquatic Play Products shall be activated only when the touch-activated button on the Bollard Activator is touched by the user. The Activator has a led light activation signal.

B. The Playsafe™ Drain Nº4, VOR-1004.4000 consists of a basin and a removable cover. The basin shall be constructed in Polyethylene (PE) 22.5" (57 cm) outside diameter X 10" (25.4cm) height. The deck grating cover shall be stainless steel and constructed with 22" (56 cm) diameter and 1/4" (0.63cm) thickness. The gaps of the openings are 1/4 in (0.6 cm). This removable cover has an anti-kid surface. The Playsafe™ Drain Nº4 has also an optional strainer basket. A concrete levelling base (supplied by installer) with the Playsafe™ drain which has the capabilities to be levelled shall be inserted in the hole to create a concrete drain box pit. The Water line outlet connected to the drain basin shall be a maximum of 6" in diameter at a minimum slope of 1%. The drainage recommended capacity is 240 GPM, 300 GPM max (recommended 908 LPM, 1135 LPM max). 1.2. Overall play product dimensions: The overall height of the Play Product shall be 0" (0 cm) above ground. The diameter of this feature shall be not less than 22.5” (57 cm). 1.3. Play Product Interactivity : N.A. 1.4. Hydraulic Activity/Components : N.A. 1.5. Hydraulic Requirements : N.A.

END OF SECTION 13 1400

Section 13 2830
Racquetball and Squash Courts

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide all labor, materials, and equipment necessary to complete the installation of prefabricated racquetball court walls and ceilings, including but not limited to the following:
   1. Wall and ceiling panels and related steel stud framing and/or wood furring.
   2. Glass walls – Stationary.
   3. Light Fixtures.
   4. Doors and valuable storage compartments.
   5. Floor system.
   6. Floor finishing, game lines (and wall markings).
   7. Wallyball kits.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Recessed concrete slab

B. Division 26 0000 - Electrical: Power for court lighting

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one month before the start of work; require attendance by affected installers.
   1. Verify building requirements, substrate conditions, utility connections, and manufacturer's installation instructions.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Submit product data sheets, including material descriptions, dimensions and profiles of components and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Submit plans, elevations, sections, construction details, and utility connections as necessary for this work.

D. Samples: Submit two samples of specified wall and ceiling panels, indicating color and texture of finish.

E. Executed warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. No materials shall be delivered to the jobsite until building is completely enclosed and weathertight.

B. It is critical to the acclimation of the flooring and panels that proper humidity and temperature be maintained in the court area. Therefore, the permanent HVAC shall be in operation and maintaining court area temperature between 50-80 degrees and 40%-60% humidity prior to and continuously after installation.

C. Panels should never be subjected to direct sunlight, rain, or wide variations of ambient conditions.

D. Store materials properly stacked in a clean, dry, storage area.

E. Panels shall be stacked flat and delivered on skids. After delivery, panels shall have banding and wrap removed to allow panels to acclimate to room conditions.

F. Material not properly protected and stored and which is defaced or damaged shall be rejected.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty for recquetball court as listed. Complete forms in Owner's name and register with manufacturer.
   1. Panels: 10 years against defects and delamination.
   2. Glass Walls: 5 years
   3. Maple Floor: 1 year

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Racquetball and Squash Courts:
   1. Allied Products, LLC; alliedproductsllc.com (Basis of Design)
   2. Playcon; playcon.com
   3. Sports Unlimited; sucourts.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Comply with ASCE 7 for seismic design category D, E, or F in accordance with requirements of local authorities having jurisdiction (AHJ).

B. Electrical Components, Devices, and Accessories: Listed and labeled by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction and installed in compliance with NFPA 70, and marked for intended application.

C. Accessibility Requirements: Comply with applicable provisions of ADA Standards.

2.03 COMPONENTS

A. Wall Panels
   1. Racquetball Courts:
      a. Front (main hit) walls: 1-1/8″ thick.
      b. Side and rear walls: 7/8″ thick.
      c. Ceiling: 9/16″ thick
   2. Dimensions:
      a. Panels shall be 4′ x 8′ and 4′ x 4′ installed in a staggered configuration.
   3. Surface:
      a. High-pressure plastic laminate with velvet texture finish (.050) thick with an average density of 85 lbs./cf.
   4. Core:
      a. Industrial grade high-density particleboard of nominal 55 lbs./cf and 45 lbs./cf density conforming to commercial standards.
   5. Adhesive
      a. Rigid set glue conforming to Federal Specifications MMM-A-188. Attach panels to framing with screws and B.F. Goodrich P.L. 400 or W.W Henry #217 heavy bodied structural adhesive.

B. Floor Assembly:
   1. Concrete sub-floor shall be furnished to the racquetball court sub-contractor broom-clean and steel troweled smooth and level with a maximum variation of 1/8″ in any 10′ radius. Any leveling required to meet this tolerance shall be the responsibility of the general contractor or owner.
   2. Flooring shall be MFMA hard maple standard T&G strip flooring, 25/32″ x 2-1/4″.
   3. Vapor barrier shall be 6-mil polyethylene.
   4. Sleepers shall be spruce, pine or fir, nominal size 2″ x 3″ x 4′ surfaced to uniform thickness, kiln dried, and Woodlife treated, each with five 3/8″ thick rubber pads. Sleepers to be installed end to end in rows 9″ O.C. in a staggered configuration at right angles to the intended direction of the finished flooring with end joints overlapping 24″.
   5. Flooring fasteners shall be 2″ cleats or 2″ staples.
   6. Gap of ½″ between floor and sidewall panels to be left for air circulation and floor expansion.
   7. Floor to be sanded with a drum sander using coarse, medium and fine sandpaper. Vacuum or tack floor before first coat of finish.
   8. Apply urethane finish per manufacturers specifications.
   9. Paint game lines per regulations.

C. Glass Wall Systems
   1. Complete glass wall systems, court doors, view windows and moveable glass walls as supplied by Allied Products, LLC. Supported by glass fins, aluminum L angle, aluminum posts, or aluminum tube frame. Conforming to Federal Specifications: DD-G-451C, DD-G-001403, ANSI Z97.1 – 1975, CPSC 16 CFR 1201. Heat soaked glass available upon request.

D. Door
   1. Glass: Shall be ½″ thick tempered glass. BOCA and FED Spec approved, to meet or exceed all industry standards.

E. Interior Lighting Fixtures:
   1. Provide flange mount for recessed hard ceiling opening, standard light-emitting diode (LED) lighting fixture, 24 inches wide by 24 inches long, with obscured tempered glass lens.
   2. Lumen ID: 17,000
   3. Layout: Per manufacturer guidelines.
   4. Warranty: 5 year

F. Heating/Air Conditioning:
   1. Coordinate mechanical ducting and vents with ceiling and wall panels as necessary.

G. Accessories:
   1. Wallyball Kit – includes ball, net, mounting hardware and rulebook.
      a. Allied Products, LLC; alliedproductsllc.com (Basis of Design)

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect court area to ensure conditions as set forth in these specifications have been adhered to.

B. Inspect concrete sub-floors and masonry walls for proper tolerance and dryness. Discrepancies should be reported to the general contractor and architect in writing. Correction of such is the responsibility of others.

C. If preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding with work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install structure in accordance with manufacturer's written instructions.

B. Install metal studs and/or furring in width and spacing in locations as shown on plans. Studs shall be plumb with corners square. Wipe any oil/dirt off surface of steel studs or furring strips. Each stud/furring strip shall receive a ribbon of construction adhesive the full width of the panel.

3.03 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean structure in accordance with manufacturer's written instructions.

END OF SECTION 13 2830

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Section 13 3000
Pre-Fabricated Metal Structures

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated shade structures.

1.02 RELATED REQUIREMENTS

A. Section 03,3000 - Cast-in-Place Concrete.

B. Section 09 2400 - Cement Plaster System

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 2010.

B. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

1.04 DESIGN REQUIREMENTS

A. Design members to withstand 30 psf live load, and 95-100 psf positive and negative wind loads.

B. Seismic Loading: Maximum Ss = 150%, R = 1.25 unless otherwise indicated by CBC.

C. Where aluminum alloy parts are in contact with dissimilar metals (other than aluminized or galvanized steel) or absorbent building materials, likely to be continuously or intermittently wet, the facing surfaces shall be painted or otherwise separated in accordance with the aluminum design manual section M.7

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 01,3030 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; roof system dimensions, general construction details, anchorages and method of anchorage,

footing details,framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

C. Samples: Submit two samples of precoated metal panels for each color selected, 2 x 2 inch minimum in size illustrating color and texture of finish.

D. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.

E. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

F. Structural drawings stamped and signed by a California licensed structural engineer.

1.07 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
   1. Design Engineer Qualifications: Licensed in California.
   2. Conform to applicable code for submission of design calculations as required for acquiring permits.

B. Perform welding in accordance with AWS D1.1.

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than 3 years of documented experience

D. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.08 WARRANTY

A. Provide 10 year manufacturer warranty for defects in materials and workmanship.

PART 2 PRODUCTS

2.01 PRE-FABRICATED SHADE STRUCTURE

A. Manufacturers:
   1. Poligon, Porter Corporation; www.poligon.com
   2. Contractor is required to contact manufacturer prior to submitting bid. Contact Sales Representative: Kelly Spence, Miracle Playgrounds. Email: kelly.spence@miracleplayground.com, telephone: 800-264-7225 x108
   3. Estimate No. 918
      a. Shade Structure at Splash Pad and Picnic Area
         1) Building Type: Cantilevered Walkway 15'x60'
         2) Model: CWC15x60MR
         3) Roof: Multi Rib Metal Roof

(a) Color: Patrician Bronze

4) Steel Columns: Hollow structural steel tube, minium ASTM A500 Grade B with a minimum wall thickness of 3/16"
   (a) Footing per manufacturer.
   (b) Color: Custom Butterscotch (RAL 1007)

b. Shade Structure at Pump Track
   1) Building Type: Cantilevered Walkway 15'x56'
   2) Model: 15x56MR
   3) Roof: Multi Rib Metal Roof
      (a) Color: Patrician Bronze
   4) Steel Columns: Hollow structural steel tube, minium ASTM A500 Grade B with a minimum wall thickness of 3/16"
      (a) Footing per manufacturer.
      (b) Color: Custom Butterscotch (RAL 1007)

c. Shade Structure at Mini Pitch
   1) Building Type: Cantilevered Walkway 12'x20'
   2) Model: CWC12x20MR
   3) Roof: Multi Rib Metal Roof
      (a) Color: Patrician Bronze
   4) Steel Columns: Hollow structural steel tube, minium ASTM A500 Grade B with a minimum wall thickness of 3/16"
      (a) Footing per manufacturer.
      (b) Color: Custom Butterscotch (RAL 1007)

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - SHADE STRUCTURES

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

D. Use concealed fasteners.

E. Install sealant and gaskets to prevent weather penetration.

3.03 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION 13 3000

Section 13 3100
Fabric Structures

PART 1 GENERAL

1.01 Section Includes

A. Fabric shade structures.

B. Tensile membranes.

1.02 Related Requirements

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 Reference Standards

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 55 - Tensile Membrane Structures; 2016.

C. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023.

1.04 Submittals

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Shop Drawings:
   1. Signed and sealed by Engineer of Record responsible for design of fabric structures.
   2. Plans:
      a. Include column centers, elevations, and dimensions.
      b. Indicate membrane layouts, membrane seams, flexible structural elements, anchorages, and interfaces with nonflexible structural elements.
   3. Details: Include connections, anchorages, and bearing supports.

C. Erection Drawings:
   1. Include column centers, elevations, load capacities, and dimensions.
   2. Indicate erection plan for tensile membrane structure installation activity; include detailed sequence or work and procedures that ensure structural integrity of tensile membrane

structure during erection.

D. Samples: For each membrane type, two samples, 12 inches by 12 inches in size, indicating specified color.

1.05 Quality Assurance

A. Designer Qualifications: Perform design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in California; with at least three years of documented experience.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

C. Fabricator Qualifications: Company specializing in fabricating products specified in this section, with at least three years of documented experience.

D. Erector Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.06 Delivery, Storage, and Handling

A. Deliver materials to project site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store products under cover, elevated above grade, and in dry, well-ventilated areas not exposed to heat or sunlight.

C. Handle fabric in accordance with manufacturer's instructions.

1.07 Warranty

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 15-year manufacturer warranty for tensile membranes and perimeter attachment system elements. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 Manufacturers

A. Fabric Shade Structures:
   1. Superior Recreational Products; superiorrecreation.com or approved equal.

a. Contact/Sales Representative Jenn Peterson (800) 922-0070 x 1071, email: jpeterson@mrcrec.com
b. Quote No. QUO0283892

2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TENSILE MEMBRANE STRUCTURES

A. Tensile membrane structures consisting of tensioned membranes stretched over flexible and nonflexible structural support elements.
   1. Provide smooth uniform membrane surface with even-curved edges and interfaces; without wrinkles, cuts, abrasions, stains, marks, surface defects, or seaming aberrations.
   2. Configuration as indicated on drawings.

2.03 Tensile Membranes

A. Custom Shade Design 140'x22'x18' (bottom of beam)
   1. High-Density Polyethylene (HDPE) Membranes.
      a. 5x fabrics 28'x22' Alnet HDPE
      b. Color: TBD
   2. Steel Columns and Beams
      a. 6x Columns 12"x12"x.5" on base plates + 6" surface
      b. 6x beams 6"x6"x1/4" at 22' long
      c. Rafters 3.5"11ga with glide elbows
      d. Color: TBD

PART 3 EXECUTION

3.01 Examination

A. Examine area to receive flexible structural elements and tensile membrane; notify Architect if area is not acceptable and do not begin installation until unacceptable conditions have been corrected.

B. Examine foundations and anchor bolts for location and elevation; notify Architect of inaccuracies, and do not begin installation until unacceptable conditions have been corrected.

3.02 Preparation

A. Prepare a clear, flat, smooth, and clean layout area on ground of sufficient size for assembly of tensile membrane panels; prepare area adjacent to location of structure installation.

B. Check contact surfaces to remove sharp objects, dirt, grease, oil, and other causes for rips, scratching, or other damage to tensile membrane panels during installation.

3.03 Erection

A. Erect tensile membrane structures and flexible structural elements in accordance with erection requirements of ASCE 55.

B. Comply with approved erection plan.

C. Do not undertake erection of tensile membranes during inclement weather conditions; installer has sole responsibility to determine when conditions are safe for erection.

D. Concrete Foundations:
   1. See Section 03 3000.

E. Install tensile membranes and flexible structural elements in accordance with manufacturer's instructions.
   1. Install to avoid damage to tensile membranes.
   2. Ensure tensile membranes surfaces are smooth, uniform, and clean, with even-curved edges and interfaces, and with no cuts, scratches, abrasions, stains, marks, blemishes, or welding irregularities.

3.04 Repair

A. Inspect tensile membranes and flexible structural elements.

B. Repair or replace defective or damaged materials as directed by Architect.

3.05 Adjusting

A. Make final adjustments to tensile membranes and flexible structural elements as required for structural integrity, and in accordance with shapes and configuration indicated on drawings.

3.06 Cleaning

A. Clean and touchup flexible structural elements in accordance with manufacturer's field repair recommendations.

END OF SECTION 13 3100

Section 21 1313
Wet-Pipe Fire Sprinkler System

PART 1 GENERAL

1.01 Work Included – Work includes, but is not necessarily limited to:

1. Fabricate, install, and secure necessary approvals for the Automatic Fire Sprinkler System for the Porterville Community Center in Porterville, California. The fire sprinkler system is to include fire sprinkler coverage throughout the new Building as shown on the Construction Documents. Install a complete fire protection system acceptable to the authorities having jurisdiction for the proposed system.

2. Provide all materials and equipment, and perform all labor required to provide shop drawings and install complete fire protection system from the fire sprinkler riser locations indicated on the fire sprinkler system construction document sheets continuing throughout the buildings per the construction documents in accordance with this specification, the current adopted edition of the CBC, CFC, NFPA 24, NFPA 13, and Porterville Fire Department requirements.

3. Provide personnel and materials to perform all acceptance tests, and to assist in inspections. Tests to be witnessed by the Authority Having Jurisdiction.

4. Provide all fire stopping material and installation labor, using UL Listed fire blocking systems, at all fire sprinkler system penetrations of fire rated assemblies.

5. The fire sprinkler system installation is to comply with the basis of design summary for the noted fire areas as indicated on Sheet FS-0.0 of the construction documents, listed under the “DESIGN CRITERIA” heading.

1.2 QUALITY ASSURANCE

A. Contractors and Manufacturers:

1. The performance of the work described in this Section is restricted to established Contractors and Manufacturers specializing in automatic fire sprinkler systems that have satisfactorily completed jobs of this size and type, who are acceptable to the Authority Having Jurisdiction. The Contractor shall hold a valid California C-16 contractor’s license. The Contractor shall demonstrate satisfactory installations of comparable systems within the proceeding five years, and shall supply references.

B. Installation Responsibility:

1. The Contractor is hereby advised that the responsibility for the installation of the fire protection system is totally that of the Contractor, and that all designs and resolutions proposed in their Shop Drawings, calculations and related documentation must be demonstrated not only in the test procedure but also throughout the guarantee period.

2. The System specified herein is for defining design intent, installation intent and minimum performance requirements and may not be downgraded without written consent of the Architect, Owner, and AHJ.

3. See Architect's Construction Documents for location requirements of fire sprinkler system.

4. No changes to AHJ approved drawings are permitted without approval by the architect, engineer, and the AHJ inspection staff.

C. Testing Laboratories: All material and equipment used in the installation of the fire protection systems shall be listed as approved by the Underwriters Laboratories, Inc., List of Fire Protection Equipment and Materials, or approved by other appropriate, nationally recognized testing laboratories for use in sprinkler systems, and shall be the latest design of the manufacturer.

D. Requirements of Regulatory Agencies: Obtain necessary approvals from, have all materials approved by, and comply with requirements of all Authorities Having Jurisdiction.

E. Coordinate and secure installation of fire service line and connect to fire service lateral as required.

F. Comply with the requirements of the 2022 adopted editions of the CBC/CFC, NFPA pamphlets 13 and 24.

1.3 PRODUCTS AND SUBMITTALS

A. Product Data: Complete materials list of items with available finishes proposed to be provided under this Section. The quality of materials required for this installation shall be that which comply with the requirements of the Authority Having Jurisdiction and the 2022 edition of NFPA 13. All materials must be UL Listed for fire protection. All piping shall be free from rust.

B. Shop Drawings:

1. Prior to submitting shop drawings and product submittals to the Architect, indicate any proposed re-locations of the following items on plans and submit to the Architect and Owner for review:

   a. Sprinklers in finished rooms:

   b. Grills and registers:

   c. Light fixtures, speakers, and smoke detectors:

   d. All underground fire service piping, backflow assemblies, thrust blocks and related appurtenances.

2. Required fire sprinkler locations: Per Construction documents, any proposed revisions are to comply with the following:

    a. Corridors and halls: Align sprinklers symmetrically so as not to conflict with other ceiling items.

    b. Rooms: Center sprinklers in-line with other ceiling devices.

    c. Acoustical tile or panel ceilings: Locate sprinklers in center of tile or panel.

3. Architect will review layout and may relocate or add sprinklers to achieve an orderly pattern of ceiling elements, at the Contractors sole expense.

4. If required by Architect, meetings will be held at their office to coordinate locations of sprinklers with other ceiling elements.

5. After obtaining Architect approval of sprinkler locations, prepare final shop drawings and product submittals for review by the Architect. Indicate all elements indicated in paragraph 1.3, B, 1 above, and any other required information.

C. Project Record Documents:

1. Submit three (3) copies of Project Record Documents

2. Contractor to provide a completed and signed NFPA 13 Contractors Material and Test Certificate upon acceptance of the system by the Authority Having Jurisdiction.

D. Operation/Maintenance Data And Warranty:

1. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Owner and the Architect (3) copies of an Operation and Maintenance Manual. Include in each copy of the Manual of a copy of the Project Record Documents

2. The Contractor shall provide a minimum warranty of one year after final inspection and sign-off of the fire sprinkler system, including all parts, materials of construction and labor for the installation.

E. General Piping Requirements

1. Underground Piping: Provide an installation which is complete in all regards including, but not necessarily limited to:

    a. Provide fire service supply piping per Civil Engineers' water utility plans, Sheet and FS-1.0, and site water line specification.

    b. Connections from main to base of riser shall be as shown on project drawings.

c. When using approved PVC piping for underground supply piping, a transition shall be made to ferrous pipe shall be accomplished at the following locations:

1) A minimum distance of five feet from a 90-degree elbow designed to supply a sprinkler riser.

2) A minimum distance of five feet from the underground elbows on the supply and service side of an above ground exterior check valve and other above grade exposed piping, fittings, connections, or valves.

3) A minimum distance of five feet prior to entering a building.

4) A minimum distance of five feet prior to passing under or through a footing or retaining wall.

2. Above Grade Piping – All pipe shall be made in the USA domestically manufactured, and shall be UL Listed for Fire Protection System installation.

a. Flanged fittings shall be used at above grade exterior locations.

b. Connections and fittings shall be threaded, flanged, grooved, or welded. Grooveless clamp or saddle fittings are not acceptable. Fittings and couplings shall be Class 125 (standard) weight minimum.

F. Fire Sprinklers:

1. In soffits and interior ceilings: Victaulic Semi-Recessed or Concealed Quick Response Pendents (finish selected by architect) or approved equal, per fire sprinkler system construction document plans.

2. In hard ceilings: Victaulic Semi-Recessed or Concealed Quick Response Pendents (finish selected by architect) or approved equal, per fire sprinkler system construction document plans.

3. Sidewall interior sprinkler to be Victaulic Quick Response (finish to be selected by Architect) or approved equal.

4. Concealed and open roof spaces: Victaulic Quick Response upright or pendents, brass finish, as approved for use.

G. Fire Sprinkler System Piping:

1. Pipe sized 1” thru 2”: Use domestically manufactured Schedule 40 black steel pipe with threaded, banded cast or malleable iron fittings, or equivalent, UL Listed for fire protection.

2. Pipe sized 2 ½” thru 8”: Use domestically manufactured Schedule 10 black steel pipe with welded and/or grooved cast iron fittings of required pressure rating, UL Listed for fire protection.

3. Piping sized 8" and larger to be Schedule 10, UL Listed steel piping.

H. Fire Department Connection (FDC)

1. Provide appropriate sized (four inch or larger, depending on system design) freestanding pipe mount, cast brass FDC with 2-1/2-inch individually clappered fire department inlet connections with breakable cast iron domed caps, one-inch cast lettering. The Fire Department Connection shall be Potter Roemer Standard No. 5500 series, UL listed with a finish as selected by the Architect.

2. Fire department connection shall be located where indicated on Sheet C-1.0 Note: Where conditions do not permit, the fire department connections shall be placed where readily accessible in case of fire and not liable to injury or fire exposure. All fire department connection locations shall be approved by the Authority Having Jurisdiction.

3. Where subject to mechanical injury, protection shall be provided. The means of protection shall be approved and shall be arranged in a manner, which will not interfere with the connection to inlets.

4. Maintain a 36-inch clear radius around the fire department connection. Grade variation within this radius shall not exceed 1:12. The fire department connection shall be arranged so that hose lines can be readily and conveniently attached to inlets without interference from any nearby objects including buildings, fences, posts, or other fire department connections.

5. The fire department connection shall be clearly visible from the street and provided with identification sign as approved by the School District Representative.

I. Supervisory switch: Designed so that it will operate between the first and second revolution of the valve control wheel or when the stem moves no more than one fifth of the distance from its normal position or if the unit is removed from its mounting.

J. Flow switch: All wetted parts of brass or stainless steel. Flow switch to be complete with retard setting providing 30 second delay before actuating.

K. Valves: U.L. listed Kennedy, Nibco or Stockham or approved alternate. Valves shall be rated for minimum 175 psi working pressure zones.

L. Pressure gauge: Bourdon spring pressure type with non-corrodible movements, set in cast iron case with black flange and with rings of pressed brass, flared type construction. Cases and rings black enamel finish. Gauges shall have 4-1/2" dials with white background, black lines, and figures, calibrated for 2 times working pressure. Installation: Each gauge connected to its respective pipe line located where shown and at inlet and outlet of each pump, by means of suitable brass pipe, pigtails and fittings containing a brass cock, Ashcroft, U.S. Gauge Company or Crosby.

M. Piping Seismic Separation Joints, where required, shall be Metraloop-Fireloop UL Listed Flexible Expansion Loops, as manufactured by the Metraflex Company Chicago, Illinois.

N. Sprinkler Cabinet

1. Provide cabinet containing spare sprinklers and equipment of the following type and number installed at an interior location nearest the wall at the system riser, in an accessible location as directed by Architect, and as approved by AHJ. Provide 6 sprinklers of each type used in the installation, with sprinkler wrenches.

2. The cabinet shall be distinctly labeled, designating the type and quantity of equipment it contains.

1.4 INSTALLATION AND EXECUTION

A. Install the work of this Section in strict accordance with the reviewed Shop Drawings and the requirements of the Division of State Architect and other Authorities Having Jurisdiction. Relocate any sprinklers not aligned with other ceiling fixtures or outlets at Contractors sole expense.

B. Coordinate routing of sprinkler piping with all other trades that will be affected by the installation of the fire sprinkler system so as to avoid interferences. The cost of any field to work in place due to incomplete or inaccurate coordination revisions with other trades will be the responsibility of the Contractor

C. Maintain maximum clearances above ceilings. All piping to be concealed unless specifically noted otherwise on the plans.

D. Install drains on main risers and auxiliary drains in accordance with standard practices and local ordinances. Install one Inspector's Test drain on each system and discharge to an approved exterior location where indicated on the project drawings and approved by the Architect.

E. Access: Do not locate any device requiring access in walls or above ceilings of public areas without Architect's prior approval. Provide access doors complying with specifications and signs for all concealed devices.

F. Piping, Hangers, Supports, Anchors and Sleeves: Install in complete accordance with NFPA 13 requirements, using UL Listed components by Cooper B-Line.

G. Install all horizontal piping so as to run parallel to or perpendicular to the building walls, unless otherwise shown on the Drawings or approved by the Architect. Do not install sprinkler piping that obstructs any door openings.

H. Guide and support all vertical risers or piping in accordance with standard practice. Fabricate and construct pipe joints so that they produce a true alignment of the pipe. Ream all pipe ends. Construct welded pipe joints in accordance with applicable codes.

I. Run all piping in such a manner as to provide appropriate flexibility with respect to expansion and contraction. In general, accomplish this with flexible couplings, expansion loops and/or leads from mains with proper lengths and appropriate fittings. Anchor piping is required.

J. Where exposed piping penetrates the floors, walls, or ceiling of finished areas, provide chromium plated pipe escutcheons at the penetrations.

K. Provide pipe sleeves through partitions, walls, and slabs and outside walls for piping furnished and installed under this Section. Extend all vertical pipe sleeves in floor 6" above the finish. Provide Drawings showing openings for proper installation of the work specified.

L. Provide all UL Listed hangers and supports required for the installation. Bracing the pipes to bottom flanges of steel beams is not permitted.

M. Use hot dipped galvanized materials in any exterior or open spaces such as canopies or covered walkways.

N. Clean pipe and fittings and keep interiors clean throughout installation. Provide caps on ends of cleaned piping.

O. Use full pipe lengths; random lengths joined by couplings will not be accepted.

P. Provide for expansion and contraction of all pipes and for seismic movement. Provide reducing fittings for all changes in pipe size; provide fittings for all changes in pipe direction. Riser piping shall be installed plumb with offset fittings used where alignment adjustment is necessary.

Q. Provide unions for pipe sizes below two-inch and flanged or grooved fittings for sizes two-inch and above to permit disconnection of equipment and fixtures.

R. Prepare all piping having welds for Authority Having Jurisdiction inspection prior to installation.

S. On-site fire code welding permits shall be obtained from the Authority Having Jurisdiction.

T. Piping arrangement shall avoid beams, columns, ducts, lighting fixtures, doors, windows, and similar obstructions for openings.

U. All piping that penetrates fire rated construction shall be fire stopped in accordance with these specifications and project drawings.

V. Underground Piping Installation

1. All bolts, nuts, washers, and rodding used for the installation of underground piping, valves, and fittings from the riser flange back to, and including all parts of the water main tap shall be stainless steel conforming ASTM A194 Grade 8M or ASTM A320 Grade B8M. All of the above materials shall be thoroughly coated with bituminous mastic. After coating, all valves and ferrous fittings shall be wrapped in 8-mil polyethylene film and securely taped in place with underground tape. The above materials shall be left visible for inspection by the Authority Having Jurisdiction prior to backfilling.

2. Install in accordance with referenced standards, codes, and manufacturer's instructions, and this specification.

3. Piping shall have a minimum cover of three feet under driveways, fire lanes, roads, streets, and two and one half feet of cover in open areas. Cover shall be measured from finished grade to top of pipe. Provide a six-inch bed of sand below pipe and twelve-inch cover of sand above piping with locator tape on top of the sand.

4. The depth of the bottom of all horizontal piping below grade shall not exceed the level distance measured from the pipe centerline to the nearest top edge of any adjacent building footing, unless approved by the Architect, shall have not less than 3-foot earth coverage.

5. Clearance shall be provided around all piping extending through floors, walls, platforms, and foundations, including drains, fire department connections, and other auxiliary piping, in accordance with the provisions of NFPA 13.

6. After underground work is complete and has been tested in accordance with referenced standards, the contractor shall complete a NFPA 24 Contractor's Material and Test Certificate for Private Fire Service Mains and provide it to the School District Representative.

7. Installation of underground water piping shall include concrete thrust blocks and anchors where vertical or horizontal deflection is 45 degrees or more, or at the intersection lines. Thrust block locations, design, and installation shall be in accordance with NFPA 24.

W. Fire-Stopping: Fire stop all holes or voids created by penetrations of the Fire Sprinkler System piping through fire rated construction, with UL Listed Fire Stop / Block Systems appropriate for the rated construction penetration.

1.5 TESTING

A. All tests described and referenced in these specifications shall be performed by the Contractor in the presence of the Authority Having Jurisdiction and the School District Representative. Tests and inspections shall apply to all water-sourced fire protection systems, including fire hydrants, sprinklers, standpipes, and all underground piping that is installed to supply these systems and devices.

B. Hydrostatic Test Preparation

1. Interior piping shall be filled with water for two (2) hours preceding hydrostatic testing.

2. Piping shall be purged of all air and other gasses prior to hydrostatic testing.

3. Underground piping shall be center loaded and all fittings, joints, strapping, and thrust blocking shall be exposed for hydrostatic pressure testing and inspection.

4. All above grade and interior piping, fittings, sprinklers and supports shall be exposed for inspections and hydrostatic testing.

5. A hydrostatic pre-test shall be conducted for both aboveground and underground piping prior to calling for Authority Having Jurisdiction final acceptance test. Written confirmation of passed 100% pre-test shall be given to the inspector of record prior to calling for final. All cost associated with delays caused by failure to complete 100% operational pre-test shall be borne by the contractor. A Contractors Material and Test Certificate shall be filled out upon completion of testing.

C. Fire department connections and piping shall be included in hydrostatic testing and shall be back flushed until clear water is observed.

D. Underground mains and supply connections to sprinkler risers shall be flushed thoroughly before connections to sprinkler systems.

E. Tests of drainage facilities shall be conducted by opening each drain valve while the system control valves are open to the supply.

F. All water level sensors, alarm and supervisory signals, tanks and automatic valves shall be performance tested.

G. Water remaining in normally dry piping shall be evacuated at completion of testing.

H. Contractor to provide to the Owner completed copies of the forms depicted in Figure 25.1 "Contractor's Material and Test Certificate for Above Ground Piping" of the 2022 Edition of NFPA 13, upon completion of the system installation and approval by the AHJ.

END OF SECTION 211313

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Section 22 0000
Plumbing

PART 1 GENERAL

1.01 Description

A. Related Documents:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
2. Section 23 00 13 General Commissioning Requirements.
3. Where the requirements of the Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.

B. Codes and Regulations:
1. In addition to complying with the specified requirements, comply with pertinent regulations of the Authority Having Jurisdiction. All work must comply with the version of the code that was in effect at the time of the initial permit application date.
a. CALGreen – California Green Building Standards Code
b. CBC – California Building Code
c. CEBC – California Existing Building Code
d. CEC – California Electrical Code
e. CEnC – California Energy Code
f. CFC – California Fire Code
g. CMC – California Mechanical Code
h. CPC – California Plumbing Code
i. CRC – California Residential Code
j. DPH – Department of Public Health
k. DWR – Department of Water Resources
l. DSA – Division of the State Architect
m. HCD – Housing and Community Development
n. NFPA – National Fire Protection Association
o. OSHPD – Office of Statewide Health Planning and Development
p. SFM – Office of the State Fire Marshal
q. Reach Codes that have been adopted by the Authority Having Jurisdiction
r. Local Building Department
s. Local Fire Marshall

C. Included: Work includes, but is not limited to, the following.
1. The Work covered by this Specification shall include furnishing labor, material, equipment, and services to construct, install and place in operation, the complete Plumbing Systems to the extent as indicated, and as shown on the Drawings and specified herein. The Work covered under this Section shall hereinafter be referred to as the Plumbing System.
i. Waste and Vent
1. Soil piping
2. DWV - Drain Waste and Vent Piping
3. Indirect waste piping

4. Area drains.
5. Floor drains.
6. Traps.
7. Vent flashings.

i. Sewers (To five feet beyond building)

1. Including metallic or non-metallic piping used to convey sewage and other waste to, and including, connection with offsite utility or onsite treatment and disposal system.
2. Manholes (pre-cast or pre-formed), cesspools, septic tank systems, and leaching lines, backwater valves and lift stations.

i. Storm and Sub-Soil Drainage

1. Roof and overflow drains, including flashing, rain water drainage piping. Exterior rainwater leader downspouts (10 gauge and heavier).

i. Water

1. Potable water piping systems including above and below grade tanks, pressure reducing valves, relief valves, balancing valves, water hammer shock absorbers, air chambers.
2. Isolation, Zone and Control Valves.
3. Hot water systems including heaters and storage tanks.
4. Disinfecting of water systems.
5. Insulation of piping and equipment for heat, sound, and vibration.
6. Backflow preventers.

i. Kitchen and Laundry

1. Sinks and dishwashers.
2. Ice makers
3. Coffee makers
4. Garbage disposers.
5. All other equipment with piping connections including kitchen unit combinations.

i. All Plumbing Fixtures and Supports

1. Including, but not limited to:
    a. Sinks, lavatories, water closets, urinals, tubs, service sinks, etc., - all materials
    b. Shower pans, shower receptors, and shower stalls
    c. Supports (backing) for all plumbing fixtures and accessories
    d. Installation of sinks in or part of drainboards - all materials

i. Fuel Gas Piping

1. Natural and manufactured gas distribution, liquefied petroleum distribution, meters, regulators and connections to all gas fired equipment.

i. Pipe Identification

i. Refer to section 23 00 13

i. Connections

1. Utilities-Sanitary sewer, storm drain, water, gas
2. Make-up water for heating and cooling systems
3. Hot water tanks
4. Temporary water, waste lines

5. The joining of pipe by any mode or method including, but not limited to, acetylene and arc welding, brazing, lead burning, plastics welding, soldering, wiped joints, caulked joints expanded or rolled joints, etc., used in connection with any of the work listed herein.

i. Layout and Cutting
1. Holes, chases, channels, the setting and erection of bolts, inserts, stands, brackets, stanchions, supports, sleeves, escutcheon plates, thimbles, hangers, conduits, and boxes.

i. Laundry, Dry Cleaning Systems
1. Water, drain and vapor vent piping
2. Other drain and vent piping and connections thereto

i. Excavation, Trenching And Backfill
1. In connection with plumbing and piping work shown herein

i. Temporary Piping In Connection With:
1. Building and construction work
2. Excavating and underground construction
3. Demolition work

i. Pipe Hangers, Supports, Anchors, Guides, Expansion Joints
1. Including:
a. Supports for equipment to which pipe is connected, such as tank supports
b. Isolators-dielectric and vibration
c. Anchors and thrust blocks of concrete, metal, etc.
d. Seismic bracing
i. Anvil/Badger, Mason Industries, B-Line/TOLCO or approved equal.
i. Seismic hanger system design shall comply with the 2022 CBC requirements and ASCE 7-16.

i. Signs And Notices

i. Roof Flashings for Piping Penetrations

i. Tests
1. Piping, for tightness
2. Equipment for performance
3. Operating instructions
4. Final operation

1.02 Accessible Plumbing Fixtures

A. Accessible plumbing fixtures shall comply with all of the requirements of the 2022 CBC 11B-213, 11B-305, &11B-308.

1.03 Quality Assurance

A. 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.
B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the Work of this Section in accordance with the requirements of governmental

agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

C. Welder's Qualifications: Comply with ASME B31.8. The pipe welder shall have a copy of a certified ASME B31.8 qualification test report. Contractor shall also conduct a qualification test. Submit each welder's identification symbols, assigned number, or letter, used to identify work of the welder. Affix symbols immediately upon completion of welds. Welders making defective welds after passing a qualification test shall be given a requalification test and, upon failing to pass this test, shall not be permitted to work this contract.

1.04 Submittals

A. Comply with pertinent provisions of Architectural Sections.
B. Product Data: Within 35 calendar days after the Contractor has received the Notice to Proceed, submit to the Architect for approval prior to acquisition:
    1. Materials list of items proposed to be provided under this Section.
    2. Manufacturer's specifications, cut sheets, and other data needed to prove compliance with the specified requirements. All pieces of equipment shall be clearly identified on corresponding manufacturer's literature being submitted. All information for each item shall be correlated.
    3. Shop Drawings or other data as required to indicate method of installing and attaching equipment and piping, except where such details are fully shown on the Drawings.
    4. Submittals for the entire Project shall be submitted at the same time. Incomplete or noncompliant submittals may be rejected.
    5. Submittals shall be provided in PDF format.

1.05 Design Changes Caused By Product Substitutions

A. If the domestic water heater is substituted with a different brand or model than what is specified on the Drawings the Authority Having Jurisdiction may require the energy compliance calculations to be updated. The contractor shall be responsible for all costs related to updating the calculations. If the substituted equipment does not comply, the contractor shall be responsible for providing equipment that meets or exceeds the performance of the specified equipment at no additional cost to the owner.
B. Contractor shall pay costs of design and installation for changes resulting from substitution of alternate products.
C. Acceptance of alternate products by Architect does not change this requirement.

1.06 Product Handling

A. Comply with pertinent provisions of Architectural Sections.

PART 2 PRODUCTS

2.01 Waste, Vent, Sewer And Storm Drainage

A. Above Grade
    1. All waste, vent, sewer and storm lines shall be of cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A-888 or

ASTM A-74 for all pipe and fittings. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International.

a. Acceptable Manufacturers:
   1. AB&I Foundry
   2. Charlotte Pipe and Foundry
   3. Tyler Pipe Company

i. Joints
   1. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions and local code requirements. Hubless coupling gaskets shall conform to ASTM Standard C-564 and be listed with NSF International. Couplings shall consist of a 304 stainless steel shields, clamp assembly and a high quality elastomeric gasket conforming to ASTM 564. Clamp shall be 4 band construction, Husky HD 4000 or approved equal.

i. Mandatory Referenced Standards
   1. Cast Iron Soil Pipe Institute Standard Specifications - Latest Issue
      a. CISPI 301: Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
      b. CISPI 310: Couplings for use in connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
   2. ASTM Standard Specifications - Latest Issue
      a. A-888: Standard Specifications for Hubless Cast Iron Soil Pipe and Fittings.
      b. C-564: Standard Specifications for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

B. Below Grade:
   1. Schedule 40 Solid wall PVC plastic DWV pipe with solvent-cemented drainage pattern fittings complying with ASTM D 1785 - Latest Issue.
      a. SCH. 40 Solid Core PVC plastic DWV pipe with solvent-cemented drainage pattern fittings complying with ASTM D 4396 may be used at Contractor's option for vent piping. -Latest Issue.

C. Condensate (sized per CMC) and indirect waste drains
   1. Type L Copper Water Tube ASTM B88 with wrought Copper solder fittings, ANSI-B16.22

2.02 Domestic Water Piping

A. Below Grade (Water Service)
   1. 3" NPS and smaller, Schedule 40 PVC Plastic Pipe and fittings. ASTM D1785, D2466, with Solvent Cement Joints ASTM D2564.

B. Above Grade (Distribution System)
   1. Piping
      a. For soldered, brazed and mechanical joints, 4" and smaller Copper Water Tube Type L Annealed Temper (Hard Drawn) ASTM B75 or ASTM B88.
   2. Fittings

a. Wrought Copper Pressure Solder Fittings, ASME B16.22 or ASME B16-25, 95-5 Tin-Antimony Filler Metal.
i. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
i. Copper Unions: MSS SP-123, cast-copper alloy, hexagonal-stock body, with ball-and-socket, met-to-metal seating surfaces, and solder-joint or threaded ends.

C. Below Grade (Distribution System)
1. Piping
a. All underground water piping within the building boundaries shall be ASTM B88-93a Type "L" annealed (soft) copper tube made up without fittings below the floor level.

2.03 Gas Piping

A. Below Ground
1. Polyethylene (PE) Natural and Liquefied Petroleum Gas Yard Piping ASTM D2513 with Fusion Joints. Provide Steel Transition Risers and Detectable Warning Tape.
B. Above Ground
1. Schedule 40, Seamless Black Steel Pipe ASTM A 120 2 1/2" and smaller with Malleable Iron Threaded fittings ANSI B16.3 Class 150.
2. Schedule 40, Seamless Steel Pipe 3" and larger. ASTM A53 with Buttweld Steel fittings ASTM A 234.

2.04 Pump Discharge Piping

A. Discharge piping from sump/sewage pumps shall be Schedule 40, ASTM A-120-84, galvanized steel pipe with ANSI B16 galvanized malleable iron fittings. Four inch and larger pipe shall be made up with welded fittings and 125# flanges.

2.05 Valves

A. Acceptable Manufacturers: Milwaukee, Hammond, NIBCO, Jomar, Watts, others as noted.

Type	Size Range	Part Number
Ball	2” and smaller (2 piece)	Milwaukee UPBA400 Hammond UP8301A NIBCO 585-80-LF
Ball	2-1/2” and larger (3 piece)	Milwaukee UPBA300 Hammond UP8604 NIBCO 595Y-LF
Note: Stem extensions of non-thermal-conductive material and protective sleeve that meets UL 2043 approved for inside air plenum and allows operation of the valve without breaking the vapor seal shall be used on insulated pipe. NIBCO NIB-Seal handle or acceptable equal.		
Gate	2” and smaller	Milwaukee UP115 Hammond UP645 NIBCO T-113-LF

B. All pump discharges shall have a check value placed minimum 5 pipe diameter from the pump.

1. NIBCO W920W or F910B
2. Acceptable equal.

C. All below grade ball valves shall have stainless steel handles.

2.06 Hangers and Supports

A. In general, all pipe hangers and supports shall conform to the following except where special pipe hangers and supports are detailed on the Drawings. In all cases hanger and support details on the Drawings shall take precedent over the following:

Items	TOLCO	Anvil
Pipe Hanger	1; 2; 200	260
Side Beam Clamp for Wood Joist	58	207
Beam Coupling for Steel Beams	65	92
Rod Coupling for Connection to "Hilti"	70	135
Inserts in Concrete Decks	107;109A;109AF	N/A
Trapeze Hangers	Tolstruct A12	AS200
Pipe Clamp	Tolco Cush Clamp	AS004OD – AS098OD

B. Similar items by Anvil International, Erico-Caddy, or TOLCO/B-Line will be acceptable.

C. Hanger Rods shall conform to the following table:

Tube/Pipe Size	Rod Diameter
1/2" to 4"	3/8"
5" to 8"	1/2"
10" to 12"	5/8"

D. Trapeze hangers may be used where parallel runs of pipe occur. All rods on trapeze hangers shall be 1/2" minimum size.

E. Hanger Support Spacing shall be as follows unless shown otherwise on the Drawings:
   1. Horizontal:
      a. Cast Iron: Every other joint unless over 4 feet, then at every joint.
         i. Copper: Every 6 feet for 1-1/2 inch and smaller, and 10 feet for 2 inch and larger.
         i. Schedule 40 PVC or ABS DWV: Every 4 feet for all sizes. Provide for expansions every 30 feet.
   2. Vertical:
      a. Cast Iron: Base and every floor not to exceed 15 feet.
         i. Copper: Every floor not to exceed 10 feet.
         i. Schedule 40 PVC or ABS DWV: Base and every floor with mid-floor guides. Provide for expansion every 30 feet.

F. Refer to the plumbing code for materials not listed above.

G. At all points where insulated pipe contacts a hanger or support, the point of contact shall be protected by a metal insulation pipe shield #B3153 as manufactured by B-Line. Equivalent pipe protectors will be considered provided the substitute item meets the same standard of quality and performance as the specified item.

H. Seismic restraint devices
   1. Available Manufacurers:
      a. Anvil/Badger
         i. Mason Industries
         i. B-Line Tolco Division of Eaton
   2. Seismic hanger system design shall meet the requirements of IBC, the 2022 CBC and ASCE 7-16.

2.07 Wall and Floor Penetrations

A. Fire walls and floors:
   1. Wall and floor penetrations shall be protected with a U.L. approved fire rated system. The system shall be per the Drawing Details, or other manufacturer's installation instructions.
   2. Fire stopping materials by Hilti, Metacaulk, or 3M are considered equal. The material shall be the same as called out for in the U.L. approved system.

B. Poured concrete walls and floors.
   1. Pipes penetrating poured concrete walls and floors shall be protected by providing the following:
      a. A Schedule 40 PVC sleeve one (1) size larger than the pipe or one quarter (1/4) inch of foam material wrapped around and secured to the pipe or packed and caulked with mineral wool.
         i. Protection shall end flush with the wall or floor surface.

C. All walls and floors:
   1. Piping passing through walls and floors exposed to view shall be provided with chrome plated split-ring escutcheon plates in finished areas. Brass or galvanized escutcheon plates may be used elsewhere.

2.08 Flashing

A. All flashing shall be 4 lb. sheet lead and all vents penetrating the roof shall be flashed and counter-flashed. Stoneman Co. roof flashing assembly with 10" skirt or equal may be used.
B. The flashing for vents penetrating a metal roof shall have a corrosion resistant aluminum base compatible with the roofing system. A rubber type flashing by "Tech Specialties" shall be installed between the flashing and pipe.
C. For single ply roofing, provide flashing per roofing manufacturer recommendations or installation instructions.

2.09 Valve Boxes

A. Brooks Products Inc., Christy Co., or equal with the word "Water" or "Gas" cast in cover as applicable.

2.010 Cleanouts

A. Provide cleanouts per Drawings and details on Drawings. Cleanouts as manufactured by J. R. Smith, Mifab, Wade, or Zurn are approved equals.
B. Cleanout tops to be installed with tamper-proof screws.

2.011 Floor Drains, Floor Sinks

A. Provide drains as specified on the Plumbing Schedule. However, drains as manufactured by Watts, J.R. Smith, Mifab, Wade, or Zurn will be acceptable provided they are equal.
B. Floor sinks by Watts, J.R. Smith, Mifab, Wade, Zurn, or Commercial Enameling are acceptable provided they are equal.

2.012 Water Hammer Arrestors

A. Provide Watts #LF15M2, Wilkins Piston Model #1260XL, Sioux Chief #65X-X or equal, as sized on the Drawings or required by PDI. Install per manufacturer's instructions.

2.013 Automatic Trap Primers

A. Provide Precision Plumbing Products, J.R. Smith, Mifab or Sloan as specified on the Drawings. Install per manufacturer's instructions.

2.014 Plumbing Fixtures

A. Fixture locations, quantities, types, sizes and connections shall be as shown on both the Plumbing and Architectural Drawings. If a conflict in fixture location is noted between the Plumbing and Architectural Drawings, the Architectural Drawings shall take precedence.
B. Fixtures shall be thoroughly protected against damage to the chrome plate or enamel, by chipping, scratching or other damage during the entire period of construction. Roof drains, floor sinks and drains, toilet and sink drains, plumbing vents, and all other similar fixtures shall be covered to prevent trash from entering the pipes until final installation of grates, domes, fixtures or other protective devices.
C. Provide fixtures as specified in the Plumbing Schedule. American Standard, Crane, Kohler, or Just are acceptable substitutes as equal if approved by Engineer.
D. Fixture carrier numbers listed are as specified on the Plumbing Schedule; however, carriers as manufactured by J.R. Smith, Mifab, Wade, or Zurn, are acceptable provided they are equal.

2.015 Connectors

A. Provide Brass Craft "Speedway" or equal heavy pattern iron pipe size brass stops, rigid or flexible supplies and chrome plated brass "P" traps. Stops in "Public" areas to have screwdriver slots and those in "Private" areas to have all cross handles.
B. Provide Brass Craft or equal flexible stainless steel braided water supplies to appliances. They may also be used to fixtures as an option to rigid supplies. Aquaflo is an acceptable substitute.
C. Provide Brass Craft flexible or equal, stainless steel gas appliance connectors. Dormont is an acceptable substitute. Diameter of connector to be as recommended by manufacturer based on connector length and rated capacity of equipment.

2.016 Access Panels

A. See section 23 00 13 for access panels.

2.017 Pressure Gages and Thermometers

A. Provide Marsh Quality gages or equal with 3-1/2" dial, gage cock, in type required. For pump suction, provide compound type.
B. Provide Trerice 7" BX or 3" Bimetal Dial series thermometers or equal, straight, angle, or oblique as required, equipped with separable sockets and well. Provide extension necks as required on insulated line.
C. Arrange gages and thermometers for easy reading.

2.018 Pressure Regulators and Backflow Preventors

A. Provide the pressure regulator(s) and backflow preventer(s) as specified on the drawings and/or as required by the governmental authority having jurisdiction.
B. Pressure regulators and/or backflow preventers by Febco, Hersey, Watts or Wilkins are considered equal when their pressure fall-off/loss is equal to or less than the specified regulators/preventer's loss for the given flow rate.
C. Provide all potable water outlets with hose attachments with non-removable hose bibb backflow preventers per the C.P.C.

2.019 Water Heaters

A. Provide water heaters as specified in Plumbing Schedule or approved equal of size, capacity, recovery, and KW/BTUH input. American, A.O. Smith and State are considered equal. Heater shall be A.G.A. or U.L. listed.
    1. Heater storage tank shall be provided with magnesium anodes, approved standard pressure/temperature relief valve and all standard factory trim.
    2. Provide approved flexible copper supplies for the water heater water connections.
    3. Instantaneous tankless water heaters shall be with water flow activated switch to energize the electrical power source, a safety high water temperature limit, and all standard factory trim.
B. Provide a Smitty Co., Benjamin Co. with 1" drain outlet or equal, water heater pan as specified in the Water Heater Schedule.

2.020 Pressure-Temperature Relief Valve

A. Pressure-temperature relief valve shall be Wilkins TP220, or TP3000 Series or equal.

2.021 Expansion Tank

A. Expansion tank shall be Wilkins WXTP series as specified on the Drawings or approved equal in size and capacity. Amtrol and Watts expansion tanks are considered equal.

2.022 Water Heater Seismic Restraints

A. Seismic restraints shall be Holdrite model QS-50 or QS-120 or approved equal as applicable for the water heater specified.

2.023 Protective Insulation (Ada Fixtures)

A. Provide approved manufactured, EVA foam antimicrobial material protective pipe and fitting covering for exposed waste and drain assembly and for hot and cold water supplies and stops. Protective system shall consist of pre-formed pipe or tubing sleeve and pre-formed fitting patterns for trap and stops.
B. Provide protective covering for off-set drain assembly and disposer at kitchen sinks.
C. Foam pipe wrap, duct tape, baggy-type covers, tie-strap fasteners are not acceptable.
D. Acceptable manufacturers:
    1. Oatey Dearborn "Safety Series"

2. Truebro “Lav-Guard”
3. Plumberex “Pro-Xtreme”

2.024 Pipe Insulation

A. Article includes insulating the following plumbing piping services:
   1. Domestic hot-water piping.
   2. Domestic hot-water return piping, including the piping between where the return piping intercepts the domestic cold water supply piping and the water heater.
   3. Domestic cold-water piping where the following conditions occur:
   4. Last 8 feet of piping to the water heater including piping between a storage tank and a heat trap, for a nonrecirculating storage system.
   5. Piping in unheated areas of the building.
   6. Piping exposed outside the building.

B. Domestic cold-water piping in unheated areas of the building and where exposed outside the building shall be insulated with 1” insulation. Where insulation is required in other areas the insulation shall conform to the requirements for domestic hot water supply and return piping.

C. Insulation material shall meet requirements of flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by Procedure ASTM-E-84, NFPA 225 or UL 723.

D. Domestic hot water supply and return piping shall be insulated with Owens-Corning Fiberglass heavy density pipe insulation 25 ASJ/SSL-II (All Service Jacket/Double/ Self-Sealing Lap). Insulation shall have a k-factor of 0.24 @ 100 degrees F mean temperature, an embossed vapor barrier laminated and pressure sealing lap adhesive. All lap and butt strips shall have integral pressure-sensitive strips and shall be applied in strict accordance with manufacturer's instructions. Insulation thickness shall be as follows:

PIPE INSULATION THICKNESS							
FLUID OPERATING TEMPERATURE RANGE °F	INSULATION CONDUCTIVITY			NOMINAL PIPE DIAMETER IN INCHES			
	k FACTOR	MEAN RATING TEMPERATURE °F		< 1	1 to < 1.5	1.5 to < 4	4 to < 8
Service Water Heating Systems				Minimum Pipe Insulation Require (Thickness in inches or R-value)			
141-200	.25-.29	125	Inches	1.5	1.5	2.0	2.0
			R-Value	R-11.5	R-11	R-14	R-11
105-140	.22-.28	100	Inches	1.0	1.5	1.5	1.5
			R-Value	R-7.7	R-12.5	R-11	R-9

PIPE INSULATION THICKNESS							
FLUID OPERATING TEMPERATURE RANGE °F	INSULATION CONDUCTIVITY			NOMINAL PIPE DIAMETER IN INCHES			
	k FACTOR	MEAN RATING TEMPERATURE °F		< 1	1 to < 1.5	1.5 to < 4	4 to < 8
Service Water Heating Systems				Minimum Pipe Insulation Require (Thickness in inches or R-value)			
141-200	.25-.29	125	Inches	1.5	1.5	2.0	2.0
			R-Value	R-11.5	R-11	R-14	R-11
105-140	.22-.28	100	Inches	1.0	1.5	1.5	1.5

			R-Value	R-7.7	R-12.5	R-16	R-12.5

E. Insulation materials not meeting the specified conductivity range shall be submitted for approval. Submittal shall clearly identify compliance with this article.
F. Water, soil and waste pipes installed in the exterior walls, attics, crawl spaces or outside of the building shall be protected from freezing.

2.025 Circulation Pump: (Domestic)

A. Provide pump(s) per schedule. Bell and Gossett, Grundfos, Laing or March are considered equal.

2.026 General Conditions

A. Examine the areas and conditions under which Work of this Section will be performed. Conditions detrimental to timely and proper completion of the Work shall be brought to the attention of the Architect before the installation of materials. Do not proceed until unsatisfactory conditions are corrected. Incorrectly installed materials requiring changes will be at Contractor's expense.
B. All plumbing fixtures, appliances, and appurtenances furnished with manufacturer's installation instructions shall be installed per those instructions.

2.027 Plumbing System Layout

A. Lay out the plumbing system in careful coordination with the Drawings. Determine proper elevations for all components of the system and use only the minimum number of bends to produce a satisfactorily functioning system.
B. Follow the general layout shown on the Drawings in all cases except where other Work may interfere.
C. Lay out pipes to fall within partitions, walls, or roof cavities, and to not require furring other than as shown on the Drawings.

2.028 Piping Installation

A. Pipe sizes as shown on drawings are Nominal Pipe Size (NPS) or Iron Pipe Size (IPS). Drawings and fixture schedule indicate pipe sizing per the 2022 CPC and Standard Engineering Practice. Pipe sizes shall be maintained to fixtures, appliances and equipment. Approved reducing fittings shall be installed at all points of connections.
B. Install piping generally square with building, free of traps or air pockets, and true to line and grade. Keep all piping tight to the building structure, unless pipe slope is required. Do not install piping in any locations where, in the Architect's opinion, it will interfere with the use of the building or create a safety hazard. Where space is inadequate, notify the Architect in time to avoid unnecessary Work. Install all exposed piping as high as possible without interfering with other trades.
C. Make changes in direction with manufactured fittings; use long radius elbows. Street elbows, bushings, close nipples and bending of pipe or tubing will not be allowed.
D. Provide "P" traps at sanitary sewer drainage devices without integral traps.

E. Underground plastic pipe will horizontally transition to metal pipe 5 feet before the above ground riser. Install plastic pipe with a minimum of 36" of cover when located under areas of possible vehicle traffic. Approved metallic pipe must be used if the minimum depth is not met. A tracer wire, terminating at each end at an exposed location, will be installed with all underground plastic pipe.
    1. Piping may terminate a maximum of one foot above ground when encased in a listed metallic transition riser.
F. Use friction wrenches when installing brass, polished, or soft metal piping, and when installing piping exposed in finished areas. Replace piping showing wrench marks.
G. Attach escutcheon plates to pipes with set screws or spring clamps with concealed hinges. Continue insulation through escutcheon plates.
H. General:
    1. Proceed as rapidly as the building construction will permit.
    2. Thoroughly clean items before installation. Cap pipe openings to exclude dirt until fixtures are installed and final connections have been made.
    3. Cut pipe accurately, and work into place without springing or forcing, properly clearing windows, doors, and other openings. Excessive cutting or other weakening of the building will not be permitted.
    4. Show no tool marks or threads on exposed plated, polished, or enameled connections from fixtures. Tape all finished surfaces to prevent damage during construction.
    5. Provide sufficient swing joints, ball joints, expansion loops, and devices necessary for a flexible piping system, whether or not shown on the Drawings.
    6. Support piping independently at pumps, coils, tanks, and similar locations, so that weight of pipe will not be supported by the equipment. Support the equipment independently from the pipe.
    7. Pipe the drains from mechanical equipment, drip pans, relief valves, air vents and similar locations, to an open sight drain, floor drain, or other acceptable discharge point, and terminate with an air break or air gap per the 2022 CPC.
    8. Securely bolt all equipment, isolators, hangers, and similar items in place.

2.029 Pipe Support Installation

A. Support pipes from structure with assemblies specified. Provide auxiliary members, anchors, guides, and sway braces necessary to maintain pipe alignment and prevent excessive movement or strain on piping system or components; allow for expansion and contraction of piping. Provide at least one hanger for each branch. Do not use powder driven fasteners, wire, perforated tape, nails, wood blocking, or other makeshift devices to support pipe.
B. Attach supports to structure with bolts, screws or concrete anchors, per support manufacturer’s requirements.

2.030 Joints and Connections

A. Cut pipe shall be reamed to full inside diameter of pipe. Cut threads straight and true. Insure all filings have been removed from inside of the pipe. Apply liquid Teflon to male pipe threads and not inside fittings. Use graphite on cleanout plug threads.
B. Joints in cast iron "No-Hub" soil/waste pipe and fittings shall be made up with neoprene gaskets and stainless steel bands conforming to CISPI 310, torque to the manufacturer's specification with an approved torque wrench.

C. Joints in copper tube shall be made with 95-5 tin-antimony or lead-free solder, applied in strict accordance with the manufacturer's directions.
D. Dissimilar metals shall be isolated with dielectric couplings, "EPCO" or approved equal. Provide access panels at all hidden couplings.
E. All plastic pipe shall be joined in accordance with the manufacturer's recommendations for their pipe and IAPMO Installation Standard per the 2022 CPC.
F. Pipe Protection: Provide protection against abrasion where copper tubing is in contact with other building members by wrapping with an approved tape, pipe insulation or otherwise suitable method of isolation.
G. Penetration Protection: Provide allowance for thermal expansion and contraction of copper tubing passing through a wall, floor, ceiling or partition by wrapping with an approved tape or pipe insulation, or by installing through an appropriately sized sleeve. Penetrations of fire resistance rated assemblies shall maintain the rating of the assembly

2.031 Sanitary Sewer, Vent and Indirect Waste System Installation

A. Install horizontal drainage piping at a minimum 2%, condensate 1%, slope unless otherwise noted. Where this is impractical notify the Architect before installing the pipes.
B. Install vent piping to drain back into the sewer system.
C. Provide cleanouts where shown on Drawings and where required by governmental agencies having jurisdiction.
    1. All cleanouts to grade shall be firmly secured by means of a concrete block 20" square by 5" thick, and shall be flush with finished grade, unless otherwise noted on the plans.
D. Provide automatic trap primers as specified at floor sinks and drains as indicated on Drawings or where required by governmental agencies having jurisdiction. Provide access panels for all hidden mechanical trap primers.

2.032 Flue Vent Pipe Installation

A. All flues or vents shall terminate above the roof with flashing and a listed vent cap installed in accordance with its listing and the manufacturer's instructions. Vent cap shall be of the same manufacturer as the flue pipe. Flues or vents shall terminate per the 2022 CPC.

2.033 Valve Installation

A. Provide valves in the water, air, and gas systems. Locate and arrange so as to give a complete regulation of apparatus, equipment, and fixtures.
B. Provide valves in at least the following locations:
    1. In branches and/or headers of water piping serving a group of fixtures.
    2. On both sides of apparatus and equipment.
    3. For shutoff of risers and branch mains.
    4. For flushing and sterilizing the system.
    5. Where shown on the Drawings.
C. Locate valves for easy accessibility and maintenance. Provide access panels for all hidden valves.
D. Unions shall be installed downstream of all screwed valves.
E. All gas pressure regulating valves shall be vented to the atmosphere.

2.034 Cleanouts:

A. Horizontal drainage pipe shall be provided with a cleanout at its upper terminal, and each run of piping, that is more than 100 feet in total developed length, shall be provided with a cleanout for each 100 feet, or fraction therof, in length of such piping. An additional cleanout shall be provided in a drainage line for each aggregate horizontal change in direction exceeding 135 degrees. A cleanout shall be installed above the fixture connection fitting, serving each urinal, regardless if the location of the urinal in the building.
    1. Exceptions – See 2022 CPC 707.4

2.035 Water Hammer Arrestor Installation

A. Provide water hammer arrestor on hot and cold water lines.
    1. Install at all quick closing valves, solenoids, and supply headers at plumbing fixture groups.
    2. Locate and size as shown on Drawings, and where not shown, locate in accordance with Plumbing and Drainage Institute Standard WH-201.
    3. Install water hammer arrestor behind access panels.

2.036 Backflow Prevention Installation

A. Protect plumbing fixtures, faucets, hose connections, and other equipment having plumbing connection, against possible back-siphonage.
B. Arrange for testing of backflow devices as required by the governmental agencies having jurisdiction.

2.037 Plumbing Fixture Installation

A. Connect plumbing services to fixtures as shown on Drawings and as specified.
B. Install compression stops and flexible supplies per fixture manufacturer's recommendation or as high as possible on wall directly below fixtures.
C. Install fixtures at right angles to, and tightly against, building surfaces, and in proper alignment. Fill gaps between fixtures and building surfaces with white grout. Mounting heights and locations shall be as shown on the Drawings, or, if not shown, as directed by the Architect.

2.038 Insulation Installation

A. Clean and dry surfaces prior to application of insulation or adhesives.
B. Insulate piping, fittings, valves, and strainers. Leave unions exposed. Where insulation terminates, bevel ends of insulation and continue jacket over insulation and secure to pipe. Do not interrupt insulation at hangers, supports, clamps, or penetrations through structure. Fittings shall be finished with "Zeston" or approved equal fitting closures. If fitting closures not available, use 8 oz. canvas dipped in "Seal-Fas".
C. Attach longitudinal jacket laps and butt strips with factory applied pressure sensitive adhesive. On concealed piping only, outward clinching coated staples at two inch spacing may be used. Cover elbows with one piece polyvinyl chloride covers. Secure with tack fasteners. Tape ends of covers with matching tape on exposed piping. Seal off all cut ends with canvas and Benjamin Foster 30-36.

D. Install closed cell polyethylene foam per manufacturers instructions.

2.039 Testing and adjusting

A. Provide personnel and equipment, and arrange for and pay the costs of, all required tests and inspections required by governmental agencies having jurisdiction. See Section 23 00 13 for test requirements.
B. Where tests show materials or workmanship to be deficient, replace or repair as necessary, and repeat the tests until the specified standards are achieved.
C. Adjust the system to optimum standards of operation.

2.040 Cleaning (For potable water systems.)

A. Disinfection: The hot and cold water distribution system shall be disinfected prior to being placed in service. The system shall be disinfected within 3 weeks of occupancy in accordance with AWWA C651 or the following requirements:
    1. The piping system shall be flushed with potable water until discolored water does not appear at any of the outlets.
    2. The system shall be filled with a water chlorine solution containing at least 50 parts per million of chlorine. The system shall be valved off and allowed to stand for 24 hours. Or, the system shall be filled with a water chlorine solution containing at least 200 parts per million of chlorine. The system shall be valved off and allowed to stand for 3 hours.
        a. To prevent reduced service life of system components, disinfection solutions should not stand in the system longer than 24 hours.
    3. Following the standing time, the system shall be flushed with water until the chlorine is purged from the system.
    4. Provide bacteriological sampling and analysis results to the Engineer for review.

2.041 Warranty

A. The contractor shall warranty all of the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or owner.

END OF SECTION 22 0000

Section 23 0000
Heating, Ventilation, And Air Conditioning

PART 1 GENERAL

1.01 Description:

A. Related Documents:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   2. Section 01 91 13 General Commissioning Requirements.
   3. Where the requirements of the Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.

B. Codes and Regulations:
   1. In addition to complying with the specified requirements, comply with pertinent regulations of the Authority Having Jurisdiction. All work must comply with the version of the code that was in effect at the time of the initial permit application date.
      i. CALGreen – California Green Building Standards Code
      ii. CBC – California Building Code
      iii. CEBC – California Existing Building Code
      iv. CEC – California Electrical Code
      v. CEnC – California Energy Code
      vi. CFC – California Fire Code
      vii. CMC – California Mechanical Code
      viii. CPC – California Plumbing Code
      ix. CRC – California Residential Code
      x. DPH – Department of Public Health
      xi. DWR – Department of Water Resources
      xii. DSA – Division of the State Architect
      xiii. HCD – Housing and Community Development
      xiv. NFPA – National Fire Protection Association
      xv. OSHPD – Office of Statewide Health Planning and Development
      xvi. SFM – Office of the State Fire Marshal
      xvii. Reach Codes that have been adopted by the Authority Having Jurisdiction
      xviii. Local Building Department
      xix. Local Fire Marshall
   2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirements will govern when so directed by the Architect.

C. Included: Work includes, but is not limited to, the following.
   1. The Work covered by this Specification shall include furnishing labor, material, equipment, and services to construct, install and place in operation, the complete Heating, Ventilating and Air Conditioning Systems to the extent as indicated, and as shown on the Drawings and specified herein. The Work covered under this Section shall hereinafter be referred to as the Mechanical System.
      i. Roof Top Packaged Heat Pump Units

ii. Fan Coil Units
iii. Condensing Units
iv. Heat Pump Units
v. Centrifugal Exhaust Fans and Roof Exhausters
vi. Duct systems complete with supports, dampers, grilles, registers, diffusers and louvers.
    1. Supply Air
    2. Return Air
    3. Exhaust Air
    4. Outside Air
vii. Filters and Filter Boxes
viii. Duct, Pipe and Equipment Insulation
ix. Low Voltage Controls
x. Refrigerant Piping
xi. Fire Life Safety Devices
    1. Duct Smoke Detectors
xii. Vibration Isolators

2. A system of temperature controls shall be furnished and installed complete as hereinafter described. Low voltage wiring and conduit, complete with electrical accessories and materials as required for the installation of the temperature control system shall be furnished and installed under this Section of the Contract but shall conform to the Specification requirements as set forth under Division 26.

D. Work Not Included In This Section:
1. Blocking, framing and wood supports required for the purpose of accommodating the Mechanical System unless specifically called for under this Division. The contractor is responsible for the correct location of such items and shall bear the expenses covering their omission or improper location.
2. Electrical connections to motors, electric starters, disconnect and over-current protective devices, unless specifically called for by this Section, or unless the equipment is furnished as an integral part of the Mechanical System Equipment, as hereinafter specified, or noted on the Drawings.
3. Line voltage electrical wiring and conduit, except where specifically called for on the Drawings or hereinafter in this Section.
4. Painting, except when supplied as factory finish, or specifically called for in this Section or on Drawings.

1.02 Quality Assurance

A. 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.
B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the Work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

1.03 Submittals

A. Comply with pertinent provisions of Architectural Section.
B. Product data: Within 35 calendar days after the Contractor has received the Notice to Proceed, submit the following to the Architect for approval prior to acquisition:
    1. Materials list of items proposed to be provided under this Section.
    2. Manufacturer's specifications, cut sheets, and other data needed to prove compliance with the specified requirements. All pieces of equipment shall be clearly identified on corresponding manufacturer's literature being submitted. All information for each item shall be correlated.
    3. Shop Drawings or other data as required to indicate method of installing and attaching equipment, ductwork and piping except where such details are fully shown on the Drawings.
    4. Submittals for the entire Project shall be submitted at the same time. Incomplete or noncompliant submittals may be rejected.
    5. Submittals shall be provided in pdf format.

1.04 Design Changes Caused by Product Substitutions

A. If the heating and/or air conditioning equipment is substituted with a different brand or model than that specified on the Drawings the Authority Having Jurisdiction may require the energy compliance calculations to be updated. The contractor shall be responsible for all cost related to updating the calculations. If the substituted equipment does not comply the contractor shall be responsible for providing equipment that meets or exceeds the performance of the specified equipment at no additional cost to the Owner.
B. Contractor shall pay costs of design and installation for changes resulting from substitution of alternate products.
C. Acceptance of alternate products by Architect does not change this requirement.

1.05 Product Handling

A. Comply with pertinent provisions of Architectural Sections.

PART 2 PRODUCTS

2.01 Heating, Ventilating and Air Conditioning Equipment

A. Heating, Ventilating, and Air Conditioning Equipment: Equipment shall be as specified on the Drawings. All other equipment shall be pre-approved by the Mechanical Engineer.
B. It shall be the responsibility of the Contractor to see that any substituted equipment performs similarly to that which is specified and fits in the same area as specified. Cost of any additional Work caused by the substitution of equipment shall be borne by the Contractor.

2.02 Air Distribution Equipment

A. Grilles, registers and ceiling diffusers and other accessory equipment shown on the Drawings and "Grille, Register and Diffuser Schedule" shall be manufactured by Titus unless shown otherwise.
B. Any substitutions of the above equipment which may be proposed by the Contractor shall be re-sized to suit his equipment by the proposed manufacturer and submitted in tabular form listing components proposed for each location in the System, identifying each as to location,

design, air quantity passing through the devices, pressure drop, noise criteria data, velocities of air leaving the device and "K" flow factors for each item. Manufacturer's data sheets showing dimensions and recommended method of installation for each component must also be included.

2.03 Louvers

A. 4" deep louvers, Greenheck, Model ESJ-401, or approved equal. Deflection blades shall be spaced on 4" centers having 1/2" high vertical baffle and an additional lateral center rain hood. The edges of louver blades shall be folded or beaded to exclude driving rain. Louvers blades shall be oriented to minimize the entrainment of rainwater. Louver blades, heads, sills, jambs, braces and mullions shall be made of aluminum. Louvers shall be provided with flanges.
B. Provide 1/2" aluminum bird screen on outside air intake louvers and 1/4" aluminum insect screen on combustion air louvers.

2.04 Rectangular Sheet Metal Ductwork

A. Rectangular supply, return, outside air and exhaust ducts, single leaf dampers and plenums shall be fabricated from prime grade galvanized steel sheets of lock form quality and shall be constructed in accordance with appropriate tables of the latest ASHRAE "Guide and Data Book" and SMACNA "HVAC Duct Construction Standards" handbook and Chapter 6 of the 2022 CMC.
B. Transverse Duct Joints shall be made with The Ductmate System. When using The Ductmate System, construction of the duct such as gage, reinforcing, etc. shall be as indicated in the latest addition of the applicable SMACNA standards. With proper data, an equal may be submitted, providing the corners have a downset and corner clips to insure airtight integrity. Testing must be done by a nationally recognized testing laboratory. The standard Ductmate 35 System joint is the equivalent of a SMACNA "J" connection. The Ductmate 25 System joint is the equivalent of a SMACNA "F" connection. The installation of the Ductmate System shall be in accordance with the latest manufacturer’s printed Assembly and Installation Instructions.
C. Each duct or plenum shall be diagonally cross-broken for rigidity.
D. Duct bends, fittings, transitions, etc. shall be fabricated in accordance with Fabrication Standards as shown on the Drawings or in accordance with latest SMACNA "HVAC Duct Construction Standards" where not shown on Drawings.
E. Support ducts to joists or similar structural members. Except where indicated otherwise, ducts with a side of 24" or more shall be supported on Ductmate trapeze duct hangers consisting of 2" high x 1-1/2" wide x 18" gauge channel and 3/8" diameter hanger rods hung from support brackets bolted to structural members. See also Special Fabrications as shown on the Drawings. Duct supports shall be eight (8) feet maximum on center.
F. At branch ducts, provide manually operated dampers of the type and arrangement shown on the Drawings, two gages heavier than the duct (if single leaf type) in which installed, and equipped with locking quadrants and closed end bearings.
G. Sizes shown on Drawings are net inside dimensions. Enlarge duct to accommodate lining.

2.05 Round Ductwork and Fittings

A. 2-10" w.g. round duct through 61" in diameter shall be United Sheet Metal spiral lockseam unseal duct, or approved equal, manufactured from galvanized steel meeting the ASTM A-527-71 in the following gages:

Diameter	Metal Thickness
3-13”	26 ga.
14-23”	24 ga.
24-37”	22 ga.

B. Round duct shall be new and exclusively obtained for this project. Each piece shall be in 20’ lengths. Ducts shall be cut to length required with joints only at fitting locations, except on duct runs longer than 20 feet.

C. Spiral duct and fitting connections, 15" diameter and larger shall be Ductmate Spiralmate round duct connectors. The connector system shall consist of two mating round duct connector flanges roll-formed from hot dipped galvanized steel with an integral sealant and closure ring roll-formed from hot dipped galvanized steel.

D. Fittings shall be United Sheet Metal galvanized fittings in the following gauges:

Diameter	Metal Thickness
3-13”	24 ga.
14-23”	22 ga.
24-37”	20 ga.

E. Spiral duct fittings must be manufactured as separated fittings and shall not be saddle taps, stubs or tap-in fittings tapped into spiral duct, nor may they be dove-tailed tap-ins into pipe or fittings.

F. Reducers shall occur after a branch tap occurs on the main portion of the fitting. Divided-flow fittings shall be used unless shown otherwise on the Drawings.

G. Joints on ducts and fittings shall be covered and sealed with 4" wide, 6 oz. canvas saturated with Arabol lagging adhesive, or Hardcast DT tape in conjunction with Hardcast FTA-20, non flammable, non-toxic adhesive, or GlenKote duct sealer or other approved mastic type sealer. Duct tape will not be allowed. Where exposed to weather, paint lagging strips with two coats of silver enamel paint.

H. All ductwork shall be constructed and supported in accordance with appropriate tables of the latest SMACNA “HVAC Duct Construction Standards” handbook and Chapter 6 of the 2019 CMC. Duct gauges to be in accordance with this section.

I. At branch ducts, provide manually operated dampers of the type and arrangement shown on the Drawings, two gages heavier than the duct (if single leaf type) in which installed and equipped with locking quadrants and closed end bearings.

2.06 Below Grade Ductwork

A. General
   1. Below grade ductwork shall be BlueDuct as manufactured by AQC Industries or equal as approved by MEOR.

B. Duct Material and Sealants
   1. Provide elbows, pipe, diffusers, plenum, clamp & gasket, boots, saddle registers, caulk, water gauge test and adapters as required by drawings for underground installation. Provide 10 year manufacturer’s parts warranty.
   2. Ductwork shall be HDPE, food grade, closed cell plastic material that is recyclable, does not emit volatile organic compounds, and conforms to ASTM-D2412. Ductwork shall be resistant to mildew, mold (UL 181B), and radon gas (BSS 7239-88). Ductwork shall not rust or crack under external stress or strain.

Ductwork shall have R-10 thermal insulation value without the use of external insulation.

3. All joints shall be gasketed and sealed. Clamps and gaskets shall be used on ductwork without flanges. Clamps shall be polyethylene with 410 stainless steel plates and stainless steel screws. Gaskets shall be comprised of ¼" thick butyl rubber sealant tape with silver polyester facing that is water and UV resistant and shall not stain. Gaskets shall comply with ASTM-E84 for flame and smoke spread.
4. Flanged joints and duct branches shall use a co-polymer adhesive caulking sealant that is water and UV resistant. Flanges shall be connected with stainless steel bolts.
5. Assembled ductwork shall be able to maintain ±10" static pressure with no leakage.
6. Assembled ductwork shall be approved for installations 27" below flood plane elevation without water intrusion.
7. Duct system installed by a manufacturer trained installer will be an air and water tight system.

2.07 Flexible Duct

A. Flexible air duct shall be Hart & Cooley Model F218. Duct shall consist of an inner core having two layers of polyester film encapsulating a steel wire helix surrounded by a blanket of fiberglass insulation and sheathed in a metalized polyester vapor barrier reinforced with fiberglass scrim. All air ducts shall be UL listed under the UL-181 standard as a Class 1 Air Duct also conforming to NFPA standards 90A and 90B. This air duct shall have a certified thermal resistance rating of R-8 in accordance with ASTM C518 at 75^0F and carry the ADC "Thermal Performance" seal.

B. Flexible air duct shall be JP Lamborn Co., AMF-07.Flexible duct shall be factory made with a sound absorbing, spun-bonded, non-woven inner core. R-4.2 insulation to encompass core and a metalized polyester reinforced vapor barrier surrounding entire duct. Ends shall have factory attached sheet metal collars secured with UL-181 FX tape. Length to be 5 feet. Duct shall be Class I, UL approved, and meet NFPA 90A, 90B and CMC minimum requirements.

C. Use only the minimum length required to make the connection. In no case shall any section of flexible duct exceed 5 feet in length.

D. Use two layers of UL listed 181 duct tape to connect flexible duct to the metal duct if flexible duct does not have S.M. collars.

E. The number of bends shall not exceed a combined total of 90 degrees. 90 degree bends will not be allowed at diffuser connections.

2.08 Duct Specialties

A. Damper Regulators and Bearings: Duro-Dyne "Specline" SR-Series or approved equal, lever type with matching end bearing. Regulator set shall include rubber gasket between regulator and duct, spring washer between core and housing, wedge pin, dial indicator and handle. Matching end bearing shall be closed end with rubber gasket:

Model	Size
148	10" and Under
388	20" and Under
128	21" and Above

B. Access Panels: Access panels shall be located at all points where adjustable mechanisms are installed internal to or on the surfaces of the ductwork. Where adjustable mechanisms are concealed by walls or ceilings, "Elmdor" or approved equal access doors shall be installed. Size shall be suitable for convenient servicing. Tile Walls: Doors and Frame: Stainless Steel. Other areas: recess type to receive ceiling or wall finish in order to provide "Blind Finish".
C. Volume Dampers:
    1. In rectangular ducts greater than 1.5 sq. ft., provide Pottorff Model CD42, or equal, factory fabricated opposed blade damper, 16 gauge blades, and brass bearings. Blade width shall not exceed six inches.
    2. In rectangular ducts 1.5 sq. ft. and less, provide single leaf dampers as described in Section 23 00 00, 2.3 (a. and g.).
    3. In round ducts 15" in diameter and less, provide shop fabricated galvanized sheet metal plate dampers. Plate shall be 18 gauge or shall be two even gauges heavier than duct; minimum thickness 22 gauge. Provide stiffening beads at 1/3 points in dampers lighter than 18 gauge.
    4. In round ducts 16" and greater, provide Pottorff opposed blade damper Model CD22R or approved equal.
    5. In round ducts 4" – 24" in diameter, above "hard" ceilings, provide DuroZone Cable Operated Damper. Cable length to be between 3 and 15 FT long. Contractor to determine proper length to be use. Cable shall be routed inside the duct to the face of the grille or diffuser. Tuck cable up behind diffuser after balancing.
D. Provide 20 gauge galvanized sheet metal escutcheon plates at duct penetrations of finished building surfaces. Install tight against surface and securely attached to duct. Continue insulation through openings.

2.09 Flexible Connections

A. Provide fireproof, insulated, non-porous, flexible connections between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connections by zinc coated steel clinch-type drawbands. Flexible connections shall be DuroDyne "Insulfab" or "Insulflex" or approved equal.
B. Provide a duct support next to each flex connector to prevent any strain on connection.

2.010 Condensate Drains

A. Air conditioning cooling coils shall have a condensate drain pipe, type "M" copper, to drain the condensate as shown on drawings.

2.011 Pipe Hangers and Supports

A. In general, pipe hangers and supports shall conform to the following except where special pipe hangers and supports are detailed on the Drawings. In cases hanger and support details on the Drawings shall take precedent over the following:

Pipe 6" Size and Smaller	
Items	Superstrut Number
Pipe Hanger	710
Side Beam Clamp for Wood Joist	540
Beam Coupling for Steel Beams	U563-U562

Rod Coupling for Connection to "Hilti"	H-119
Inserts in Concrete Decks	
Trapeze Hangers	A1200-A1202
Pipe Clamp	A716 or 701W/S-716

B. Similar items by Unistrut, Securstrut, Michigan, or B-Line will be acceptable.
C. Hanger Rods shall conform to the following table:

Tube/Pipe Size	Rod Diameter
½ to 4"	⅜"

D. Hanger Support Spacing shall be as follows unless shown otherwise on the Drawings:
   1. Horizontal:
      i. Copper: Every 6 feet for 1-1/2 inch and smaller, and 10 feet for 2 inch and larger.
      ii. Steel, Gas: Every 6 feet for 1/2 inch, 8 feet for 3/4 inch and 1 inch, and 10 feet for 1-1/4 inch and larger.
   2. Vertical:
      i. Copper: Every floor not to exceed 10 feet.
      ii. Steel, Gas: Same as horizontal spacing except 1-1/4" and larger at every floor.

2.012 Duct Smoke Detectors:

A. HVAC systems rated at 2000 CFM or greater shall be equipped with a duct smoke detector to automatically shut off the HVAC system if smoke is detected.
B. The detectors shall be installed in the main supply duct downstream of any filters, in the main return air duct after the last terminal connection and the any exhaust duct after the last terminal before the fan.
C. The detector shall be System Sensor Innovairflex D4120 4-wire Photoelectric Smoke Detector. Provide with Factory NEMA 4 enclosure if mounted outside.

2.013 Damper Actuator

A. Actuators shall be Belimo. Substitutions will not be acceptable. Actuator shall be direct coupled over the shaft, spring return type, unless specified otherwise

2.014 Electrical Equipment

A. Motor starters shall be provided complete with properly sized thermal overload protection and other appurtenances necessary for motor control specified. Mount starter adjacent to equipment. See electrical drawing. Maintain minimum of 3' clearance to front of device.
B. Motor Starters: Shall be NEMA I or III as appropriate, general purpose, weather-resistant, with watertight enclosure where required.

2.015 Insulation

A. General: Insulation and lining material shall meet requirements of flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by Procedure ASTM-E-84, NFPA 255 or U.L. 723 and shall conform to NFPA 90A and 90B.
B. Heating and cooling duct and related heating and cooling equipment insulation shall conform to 2015 Building Energy Efficiency Standards, Administrative Regulations, Title 24, Part I,

Section 124, except to the extent that this Specification supersedes the minimum standards as established by the Code, in which case this Specification shall take precedent.

C. Unless noted otherwise, insulation shall be Fiberglass, or approved equal material. Application Work shall be performed in accordance with the best accepted practice of the trade and the manufacturer's recommendations. The performance of insulation Work shall be by experienced insulation applicators. Insulation shall be installed after the specified tests have been applied to the piping and duct systems, and the systems have been inspected and approved. Fiberglass trade names and/or numbers have been used to establish a standard of quality.

D. External Duct Insulation – Outdoors, in a space between the roof and an insulated ceiling, in a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, in an unconditioned crawlspace; or other unconditional spaces: Shall be applied to concealed heating and cooling, supply and return duct except duct that is internally lined. Insulation on duct shall be Manville Microlite FSK duct insulation, 3" thick, minimum installed R value of 8.0 or greater, FSK aluminum foil reinforced with fiberglass, scrim laminated to U.L. rated Kraft, or approved equal. Adhere to duct surfaces with Foster's 85-62 or approved equal, adhesive applied in strips of 6" wide on approximately 12" centers. Circumferential seams shall be butted together and sealed over joints with 3" wide pressure sensitive foil vapor barrier tape. Longitudinal edges shall be lapped 2" and secured with outward clinching staple 6" on center then sealed with pressure sensitive foil vapor barrier tape. Duct wrap shall be installed to allow maximum fullness at corners (avoid excessive compression) minimum thickness at corners shall be 1". Where ducts are over 24" in width, the duct wrap shall be additionally secured to the bottom of the rectangular ducts with mechanical fasteners spaced on 18" centers (Max.) to prevent sagging insulation.

E. External Duct Insulation – All other locations not listed above: Shall be applied to concealed heating and cooling, supply and return duct except duct that is internally lined. Insulation on duct shall be Manville Microlite FSK duct insulation, 2" thick, type 100, minimum installed R value of 6.0 or greater, FSK aluminum foil reinforced with fiberglass, scrim laminated to U.L. rated Kraft, or approved equal. Adhere to duct surfaces with Foster's 85-62 or approved equal, adhesive applied in strips of 6" wide on approximately 12" centers. Circumferential seams shall be butted together and sealed over joints with 3" wide pressure sensitive foil vapor barrier tape. Longitudinal edges shall be lapped 2" and secured with outward clinching staple 6" on center then sealed with pressure sensitive foil vapor barrier tape. Duct wrap shall be installed to allow maximum fullness at corners (avoid excessive compression) minimum thickness at corners shall be 1". Where ducts are over 24" in width, the duct wrap shall be additionally secured to the bottom of the rectangular ducts with mechanical fasteners spaced on 18" centers (Max.) to prevent sagging insulation

F. Internal Duct Insulation - Outdoors, in a space between the roof and an insulated ceiling, in a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, in an unconditioned crawlspace; or other unconditional spaces: Shall be applied to all heating and cooling supply and return duct and plenums on roof or where shown on Drawings. Manufacturer shall be Manville Microlite, or approved equal. Duct Liner shall be Linacoustic R, 2" thick, 1.5 pcf, with a "K" value of 2.2 in. for a total "R" installed value of 8 or greater. Insulation shall withstand velocities of up to 5000 FPM and temperatures up to 250 degrees F.

G. Internal Duct Insulation – All other spaces not listed above: Shall be applied to all heating and cooling supply and return duct and plenums where shown on Drawings. Manufacturer shall be Manville Microlite, or approved equal. Duct Liner shall be Linacoustic R, 1 ½”

thick, 1.5 pcf, with a "K" value of 2.2 in. for a total "R" installed value of 6 or greater. Insulation shall withstand velocities of up to 5000 FPM and temperatures up to 250 degrees F

H. Portions of duct receiving Duct Liner shall be completed with transverse joints neatly butted with no gaps or interruptions. The duct liner shall be adhered to the sheet metal with 100% coverage of adhesive and exposed leading edges and transverse joints coated with adhesive. Adhesive shall be a water based product. In addition, this shall be secured with mechanical fasteners which shall compress the liner sufficiently in place. The liner shall be cut to assure overlapped and compressed longitudinal corner joints. Application procedures shall comply with the recommendations of the Sheet Metal and Air Conditioning Contractor's National Association's Duct Liner Application Standard, Second Edition.

I. External Duct Insulation Exposed to Weather: Shall be applied to heating and cooling supply and return ducts and plenums exposed to weather if not noted to be internally insulated. Insulation shall be Knauf Type ASJ, or approved equal, rigid board fiberglass, 3.0 # per cubic foot minimum density, 2" min. thickness, 8.0 min. R value. The board shall be neatly cut and fitted to the surface with joints tightly butted together and against standing seams. The insulation shall be secured to the duct with adhesive and mechanical fasteners starting 3" from butt joints and 18" on center each direction. Vapor-barrier tape shall be then applied over joints, seams, breaks and any penetrations of the insulation vapor barrier jacket. A weather-barrier mastic compound reinforced with fabric or mesh shall be applied as a finish coat. Finish by painting with two (2) coats of aluminum paint.

J. Ducts: Ducts shall be constructed, installed, sealed and insulated in accordance with the 2022 CMC. The above paragraph(s) shall supersede if more stringent.

2.016 Temperature Controls

A. Temperature controls shall be furnished as indicated in schematic Drawing on Plans including room thermostats, relays and other necessary combustion, operating and safety controls.

B. Wiring and Conduit
   1. Control wiring and conduit shall be the responsibility of this section and be installed as follows:
      i. In equipment rooms/attics – Conductors shall be run in conduit. Final connection to equipment shall be flexible conduit.
      ii. Concealed in building construction (wall/inaccessible ceilings) - Conductors shall be run in conduit.
      iii. Roof mounted/exterior equipment yards – Conductors shall be in conduit. All flexible conduit shall be seal-tite with weatherproof connections. Equipment on grade and detached from the building a distance greater than 36” shall have underground control conduit routed to equipment.
      iv. Above accessible ceiling spaces – Control cable will be allowed to be installed without conduit in accessible areas above ceilings as follows:
         1. Cable is an approved type for the application.
         2. Cable is bundled/organized in management devices routed square with building lines (no diagonals) and kept clear of electrical devices (i.e., ballasts, transformers, etc.) that could cause interference.
         3. Conduit sleeves are provided between accessible ceiling spaces (i.e., across soffits, gypboard ceilings, etc.) as required to maintain future access to cable.

v. Cable routed in accessible ceiling spaces shall comply with EIA/TIA standards for communications cabling. Communication bus wire shall be W183C-2058Y Connect Air, yellow shielded cable.

C. Electric wiring, conduit and other electric devices required to complete the installation of the temperature control systems shall comply with requirements as set forth in the Electrical Section of this Specification.
D. After completion of the installation, the Contractor shall adjust thermostats, motors and other equipment provided under this Contract. He shall place them in complete operating condition subject to approval of the Architect.
E. The Control System herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of acceptance by the Architect, any of the equipment herein described is proved to be defective in workmanship or material, it will be adjusted, repaired or replaced free of charge by the Contractor.
F. The final connections and supervision of control wiring and interlock wiring shall be the responsibility of this Contractor.
G. The Contractor shall submit to the Architect for approval, the required number of shop drawings of the entire control system before starting Work.
H. Upon completion of the Work, the Contractor will provide diagrammatic layouts of the Automatic Control Systems specified herein. Layouts shall show control equipment and the function of each item shall be indicated.
I. The temperature control system shall be installed by persons in the direct employment of the temperature controls manufacturer(s) exclusive contracting representative. The Mechanical Contractor shall not install the temperature controls unless pre-approved by the Mechanical Engineer.

2.017 Refrigerant Piping

A. Refrigerant piping shall be flushed clean with nitrogen and the ends capped prior to installation. Refrigerant piping shall be Type L copper with wrought copper fittings. Use 45% minimum silver brazing alloy with melting point higher than 1100 F. for making the joints.
B. Insulate refrigerant suction line with 3/4" thick Owens-Corning Fiberglass or Armstrong Armaflex foamed plastic flexible tubing insulation applied with No. 500 adhesive. Use multiple layers and miter insulation to cover joints and all other items as required to prevent condensation.
C. When piping & insulation are installed outside of building, insulation shall be aluminum jacketed. Jacketing shall be minimum 0.016” thick, 3105 or 3003 alloy aluminum with moisture barrier & stucco embossed finish. Provide aluminum elbow covers at all pipe bends equivalent in construction to jacketing.

2.018 Refrigerant Piping Accessories

A. Stop valves shall be Henry Type 622, 500 psi pressure rating brass, soldered, packless diaphragm, globe shut-off pattern.
B. Solenoid valves shall be Sporlan Type MA14, 450 psi rating, brass body.
C. Filter dryer shall be Sporlan "Catch-All" with soldered connections.

PART 3 EXECUTION

3.01 Surface Conditions

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 Coordination

A. Coordinate as required with other trades to assure proper and adequate provision in the Work of those trades for interface with the Work of this Section.

3.03 Preparation

A. Holes in concrete:
   1. Provide sleeves, accurately dimensioned and shaped to permit passage of items of this Section.
   2. Deliver such sleeves, with accurate setting drawings and setting information, to the trades providing the surfaces through which such items must penetrate, and in a timely manner to assure inclusion in the Work.

B. Flashing:
   1. Where items of this Section penetrate the roof, outer walls, or waterproofing of any kind, provide under this Section base flashing and counterflashing required at such penetration.
   2. Provide on each pipe passing through the roof a 4 pound seamless lead flashing and counterflashing assembly.

3.04 General Installation Requirements

A. Conceal piping, ductwork, and equipment in spaces provided unless specifically shown otherwise. If spaces are inadequate, notify Architect in time to avoid unnecessary Work. Do not cut or notch structural members without specific approval of the Architect.
B. Follow manufacturer's instructions on items not specifically covered in drawings and specifications. Report discrepancies to Architect for clarification before starting Work.

3.05 Equipment Interface

A. Provide required shut off valves, unions, and final connections of piping to the Work of this Section.
B. For electrically operated equipment, verify the electrical characteristics actually available for the Work of this Section and provide equipment meeting those characteristics.

3.06 Painting

A. Paint inside of air outlets and connecting plenums with one coat of flat black paint, or provide all such items factory prepainted.
B. For roof-mounted equipment, provide factory pre-finish on exposed surfaces.
C. Touch-up scratches and abrasions to be invisible to the unaided eye from a distance of 5 feet.

3.07 Installation Of Ductwork

A. Ductwork shall be delivered to the Project site with surfaces clean and free of loose dirt and rust. Special care shall be exercised by the Contractor to store the duct in a clean area to prevent the accumulation of dirt prior to installation. Fabricated or partially fabricated duct sections shall not be stored in open fields or on dirt areas surrounding the construction site. Paved areas may be used, if available, provided adequate protection is provided to prevent the accumulation of dirt on duct surfaces. If possible, the Contractor should arrange to deliver duct to the project site and store on the floor of the area in which it is to be installed.
B. Before installation of ductwork, the Contractor shall inspect each section of duct and wipe internal surfaces clean. At the end of each Work period, or when ends of duct are left installed for future extension, the open ends shall be tightly closed off with a plastic sheet and taped securely to the open end of the duct.
C. Construct and install sheet metal in accordance with latest SMACNA recommendations. Provide variations in duct size and additional duct fittings as required and approved by the Architect at no extra cost to the owner.
D. The throat radius of bends shall be 1-1/2 times the width of the duct. Provide turning vanes in any mitered turn greater than 45 degrees.
E. Transition slopes shall be no less than one to five where space permits.
F. Abrupt offsets in the duct system greater than 30 degrees will not be allowed.

3.08 Temperature Control Installation

A. Install wiring and tubing parallel to walls and floors and securely clipped to structure or mechanical system components. Group parallel runs for neat appearance.
B. Install room thermostats and other control devices at 48 inches above finished floor unless a lower mounting height is required for access by handicapped.
C. Install outside air sensor in a location where it is not directly affected by radiation from the sun or any heat generating device or by a conditioned air stream or any other location that would produce a false reading.
D. Upon completion of the installation calibrate all equipment and adjust controls for proper operation.

3.09 Refrigerant System Charging Procedure

A. Pressurize the system with refrigerant and hold for 24 hours with no drop in pressure; test joints and equipment for evidence of leaks after satisfactory pressure test.
B. Provide 1/2" angle type charging and purging valves adjacent to high and low side of the condensing unit to accomplish the procedure described hereinafter. Connect the vacuum pump to both the high and low side of the system. Do Work when ambient air temperature is above 60 degrees F during the evacuation process.
C. Operate the vacuum pump until the system is evacuated to 2.5 mm Hg absolute. Break the system vacuum with nitrogen or refrigerant.
D. After the system has been evacuated to 2.5 mm Hg absolute, close the vacuum pump suction valve and stop the pump.
E. Charge system to required capacity with specified refrigerant.

3.010 Control Device Identification Labels

A. Thermostats and Exhaust fan switches shall have labels mounted on or just above the control device labeled with the equipment being controlled. As an example, for a exhaust fan

controlled by a switch the label would read "EXHAUST FAN # 1" or if a thermostat the label would read "AC-1".

1. Labels shall be 2" x 1" x 1/8" thick Formica/plastic engraving stock beveled on both sides and with two 3/16" diameter holes near the top uppermost tag corners.
2. Labels shall be white with 3/8" high red engraved letters.
3. Labels shall be attached to the equipment with adhesive.

3.011 Warranty

A. The contractor shall warranty all of the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or owner.

3.012 Shop Drawings

A. The Contractor shall prepare shop drawings covering duct systems, equipment and Mechanical Room piping systems. The drawings shall be prepared in 3/8" scale and shall be submitted to the Architect for approval prior to any fabrication. In preparing the shop drawings, the Contractor shall coordinate the location of duct, piping and equipment with the Work of other trades.

3.013 Mechanical System Start-Up Responsibility

A. Start up Mechanical Systems, and perform any such Work as may be required to adjust the systems to meet the requirements of the Contract Documents. Air distribution balancing shall be performed in accordance with Article "MECHANICAL SYSTEMS BALANCING".
B. Install new clean specified filters in equipment containing filters immediately prior to owner occupancy. Contractor to bear all costs for this work.

3.014 Mechanical Systems Balancing

A. Testing and air balancing shall be performed by an independent balancing company certified by Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB) or Testing, Adjusting, and Balancing Bureau (TABB). Testing and balancing shall be performed by a company other than the mechanical system installers/contractor. The name of the firm that the Contractor proposes to engage to perform this Work of balancing the system shall be submitted to the Engineer for approval prior to commencing the Work.
B. After Systems have been tested as outlined, air and water flow rates shall be balanced, and control devices adjusted. Balance and testing shall not begin until systems have been completed and are in full working order. Upon completion of the balancing operation and prior to final acceptance of the systems, the balancing firm shall submit a report, with six (6) copies, certifying to the proper performance of the system for approval by the Mechanical Engineer.
    1. The following information shall be included in the Air Side Report:
        i. Fan speeds.
        ii. Motor current readings and voltage readings.
        iii. Air quantities in CFM at supply, return, exhaust terminals, and outside air intakes, both at design value and actual measured value. Test and adjust each terminal to within +10% of design requirements.

iv. Air velocities in FPM at supply, return, and exhaust terminals at design value and actual measured value.
v. Positive static pressure, negative and total pressures and total air quantities for each fan system.
vi. Equipment nameplate data.

END OF SECTION 23 0000

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Section 23 0013
General Mechanical Requirements

PART 1 GENERAL

1.01 Description

A. Related Documents:
   1. The other Contract Documents complement the requirements of this Section.
   2. Division 1 - General Requirements applies to the Work of this Section.
   3. Where requirements of this Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.

B. Codes and Regulations:
   1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.

C. Included: Work includes, but is not limited to the following:
   1. Heating, Ventilating, Air Conditioning and System Balancing
   2. Plumbing
   3. Fire Protection
   4. Carpentry and metal Work required for Work of this Section and not specifically shown under another Section. Openings in concrete or masonry construction shall be either core drilled or saw cut unless indicated otherwise on Drawings.
   5. Excavation and Backfill
   6. Coordination Drawings

D. Related Work:
   1. Painting (Division 9)
   2. Cutting and Patching (Division 1)
   3. Low voltage electrical control (Division 16)

1.02 Definitions

A. Furnish: Purchase and deliver to job site in new condition.
B. Install: Receive and store at job site until required; place secure and connect; furnish required appurtenances.
C. Provide: Furnish and install as defined above.
D. Section: Refers to a Section of these Specifications.
E. Standards: The issue in effect as of the date of the contract documents.

1.03 Project Record Drawings

A. Comply with pertinent provisions of Architectural Sections (Division 1).

1.04 Service Interruptions

A. When Work of this Section requires temporary shutdown of existing systems for connections, the shutdown shall be made only during pre-arranged time agreeable to the Owner.

1.05 Correlation, Interpretation and Intent Of Contract Documents

A. The Mechanical Drawings are, in general, made to scale and the Contractor may obtain approximate distances and dimensions by scaling the Plans. It is distinctly understood, however, that it is done entirely at the Contractor's responsibility. Refer to Architect's Plans and Specifications for construction details, which will affect the Work and equipment. Examine the Architectural, Civil, Structural, Mechanical, Electrical, Landscape, Irrigation, Data, Fire Protection and Plumbing Plans and Specifications to ensure that this work does not conflict with the above trades. Plumbing, Mechanical and Electrical Plans are diagrammatic and, therefore, do not necessarily represent the exact installation. However, pipe sizing for utility services and ductwork are calculated per their respective codes and Standard Engineering Practice and shall be installed as sized from point of origin to terminal point. It shall remain the Contractor's responsibility to submit Shop Drawings if he/she has any questions about the final arrangement. Nothing on these Plans or Specifications shall be construed to permit work not conforming to all applicable codes and regulations.

PART 2 PRODUCTS

2.01 Access Panels

A. If not called for under other Sections, furnish Milcor, Elmdor, or Jay R. Smith access panels where shown on the Drawings or required for maintenance access to completed Work of this Section. Submit size, type, and location of proposed access panels not specifically shown, for review by Architect.
B. Access panels shall be constructed of 16 gauge prime coated steel or stainless steel with screwdriver operated cam latch, concealed hinges, and fire rating equal to adjacent construction.
C. Provide flush type doors with:
    1. Stainless steel finish for tiled surfaces.
    2. Prime coated finish for other surfaces.

2.02 Flashing

A. Provide watertight flashing at all openings through exterior walls and roof. Refer to Architectural Drawings.

2.03 Belt Drives

A. All belts shall be "Vee" type, or approved equal. Sheaves shall be adjustable and shall be sized to drive fan at scheduled RPM when set at midpoint of adjustment range. All belt drive assemblies shall be rated at 150% of drive motor horsepower. OSHA approved belt guards shall be provided over all drive assemblies. The Contractor shall change any belts and drives as required to produce the specified CFM.

2.04 Vibration Isolation and Noise Control

A. All fans, heating and ventilating units, air conditioning units, blowers and similar equipment shall be securely mounted to and/or supported from the structure.
B. Isolate all bare water piping from structural members or hangers with "Trisolators" or submitted and approved equal insulating sleeves. Install hangers on outside of insulated jacket on all insulated lines.

2.05 Weatherproofing

A. All equipment exposed to weather shall be protected by means of a suitable finish (i.e. paint). All fan cabinets, roof-mounted equipment, and ductwork shall be fabricated in such a manner to prevent leakage through seams and joints. Water rated, exterior hoods shall be provided over motors, belts, and other devices to insure against damage by water. At all locations where pipes and/or ducts penetrate exterior walls, or roofs, suitable rain tight flashing shall be provided.

2.06 Pipe Wrapping

A. All pipe, metal components, and joints buried in ground shall be primed and protected with 10-mil tape double wrapped or approved equal per IAPMO IS 13-2006. Before tape application, all bare pipe and fittings to be wrapped must be coated with pipe wrap primer. Stretch first layer of tape to conform to the surface while spirally half-lapping, apply a second layer, half-lapped and spiraled as the first layer with spirals perpendicular to first wrapping. In lieu of tape wrap, heat shrinkable 10-mil minimum thick polyethylene sleeve may be used.
B. When applying tape, use only enough pull to cause the tape to properly conform to the irregular surfaces of the item. The proper amount of pull is reached when the tape surface is smooth without any wrinkles. Continue tape 4" above grade. End overlaps should point down. Tape shall be applied per manufacturer's installation instructions.

2.07 Electric Motors and Electrical Devices

A. All Electric motor current characteristics are as shown in equipment schedules on drawings and as specified hereinafter in this Specification. The Contractor shall refer to the Electrical Plans and shall confirm all motor voltage, amperage and phase characteristics before processing submittals or ordering equipment. If any equipment is installed different from the supplied electrical power, it is the contractor's responsibility to correct equipment to the required electrical characteristics.
B. All electrical devices of a type normally listed by Underwriters Laboratories, Inc. shall bear U.L. label of approval.
C. Motor starters shall be provided complete with properly sized thermal overload protection and other appurtenances necessary for motor control specified. Mount starter adjacent to equipment. See electrical drawing. Maintain minimum of 3' clearance to front of device.
D. Motor Starters: Shall be NEMA I or III as appropriate, general purpose, weather-resistant, with watertight enclosure where required.

2.08 Painting and Finishing

A. Provide the coating specified below unless otherwise specifically called for under Painting, Division 09900. Exclude non-ferrous items, stainless steel, items to be insulated, and factory-finished items. Conform to requirements of the Painting Section where requirements are not specified in this Section.
B. All materials used, except as otherwise specified in carrying out the provisions of the contract, are to be Fuller-O'Brien manufacturer or approved equal. Numbers given below are Fuller-O'Brien Company designation unless noted otherwise.
    1. Primer coat for all exterior and interior materials: 1 Coat - Primer #66850

2. Finish coats as listed below:

Exterior concrete and concrete block	2 Coats – Semi-Gloss #664XX
Interior concrete and concrete block	2 Coats – Semi-Gloss #214XX
Exterior metal	2 Coats – Semi-Gloss #664XX
Interior metal	2 Coats – Semi-Gloss #214XX
Exterior galvanized metal	2 Coats – Semi-Gloss #664XX
Exterior stucco	2 Coats – Flat #668XX
Interior of Grilles, Diffusers, and Registers	1 Coat – Flat (black) #31202

3. Furnish equipment with factory or field-applied prime coat and finish coat of enamel. Restore damaged finishes to match original.

PART 3 EXECUTION

3.01 General Equipment Installation Requirements

A. Install equipment to provide neat appearance, required manufacturer's access, and required space to allow replacement or maintenance. Provide bases, supports, anchor bolts, and other items required to install equipment. Installation shall be level and braced per CBC.
B. Equipment shall operate quietly and without objectionable vibration. Excessive vibration, other than from specified equipment operating at optimum conditions, shall be the Contractor's responsibility and shall be eliminated as directed by Architect.

3.02 Coordination Of Work

A. Coordinate Work of this Section with Work of other Sections to avoid conflicts. If required, provide shop drawings and submit to Architect for approval.
B. Insure that Work of other Sections is suitable to accommodate Work of this Section.

3.03 Adequacy Of Furring

A. Conceal piping and ductwork in spaces provided unless specifically shown otherwise. If spaces are inadequate, notify Architect prior to ordering materials and fabrication of components.

3.04 Protection and Cleaning

A. Protect equipment from dirt, moisture, and mechanical damage during construction. Restore or replace damaged equipment to original condition.
B. Keep interior of piping and ductwork free of foreign material during construction. Flush piping systems with test medium specified under Piping Tests before installing equipment and appurtenances or making final connections.

3.05 Closing-In of Uninspected Work

A. Do not conceal or cover Work before tests and observations are completed. Uncover Work prematurely closed in and repair resulting damage to all Work, if requested by Architect, Engineer, or Project Inspector.

3.06 Damage

A. Repair or replace items damaged by leaks or overflow from Work provided under this Section and for any damage to any part of the project site, for a period of 1 year after notice of completion date. This is in addition to and not a limitation of other rights the Owner may have against the contractor under the Contract Documents.

3.07 Painting and Finishing

A. The contractor shall examine carefully all surfaces to be finished under the contract; and before beginning any of his work shall see that the work of other trades has been left or installed in a workmanlike condition to receive paint, or a particular finish.
B. The contractor shall take the necessary steps to protect his work and the work of other contractors during the time his work is in process and the contractor shall be responsible for any and all damage to the work or property of other contractors caused by his employees or by himself.
C. Provide protective covers or drop cloths to protect floors, fixtures, and equipment. Exercise care to prevent paint being spattered on to surfaces which is not to be painted. Surfaces, from which such paint cannot be satisfactorily removed, shall be painted or repainted, as required to produce a finish satisfactory to the Architect.
D. Cracks, holes, or imperfections in concrete or plaster are to be filled with patching plaster and smoothed off to match adjoining surfaces.
E. All surfaces shall be in a proper condition to receive finish. Clean surfaces as necessary to receive paint. Remove all grease from metal surfaces before painting.
F. Each coat of paint shall be applied at proper consistency and brushed evenly, free of brush marks, sags, runs, and with no evidence of poor workmanship. Color between coats of paint shall differ; (Color variations between coats should be enough to impair hiding.) Care shall be exercised to avoid lapping of paint on glass or hardware. Paint to be sharply cut to lines. Finished paint surfaces to be free from defects or blemishes.
G. Exposed piping, ducts, and mechanical equipment (except for factory finished items) shall be painted. Exposed piping, except for identification banding, shall be painted to match surfaces adjacent. Each coat to be inspected when dry and subsequent coat not to be applied until approval received.
H. Paint all surfaces visible through grille, diffuser and register faces, flat black.
I. The contractor shall store all painting materials and equipment outside of the building. The receiving and moving of all paint materials and mixing shall be done outside of the building. Any other arrangements shall be made only with Architects approval.
J. All necessary precautions shall be taken to prevent fire. Rags, waste, etc., soiled with paint or cleaning material, shall be removed from the premises at the end of each day's work.

3.08 Mechanical System Testing

A. Furnish all test pumps, gauges, and equipment. Test all safety controls and devices.
B. For air tests, install a calibrated test pressure gauge in the piping system to observe any loss in pressure. Calibrate the test pressure gauge with a dead weight tester within 15 days before use and certify by initial and date on a sticker applied to the dial face. Maintain the required test pressure for the time indicated. Brush joints with a soapy water solution to check for leaks if the required pressure cannot be maintained.
C. After any test, repair all leaks found as directed and re-test as necessary until the system is proven tight.

D. Before applying test pressure to any piping systems the Contractor shall be responsible for isolating all equipment e.g. control valves, regulators, relief devices, tanks and any other line accessories, which would otherwise be damaged by the test pressure.
    1. Soil, Waste, Vent, Roof, and Condensate Drainage:
        i. Entire System: Tightly close all openings except the highest one. Fill to overflowing with water.
        ii. Sections of System: Tightly close all openings except the highest opening of the section under test. Fill section with water to test each section with a minimum 10-foot head of water except for the uppermost 10 feet of the system.
        iii. Allow to stand for (4) hours or longer, as required to complete the inspection.
    2. Domestic Water: Fill with water and test at 150 psig. Retain for (4) hours.
    3. Refrigerant: Pressurize the system with nitrogen to 150 psig and hold for 24 hours with no drop in pressure; test joints and equipment for evidence of leaks after satisfactory pressure test.

E. After all Systems have been tested as outlined, all flow rates shall be balanced, and all control devices adjusted. See Section 23 00 00.

F. The equipment and installations shall be operated by the Contractor and he shall demonstrate that all Systems are performing according to the requirements of the Plans and Specifications and to the satisfaction of the Architect, Engineer and Owner.

G. Acceptance Testing Requirements: For applicable acceptance tests see the energy compliance documentation. Acceptance testing shall be the responsibility of the mechanical contractor and shall be performed by an Acceptance Testing Technician who has been certified by a California Energy Commission approved Acceptance Test Technician Certification Provider Program. The Test and Balance Contractor can also be the Acceptance Testing Technician

3.09 Cutting and Patching

A. The Contractor shall do all cutting and patching which may be required for the installation of the Work under this Division of the Specifications. Patching shall be of the same quality, materials and finish as, and shall match accurately, all surrounding construction. No cutting of the Structure shall be permitted without the approval of the Architect.

B. Wherever concrete or paved surfaces are cut to provide for the installation under this Section, the Contractor shall restore the surfaces to their original condition. Subgrade materials, concrete, and paving materials, along with the placement of same, shall be in accordance with the respective Sections of this Specification as they apply to the installation of such material.

3.010 Excavation and Backfill: (Buried pipes within the building walls and to 5 feet from the building.)

A. Dig trenches straight and true to line and grade; bottom shall be left smoothed of rock points. Pipe shall be supported for the entire length on undisturbed, original earth. The minimum trench width shall be 16" and all pipe shall be 2 feet below the finished grade, minimum, wherever conditions permit. Sewer pipes to be below grade a s necessary to meet the slope and invert on the Drawing. Whenever substantial variations of pipe bury is indicated by field conditions, the proposed changes in depth of bury shall be submitted, in writing, to the Architect for approval.

B. All piping shall be laid on a bed of clean dry sand not less than 6" thick. The space between the pipe and the sides of the trench shall be backfilled with clean dry sand to a point 6" above the crown of the pipe. Both sides of the pipe shall be filled at the same time.
C. The remainder of the trench shall be backfilled with native soil in lifts no greater than 12" and shall be mechanically compacted by tamping so to maintain a minimum relative dry density of 95%, determined by California Impact Test Method No. 216.
D. All backfilling shall be brought flush with finished subgrade.
E. Excess material shall be removed from the site. Trenches shall be backfilled immediately after approval.

3.011 Installation Of Piping, Ductwork and Equipment

A. The installation of piping, ductwork, and equipment shall be made in such a manner to clear beams and obstructions. Do not cut into or reduce the size of plates or any load carrying members without approval of the Architect. Check Drawings and Work of others to prevent interference. Deviations of the Work determined by the Architect shall be installed by the Contractor without additional cost.
B. Install piping and ductwork promptly, cap or plug open ends of pipe. No piping shall be permanently covered by construction before inspection and approval. Piping and ductwork shall be installed in accordance with best practice and recommendations of the manufacturer.
C. Conceal piping and ductwork unless indicated otherwise. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Remove defective material from site. Install piping generally level, free of traps and unnecessary bends to conform with building requirements, and provide space for other work. Piping to be free of unusual noises. Avoid any possible galvanic action by isolating dissimilar metals with suitable Dielectric Insulating Fittings.
D. Unless called for otherwise, hereinafter in this Specification or by specific detail on the Drawings, all water pipes in contact with structure and/or hangers shall be suitably isolated. In the case of uninsulated pipe, "Trisolators" or equal shall be used.
E. Protect enameled or polished equipment from damage, tool marks, etc.

3.012 Sterilization Of Pipes

A. After preliminary purging of the Systems, the entire domestic potable water system pertaining to Work under this Contract shall be chlorinated in accordance with American Water Works Association, State of California Health and Safety Code procedure for disinfecting water mains. A thorough flushing operation shall be run upon completion of sterilization. Contractor shall then arrange with local health authority for test on mains and water systems and provide three (3) copies of test results to the Architect.

3.013 Equipment Identification Tags

A. Major pieces of equipment shall include, but are not limited to: water heaters, air conditioners, unit heaters, supply and exhaust fans, and shall be tagged.
    1. Tags shall be 2" x 2" x 1/8" thick Formica/plastic engraving stock beveled on both sides and with two 3/16" diameter holes near the top uppermost tag corners.
    2. Tags shall be white with 3/8" high red engraved letters.
    3. Tags shall be attached to the equipment with bolts, screws or chains as per valves.

4. Tags shall have the following information:
   i. Equipment number and nomenclature corresponding to the information on the mechanical contract drawings.
   ii. Examples:

WH	EF	AC
1	2	3

3.014 Identification Of Piping Systems

A. Building Systems:
1. Piping systems installed anywhere within the scope of the Work shall be identified as to contents using a color banding and marking system as outlined and in compliance with Federal OSHA requirements.
2. This Work includes furnishing and application of all snap-around and/or self-sticking pipe markers. Formica valve tags, chains, wires, and related materials proper for the completion of the Work.
3. Pipe markers shall be permanently shaped vinylite plastic snap-around pipe markers as manufactured by Seton Nameplate Corporation, Wilmington Plastic Company, or approved equal.
4. A maximum of four basic background colors shall be used and they shall conform to the American Standards Association Standard A13.1, "Scheme For Identification of Piping Systems" The names of materials (pipe contents) shall be superimposed on these ANSI background colors. Work legends shall conform to ANSI A13.1 to avoid confusion and mistakes. Basic background colors and content classification are:

Yellow	Dangerous Materials
Red	Fire Protection
Bright Blue	Protective Materials
Green	Safe Materials

5. Pipe marking and installation shall be as follows:
   i. Apply "Plastic Pipe Marker" at each valve to show proper identification of pipe contents.
   ii. Use an "Arrow Marker" with each "Pipe Content Marker". The Arrow shall always point away from the "Pipe Marker" and in the direction of the flow.
   iii. If flow can be in both directions, use a double-header "Arrow Marker".
   iv. Apply "Pipe Marker" and "Arrow Marker" at every point of pipe entry and exit where the line goes through the wall, floor or roof.
   v. Apply "Pipe Marker" and "Arrow Marker" on each riser and "T" joint.
   vi. Apply "Pipe Marker" and "Arrow Marker" every 50 feet on long continuous lines.
   vii. Identifying long continuous lines with "Pipe Marker and "Arrow Marker at every bay or aisle within the building. All branch runs from mains on the roof shall be identified with "Pipe Marker" and "Arrow Marker" at the point of takeoff.
   viii. Apply "Markers" on the two lower quarters of the pipe where view is unobstructed. In this position "Markers" are read at a glance from ground floor level and dust will not obscure the "Marker". Roof-mounted piping

"Markers" shall be so located that they can be read from a standing position on the roof.

ix. All identification markers located out of doors and exposed to the sun and the elements shall receive one coat of clear lacquer after application to the pipe, to seal edges and to act as a protective coating.

x. Each "Arrow Marker" must have the same ANSI background color as its companion "Pipe Marker". Arrow must point away from "Pipe Marker" and indicate direction of flow.

xi. "Pipe Markers" shall be guaranteed to stay on pipe systems for a period of not less than five years.

6. Following is a list of, but not necessarily limited to, the more commonly used piping systems that require identification "Pipe Markers" and "Arrow Markers".

Abbreviations on Drawings	Wording to Put on Pipe Marker	ANSI Color Background
CW	Domestic Cold Water	Green
DHWS	Domestic Hot Water Supply	Yellow
DHWR	Domestic Hot Water Return	Yellow
S	Gravity Sewer or Drain	Green
V	Vent	Green
CD	Condensate Drain Return	Yellow
RL	Refrigerant Liquid	Yellow
RS	Refrigerant Suction	Yellow
All lettering shall be black on the yellow background and white on all other background.		

3.015 Seismic Bracing

A. It shall be required that pipes, ducts and conduits be supported and braced per the SMACNA "Seismic Restraints Manual Guidelines for Mechanical Systems", 2006 Edition.

B. When the SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems" does not specifically address the size of duct or pipe to be braced, the following shall apply:

1. All ducts shall be braced and guyed to prevent lateral or horizontal swing to the satisfaction of the Architect, Engineer, and State Inspector.
2. All pipes shall be braced and guyed to prevent lateral or horizontal swing to the satisfaction of the Architect, Engineer, and State Inspector. Absolutely, no "Plumber's Tape" shall be used anywhere on this project.

3.016 Operation and Instruction

A. The Contractor shall furnish competent Technicians to supervise start-up operations of equipment specified by the Architect or Engineer and to instruct Owner's operators. The Contractor shall furnish six complete sets of operating instructions and service manuals to the Architect.

B. Instruction period shall be started after instruction books and service manuals have been submitted to and approved by the Architect and shall be at hours (regular and non-regular) arranged by the Architect.

C. Service manuals shall include oiling, cleaning, and servicing data, compiled in clearly and easily understood form and in a durable binder. Data shall show all serial numbers of every piece of equipment and complete list of replacement parts.

3.017 Warranty

A. The contractor shall warranty all of the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or Owner.

END OF SECTION 23 0013

Section 33 3113
Site Sanitary Sewerage Gravity Piping

PART 1 - GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 Summary

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure and pressure couplings.
3. Cleanouts.
4. Encasement for piping.
5. Manholes.

1.03 Definitions

A. PVC: Polyvinyl Chloride Plastic.

1.04 Action Submittals

A. Product Data: For the following:

1. Piping Material.
2. Fittings.
3. Manholes, including frames and covers.
4. Cleanouts.

1.05 Informational Submittals

A. Field quality-control reports.

1.06 Delivery, Storage, And Handling

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.07 Project Conditions

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager and City of Porterville no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Manager's written permission and approval from the City of Porterville.

PART 2 - PRODUCTS

2.01 Pvc Pipe And Fittings

A. PVC Type PSM Sewer Piping NPS 4 to NPS 15:

1. Pipe: ASTM D 3034, SDR 35 or SDR 26 as indicated on Drawings, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Gravity Sewer Piping NPS 18 to NPS 36:

1. Pipe and Fittings: ASTM F 679, Min. 46 psi Pipe Stiffness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

2.02 Nonpressure-Type Transition Couplings

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc
c. Logan Clay Pipe.

d. Mission Rubber Company; a division of MCP Industries, Inc.
e. NDS.
f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cascade Waterworks Mfg.
b. Dallas Specialty & Mfg. Co.
c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Fernco, Inc.
b. Logan Clay Pipe.
c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.03 Cleanouts

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2.04 Manholes

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with rubber gasket joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Base: Cast-in-place concrete as indicated on drawings.
4. Top Section: Concentric-cone with top of cone of size that matches grade rings.

5. Joint Sealant: ASTM C 990, bitumen or butyl rubber. Joints shall be water-tight.
6. Reinforced-concrete rings, 9 to 18-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 4 to 6-inch riser, with 4-inch minimum-width flange and 25-1/4 to 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.05 Concrete

A. General: Cast-in-place concrete complying with ACI 318, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix for Cast in Place Concrete: Class 3 Concrete, 2500 psi minimum at 28 days, with 0.50 maximum water/cementitious materials ratio unless noted otherwise on the Drawings.

1. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel.

PART 3 - EXECUTION

3.01 Earthwork

A. Excavating, trenching, and backfilling are specified in Section 31 2000 "Earth Moving."

3.02 Piping Installation

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. It shall be the responsibility of the contractor to review the Drawings and furnish all fittings, etc. necessary to complete the work.

C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

F. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

G. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope as indicated on drawings.
2. Install piping with 36-inch minimum cover.
3. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
4. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Hub-and-spigot, cast-iron soil pipe.
2. Hubless cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Expansion joints and deflection fittings.

I. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.03 Pipe Joint Construction

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
2. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
3. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Shielded flexible couplings for pipes of same or slightly different OD.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.04 Manhole Installation

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Install FRP manholes according to manufacturer's written instructions.

D. Form continuous concrete channels and benches between inlets and outlet.

E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.05 Concrete Placement

A. Place cast-in-place concrete according to ACI 318.

3.06 Cleanout Installation

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Pipe branches for cleanouts and riser extensions shall match mainline specifications. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Heavy-Duty, top-loading classification cleanouts in all areas except vehicle-traffic service areas and roads.
2. Use Extra-Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas and roads.

B. Set cleanout frames and covers outside of paved areas as indicated on the Drawings.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.07 Connections

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 22 1316 "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 2500 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 2500 psi.

3. Make branch connections from side into existing piping, NPS 21or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 2500 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Connect to grease, oil, and sand interceptors specified in Section 22 1323 "Sanitary Waste Interceptors."

3.08 Identification

A. Comply with requirements in Section 31200 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.09 Field Quality Control

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

        1) Mandril Tests: Upon completion of backfill and compacting trenches, the contractor, at his own expense shall pull a properly sized mandril through the installed main lines, 8 inches inside diameter and larger, to demonstrate that the maximum pipe deflection does not exceed 5%. If excessive pipe deflection obstructs passage of the mandril, the contractor shall excavate and make suitable repairs.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, and the following:

a. Test plastic gravity sewer piping according to UNI-B-6 or ASTM F 1417.

6. Manholes: Perform exfiltration hydraulic test according to ASTM C 969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

E. Additional construction, testing, and replacement costs resulting from damaged or improperly installed infrastructure shall be paid for by the Contractor.

3.10 Cleaning

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION

Section 26 6000
General Conditions for Electrical Work

PART 1 - ORDINANCES, REGULATIONS AND CODES

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary conditions, Divisions 0 and 1, specifications apply to work of this section.

1.02 All work must conform to the requirements which fall within the scope of the regulations in the Codes or under the jurisdiction of any of the governing bodies listed.

A. The California Code of Regulations, Titles 19 through 24.

B. The California Electrical Code as applicable under current state and local regulations (latest edition and supplements).

C. State Board of Health.

D. CAL-OSHA Regulations.

E. Nothing in these Specifications or shown on the plans shall relieve the Contractor from full compliance with applicable portions of any of the above regulations pertaining to work which shall be installed under this Contract.

1.03 PERMITS AND FEES

Pay for and obtain all permits, inspection fees, etc., as required for the completion of all work included in this Contract. Any inspection Certificates required shall be obtained and delivered to the Owner.

1.04 EXAMINATION OF DRAWINGS AND SITES

Before submitting his bid, the Contractor shall carefully examine the Architectural, Structural, Mechanical and Plumbing Drawings for this work, along with the Specifications for same in addition to the drawings and specifications governing the work of this trade. The Contractor shall also visit the site of the proposed construction and be familiar with all the site conditions. No subsequent allowances will be made to the Contractor because of negligence in complying with the above or any alleged inability to understand the requirements.

1.05 CONDUCT OF THE WORK

The Contractor shall maintain on the job a competent foreman or a superintendent at all times to superintend the work.

1.06 CONTRACTOR'S RESPONSIBILITY

The Contractor shall be responsible for the safety and good condition of all materials and equipment until final acceptance by the Owner. The Contractor shall erect and maintain suitable barriers, protective devices, lights, and warning signs where required for the protection of the public and employees about the buildings. The Contractor shall be fully responsible for any loss or injury to persons or property resulting from negligence or the carelessness and neglect of his employees.

1.07 SUBMITTALS

A. Shop drawings of power and signal service and distribution equipment and lighting fixture catalog cuts shall be submitted for approval via PDF.

B. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor, table of contents and indexed tabs dividing each group of materials or item of equipment. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identical by the mark number as indicated on drawings.

C. Equipment or material furnished or incorporated in construction without prior approval of the Architect may be rejected and if rejected shall be removed from the structure and replaced with approved equipment or material at the Contractor's expense.

1.08 RECORD DRAWINGS

See General Conditions.

1.09 CATALOG DATA AND OPERATING INSTRUCTIONS

Upon completion of the work in this Contract, the Architect shall be furnished with a complete set of catalog data which describes each piece of equipment installed under this Contract. The catalog shall be bound in a set and shall be clearly labeled as to each item of equipment used.

PART 2 - LOCATIONS

2.01 The work as laid out is to some extent diagrammatic, and the location thereon indicated may be approximate only. The Contractor, therefore, shall install all the equipment, apparatus, conduit runs and the like as follows:

A. Adhere to the location indicated as far as possible.

B. Maintain ample head room in all rooms and passageways, clearance around all apparatus and equipment and under pipe lines for unrestricted passage and for easy servicing of all apparatus, equipment, devices and the like.

C. Verify the exact locations of all fixtures and other apparatus or devices as indicted on the drawings. In the event these drawings do not sufficiently indicate the locations for all such fixtures, apparatus or devices, the Contractor shall obtain the exact locations from the Architect.

2.02 VERIFICATIONS OF DIMENSIONS

A. The Contractor shall, as work progresses, verify the dimensions of the spaces available for the installation of the work and he shall assume full responsibility for the proper locations and grading of each portion thereof.

B. Where the work requires connections to be made to equipment that is furnished and set in place by others, the Contractor shall obtain exact locations and rough-in dimensions from the manufacturer of such equipment, and he shall install the connections in a neat and workmanlike manner.

2.03 CUTTING AND PATCHING

This Contractor shall do all cutting and patching of the work for the installation of the equipment and materials as approved by the Architect and/or Engineer. All patching shall accurately match the adjoining work.

2.04 BORING

A. Provide mechanical boring equipment to bore under existing asphalt, concrete, or other surfaces or objects as noted on the drawings. All borings shall be a minimum of 24" under the substrate material unless otherwise authorized by the Architect.

B. Holes shall be bored not to exceed 1" larger diameter than the largest component remaining in the excavation.

C. Water or air pressure jetting are not permitted, unless they comply with the following requirements:
   1. All surfaces of the hole can be visually inspected with 6' maximum length.
   2. All objects shall be supported continuously to prevent sagging.
   3. The hole shall be filled with compacted damp sand and inspected by the Project Inspector or Materials Testing Lab technician.

2.05 FOUNDATIONS AND SUPPORTS

This Contractor shall provide all foundations, supports and hangers, etc., as required to install the equipment as specified or shown on the drawings. All equipment shall be supported, braced and cross-braced in such manner as to prevent sway and/or lateral movement.

2.06 EXCAVATION AND BACKFILL

A. Excavating required for the installation of the work shall be done by this Contractor. Underground lines outside the buildings shall be installed with a minimum cover of 24" except depth of utility services shall comply with respective utility company requirements.

B. The conduit shall be laid on material described below to afford bearing for the full length of the conduit. Any part of the trench excavated below grade shall be corrected with thoroughly compacted material approved by the Architect.

C. When the bottom uncovered at subgrade is soft and, in the opinion of the Architect, cannot support the conduit, a further depth shall be excavated and refilled to conduit foundation grade as required by the Architect.

D. Backfill:
   1. 6" Below, Around, and to 6" Above Conduit: Material shall be sand. Place carefully around and on top of conduit, taking care not to disturb conduit. Consolidate with vibrator.
   2. 6" Above Conduit to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

E. No excavation below the level of, or adjacent to, foundations of footings shall be made except in a manner approved by the Architect.

F. A red or yellow tracer tape stating "CAUTION ELECTRIC LINE BURIED BELOW" shall be installed 12" above conduit, full length of trench.

G. Electrical conduit shall not be run in excavations provided for plumbing or heating pipes, unless separated by a minimum of 12 inches.

H. Verify location of all underground lines with Owner and utility companies before starting excavation. If any utility company facilities are identified and located within the perimeter of the building, the Contractor shall stop work, promptly notify the Architect and secure instructions.

I. Ten (10) days before doing any excavation or trenching, contact "Underground Service Alert," 1-800-642-2444, advise them of work schedule and comply with their recommendations.

2.07 CLEANING UP

A. The Contractor shall keep the premises free from accumulations of his waste material or rubbish. At the completion of the work, he shall remove all his rubbish, tools, scaffolding and surplus materials from and about the buildings, leaving the premises in a clean condition.

B. All exterior surfaces of exposed equipment and material shall be thoroughly cleaned of all dirt, cement, plaster and other debris, including the exterior surfaces of all conduit, conduit fittings, conduit hangers, insulation and the like.

C. All surfaces to be painted shall be carefully wiped or otherwise cleaned; cracks and corners scraped out clean, grease and oil spots removed so that surfaces may receive paint without further preparation.

D. All fixtures and plated materials shall be thoroughly cleaned and polished.

2.08 DAMAGE BY BREAKS

The Contractor shall be responsible for all damage to any part of the premises caused by breaks in conduit or fixtures furnished and/or installed by the Contractor under this specification for a period of one (1) year from date of acceptance of the project by the Owner.

2.09 SITE CONDITIONS

A. Where existing utilities are shown on the plans, extreme care shall be exercised in excavating near these utilities to avoid any damage thereto, and the Contractor shall be held responsible for any such damage caused by this operation.

B. The general location and arrangement of conduit, equipment apparatus, etc., as shown in the drawings or herein specified and all installations shall be made in accordance therewith. Information on the drawings relative to existing services is approximate only. Minor deviations required to conform to actual locations shall be made without additional cost to Owner.

C. Should existing utilities, not shown on the plans, be found during excavations, or identified, the Contractor shall promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any damage arising from the operations after discovery of such utilities not shown on the plans. These utilities shall be removed or relocated as directed by the Architect. An equitable adjustment in the Contract will be made for the additional work involved.

D. The Contractor shall use special precautions where excavations are made in the areas near electrical ducts since they may be high voltage ducts. All such ducts shall be exposed by careful hand excavation so as not to damage the ducts or cause injury to personnel and shall be suitably marked with warning signs, barricades, etc. as required.

2.10 STANDAR PRACTICE

All work not shown in complete detail shall be installed in conformance with the best standard practice for the trade.

2.11 INTENT

It is the intention to provide systems that are complete in every respect without further cost to the Owner. Anything not shown in drawings, or indicated in the specifications, but required for complete operating systems shall be included as part of this Contract. This shall include all connections to existing services.

2.12 SPECIAL NOTE

Attention of Contractor is hereby called to all work covered by notes on the drawings. Work covered by notes must be furnished and installed whether it is specifically mentioned in these specifications or not.

2.13 GUARANTEE

Except as otherwise specified, all materials, apparatus equipment furnished and installed under the Electrical Section of this specification shall be new and free from all defects. Should any trouble develop within a period of one (1) year from date of acceptance of the work, due to inferior or faulty material and/or workmanship, the trouble shall be corrected, and material and equipment replaced by the Contractor without expense to the Owner.

2.14 SERVICES

The location of any existing utility services shown on the drawings is approximate and shall be checked by this Contractor for exact location. Refer to "EXCAVATION AND BACKFILLING" for additional requirements.

2.15 LIST OF MATERIALS

Within thirty (30) calendar days after the award of the Contract, the Contractor shall PDF of a complete list of materials to be installed under this Contract, giving, in the case of each item of material to be used, the name of the article. All substitutes must be approved by the Architect as stipulated in Section 01620.

2.16 ACCAESS OPENINGS

It shall be the responsibility of the Contractor to provide sufficient and convenient access openings, panels, etc., in the building construction where required for the maintenance of, installation and/or removal of all equipment, or other items of the various systems and equipment.

2.17 PURACHASE ORDERS AND EQUIPMENT

A. The Contractor shall file with the Architect two (2) certified copies of all purchase orders, for materials, equipment, appliances, and rentals thereof within two (2) weeks from date of Notice to Proceed with the Contract if requested by the Architect.

B. The Contractor shall file with the Architect two (2) certified copies of acceptance of purchase orders for materials, equipment, and appliances by the manufacturer, distributor, or wholesale house within six (6) weeks from the date of Notice to Proceed with the Contract if requested by the Architect.

C. Failure to provide same within the stipulated time shall be deemed sufficient cause for the Architect to withhold certificates of payment for work completed or materials and equipment provided by the Contractor or his subcontractors toward the completion of their Contracts.

END OF SECTION
26 6000

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Section 26 7000
Basic Electrical Materials and Methods

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary conditions, Divisions 0 and 1 and Section 26 6000 specifications apply to work of this section.

1.02 SCOPE OF WORK

This portion of the work includes the furnishing of all labor and materials necessary for the complete wiring system to outlets and all equipment shown on the drawings or covered by this Section of the Specifications and other Division 26 and Division 28 sections of the Specifications. In general, the work includes the following:

A. Complete system of conduits, substructures and equipment for power, telephone, and cable television services. The Electrical Contractor shall inform the respective utility companies that the project has been started and confirm that all forms, which are required for the Application for Service, have been completed and submitted to the Utility Company. The Electrical Contractor shall obtain a copy of the approved engineering drawings prior to construction.

B. Complete system of branch circuit wiring, conduit and distribution equipment for lights, receptacles, and power.

C. Furnish and install lighting panelboards, lamps, lighting fixtures, wall switches, convenience outlets, etc. as shown 0n the drawings.

D. All hangers, anchors, sleeves, chases, and supports for fixtures, all electrical equipment, and materials.

E. Furnish, install, and connect wire, conduit, and switches, etc. required for other equipment covered by other sections of these Specifications.

F. All excavating and backfill as required for electrical work.

G. The patching and repair of all work modified or damaged by the installation of work under this Contract.

H. Outlet boxes and conduit system for telecommunications (voice and data).

I. Demolition work.

J. Terminal cabinets and backboards.

K. The Contractor shall furnish and install all work necessary to make complete systems, whether or not such details are mentioned in these Specifications or shown on the drawings, but which are necessary in order to make complete working systems, excepting only those portions that are specifically mentioned therein or plainly marked on the accompanying drawings as being installed by other Contractors.

L. Electrical Contractor must coordinate the work with the work of other trades so as to provide raceways, conductors and outlets in the correct location for the equipment served, including all built-in appliances, mechanical, and signal equipment and connect same. Electrical Contractor must provide power of the correct voltage and phase to each item of equipment.

M. Before construction starts, the Electrical Contractor shall arrange a coordination meeting with the General Contractor and all other subcontractors supplying equipment that requires electrical connections. All electrical requirements shall be verified, and any problems shall be immediately reported to the Architect. Equipment items to verify shall include, but not be limited to: Voltage, amps, phase, location, orientation, space requirements, type of connection, starter and disconnect location and provision, control system operation and requirements, etc.

N. The above list is given for the convenience of the Contractor and is not considered all-inclusive.

1.03 TEMPORARY CONSTRUCTION POWER

A. Provide a temporary construction power system that is adequate for this project. Coordinate requirements and details with the General Contractor. All 120V, 15A and 20A receptacles shall have ground fault circuit interrupter protection.

PART 2 - WORK NOT INCLUDED

2.01 The furnishing and installation of motors.

2.02 Access panels.

PART 3 - MATERIALS

3.01 All materials, appliances, and equipment except that furnished by the Owner shall be new, bear U.L. Label and of the make, brand or quality specified or as accepted by the Architect as herein provided. This shall also apply to all parts of the work whether or not this particular paragraph is referred to by number.

3.02 All apparatus, conduit systems, etc., shall be installed and interconnected so as to form complete systems as herein specified and/or shown on all the accompanying drawings. This Contractor shall furnish and install all work necessary to make complete working systems, excepting only those portions that are specifically mentioned herein or plainly marked on accompanying drawings as being furnished by other contractors.

3.03 MAIN SWITCHBOARD

A. Dead front, dead rear, floor standing, consisting of underground pull section, main section with main circuit breaker and equipment to accommodate power company's current transformer and meter, distribution section and sub-feed circuit breakers as shown on drawings. Main switchboard shall be as manufactured by Square D, General Electric, Eaton, Siemens or approved equal.

B. Circuit breakers shall be molded case type, quick-make, quickbreak, with thermal magnetic trip. Size and rating shall be as shown on the drawings. All circuit breakers shall be bolt-on type. Two and three pole breakers shall have integral internal common trip. All circuit breakers, rated 100 amps and larger, shall be equipped with adjustable instantaneous trip settings.

C. Finish shall be one coat of rust-inhibiting primer and two coats of gray enamel.

D. Full-size buses shall extend the full height of the distribution section. A copper ground bus shall be provided firmly secured to each vertical section structure and shall extend the entire length of the switchboard.

E. Section or sections shall be fully bussed with either copper or tin-plated aluminum bussing with all hardware in place for future devices. The bussing shall be braced to withstand the fault current of 50,000A symmetrical minimum. Filler plates as required shall be supplied with two handles on each plate. Sub-feed devices shall be of the types indicated on the drawings and shall be lockable in the "Open" position. A nameplate shall be supplied for each device in each section of each switchboard affixed to the switchboard trim adjacent to device and indicating name of device as shown one line diagram. Black letters shall be minimum ¾" high on white background.

F. All circuit breakers in the main switchboard shall have short circuit current interrupting capacity exceeding the maximum available at service transformer. Contractor shall be responsible for obtaining fault current information from serving Utility Company prior to fabrication of main switchboard. The main switchboard shall have an integrated short circuit current interrupting rating of minimum of 42,000A symmetrical, or greater if indicated on drawings.

G. Underground pull sections shall be manufactured by the same manufacturer of the switchboard and per the serving Utility Company's requirements.

H. The Electrical Contractor shall submit three (3) copies of the main switchboard shop drawings to the Serving Utility Company for their approval prior to fabrication of the main switchboard.

3.04 PANELBOARDS

A. The panelboards shall be constructed in accordance with the standard set up by the Underwriters' Laboratories, Inc., and as manufactured by Square "D", General Electric, Eaton, Siemens or approved equal, and each shall contain the number and type of circuit breakers as indicated on the drawings. All circuit breakers, rated 100 amps and larger, shall be sub-feed type and equipped with adjustable instantaneous trip settings.

B. The panelboards shall be equipped with a hinged lockable door, piano hinged trim, and typewritten circuit directory. All finish in offices, corridors or areas subject to public view shall be prime coat for finish coat by painter. In storage rooms, equipment rooms, etc., finish shall be standard factory gray Hammertone. Provide a flush lock on all panelboards.

C. Provide an engraved Bakelite nameplate, fastened with screws or rivets to face of each panelboard, which will identify it.

D. Any panel with an isolated ground bus shall have a nameplate stating, "IG CIRCUITS". Nameplate to be same size and color and adjacent to panel designation nameplate.

E. PDFs of detailed construction drawings for the panelboards and terminal cabinets shall be submitted to the Architect for Approval before their construction is started.

3.05 MAGNETIC STARTER

A. Motor Starters shall be across-the-line magnetic type rated in accordance with NEMA Standards, sizes, and horsepower ratings, mounted in general purpose enclosures, or NEMA 3R as required. All starters shall be full voltage, non-reversing, unless otherwise noted. Thermal overload relays on starters shall be non-compensated bimetallic type with selector for either auto or manual reset. Overload heater units shall be provided in each leg of starter unit. Each starter shall have 2 auxiliary interlock contacts.

B. Each starter shall have a 120-volt control transformer and HOA selector switch mounted on cover.

3.06 TERMINAL CABINETS

A. Terminal cabinets shall be flush, or surface mounted as indicated with hinged doors and lock. The exterior finish to be same as for panelboards. Provide ¾" plywood backing inside of cabinet. Provide proper number of terminals in cabinets as required.

B. Provide a Bakelite nameplate fastened with screws or rivets to the face of each terminal cabinet, which will identify it.

C. Provide circuit directory and holder on inside of door with one line for each conductor entering and each conductor leaving cabinet.

3.07 RACEWAY AND FITTINGS

A. Shall be manufactured by Allied Tube and Conduit Corporation, AFC Cable Systems, Inc., Carlon, Cantex, PW Pipe or approved equal.

B. Galvanized rigid steel conduits (RSC) may be used in all above ground locations.

C. For underground runs in direct contact with earth, conduit shall be PVC.

D. Galvanized intermediate metallic conduit (IMC) may be used in indoor locations not in direct contact with earth.

E. Galvanized electrical metallic tubing (EMT) may be used in indoor dry locations in which it is:
   1. Not subject to physical damage.
   2. Not in direct contact with earth.
   3. Not in concrete slabs.
   4. Not in hazardous areas.
   5. On roof or walk cover when specifically shown on drawings.
   6. In masonry walls, not in the same cells as rebars.

F. Non-metallic rigid conduit shall be PVC Schedule 40 and may be used:
   1. Underground.
   2. Below concrete slab on grade.
   3. In concrete slab on floors above grade.
   4. In masonry walls, not in same cells as rebars.

G. Flexible steel conduit may be used in dry locations for final connections to:
   1. Motors, transformers, and other mechanical equipment, not to exceed 18 inches.
   2. Lighting fixtures, not to exceed 72 inches.
   3. Facilitate wiring in tight locations, when approved by the Engineer.

H. Flexible aluminum conduit may be used in walls or in attics to facilitate wiring in tight locations, when approved by the Engineer.

I. Liquidtight flexible steel conduit shall be used in outdoor or wet locations for final connection to motors or other mechanical equipment, not to exceed 18 inches.

J. Fittings:
   1. For rigid and intermediate steel conduits, fittings shall be:
      - Galvanized rigid steel threaded type.
      - Provide insulated grounding bushings at switchboard enclosures and panel enclosures for feeders.

2. For electrical metallic tubing (EMT), fittings shall be:
   - Zinc plated steel set screw type in dry locations.
   - Zinc plated steel compression type for conduits larger than 1", in wet locations and in masonry walls.
   - All connectors shall have an insulated throat.
3. For non-metallic conduits, fittings shall be PVC Schedule 40 type. Use PVC schedule 40 adapters at all boxes and panelboards.
4. Brush or dauber apply PVC cement.
5. For flexible metallic conduits, fittings shall be zinc-plated steel/malleable iron squeeze type.
6. For liquidtight flexible metallic conduits, fittings shall be zinc-plated steel/malleable iron compression type.
7. Use of the following is prohibited:
   - Crimp-on, tap-on or indenter type fittings.
   - Spray (aerosol) PVC cement.

3.08 PULL BOXES

A. Pull Boxes shall meet all code requirements as to size for conduits terminating therein and to thickness of material used in fabrication.

B. Fabricated sheet steel pull boxes shall be installed only in dry, protected locations and shall be furnished with knockouts and removable screw cover. The box shall be finished with one coat of zinc chromate and a coat of primer sealer and where exposed to public view shall be painted to match the surrounding surface.

C. Weatherproof sheet steel pull boxes shall be fabricated of code gauge galvanized sheet steel with two coats of rust resistant finish and shall be furnished with gasket and made completely weathertight.

D. Approved manufacturers for metal boxes are Cooper B-Line, Milbank, Hoffman or approved equal.

E. Weatherproof concrete pull boxes, junction boxes and telephone boxes shall be manufactured by Christy Concrete Products, Utility Vault or approved equal. All pull boxes shall be H/20 rated and be equipped with H/20 rated galvanized steel checker plate cover with the inscription "Electric, Lighting, Fire Alarm or Signal".

3.09 TIME SWITCHES

A. Shall be denoted as in the plans.

3.10 OUTLET BOXES

A. All outlet boxes shall be standard one or two piece galvanized knockout outlet boxes. Raco, Appleton, Thomas and Betts or approved equal.

B. All outlet box covers, rings or other fittings shall be standard galvanized. Raco, Appleton, Thomas and Betts or approved equal.

C. No outlet box shall be smaller than four inches (4") square and 1 ½" in depth, except in concrete block construction where Thomas and Betts concrete masonry boxes are approved.

D. Floor outlets on grade shall be fully adjustable type floor boxes, suitable for use in concrete floors. Wiremold #RFB6E-OG with a Wiremold #8CTC2NKTR Evolution cover assembly. Where floor box is installed in a bare concrete floor, provide a Bare Concrete and Terrazzo ring, Wiremold #RFB6E-CTR with a Wiremold #8CT2NKTR Evolution cover assembly. The cover shall be die-cast aluminum with nickel finish, unless otherwise noted on drawings. For 120V power, provide an industrial specification grade 20A 125V duplex receptacle with internal duplex receptacle bracket #RFB6DP, quantity as shown on drawings. For data/telephone, provide a decorator style receptacle bracket #RFB6GFI for mounting frame to accept the modular telephone/data jacks, unless otherwise noted on drawings. Any unused device compartments shall be covered with internal blank bracket #RFB6B.

E. All special outlets shall be as hereinafter specified or as shown in the drawings.

F. Thru boxes are not permitted.

G. Any unused boxes shall be equipped with a blank cover plate.

3.11 RECEPTICALS

A. Furnish and install an industrial specification grade 20A, 125-volt, 3 wire grounding type tamper-resistant duplex receptacle with one piece brass mounting strap at all receptacle outlets as indicated on drawings. Leviton #5362-SGW or equal as manufactured by Hubbell, Pass and Seymour, Eaton, or other approved manufacturers.

B. Device color shall be white.

C. Tamper-resistant isolated ground duplex receptacles shall be 20A, 125V NEMA 5-20R, orange in color. Leviton #T5362-IG or approved equal.

D. Tamper-resistant G.F.C.I. duplex receptacles shall be provided for 15 and 20 amp 125-volt circuits where required by the C.E.C. #210.8 and #590.6. At indoor locations, provide Leviton #G5362-0TW or equal. At exterior locations, provide weather and tamper-resistant type G.F.C.I. duplex receptacles, Leviton #G5362-WTW or equal. At damp locations, provide a diecast weatherproof lockable cover, RACO # 5028-0 or equal. At wet locations, provide a diecast weatherproof "while-in-use" lockable cover, Red Dot #CKSUV or equal.

3.12 LOCAL SWITCHES

A. Furnish and install industrial specification grade, quiet type toggle switches, 20 AMP rated 120/277V AC only, controlling wall and ceiling outlets as indicated on the drawings. Leviton #1221-2W or equal as manufactured by Hubbell, Pass and Seymour, Cooper or other approved manufacturers.

B. Where two or more switches are in proximity they shall be ganged in the same box, and they will be set under one plate. Switches controlling lights and/or outlets on emergency power shall be kept entirely independent of all other switches not on emergency power by mounting in a separate box.

C. Special receptacles or switches shall be as noted in the drawings.

D. Where key switches are noted on the drawings, provide Leviton #1221- 2KL.

E. Device color shall be white.

F. When a switch is used as a disconnecting means, it shall be mounted in a readily accessible location.

3.13 WALL PLATES

A. All wall plates for electrical outlets and devices shall be smooth stainless steel, non-magnetic type 302S.

B. All telephone outlet plates shall be blanked plates, same as device plates.

3.14 CONDUCTORS (Wire)

A. All wire installed in this contract shall be of a standard manufacturer as approved by the National Board of Fire Underwriters and be of the size as indicated on the drawings. All wire shall bear the Underwriters' label and shall be brought to the job in unbroken packages and approved by the Job Inspector before it is installed.

B. All power conductors #10 AWG and smaller shall be type THWN copper, unless otherwise noted. All conductors #8 AWG and larger shall be type THWN-2 copper, unless otherwise noted.

C. All underground conductors in a 480V or 480/277-volt power system shall be type XHHW-2 copper, unless otherwise noted.

D. Number 12 AWG wire shall be the smallest gauge wire used, except for signal circuits, which shall be as shown on plans or as specified under other sections of these specifications.

E. All wire #8 AWG gauge or larger shall be stranded.

F. The neutral conductor of all lighting feeders shall be of the same size as the phase conductors.

G. Splices on all wire less than #8 gauge shall be with insulated spring connectors Ideal "Wing Nuts", 3M "Scotchlok", or equal.

H. Splices in wires #8 gauge and larger shall be made with crimp on solderless connector, 3M Scotch, Burndy or equal. Connectors to switches or bus bar shall be made with one-piece lugs for all wires, sized for conductors as shown on plans.

I. Each branch circuit shall be marked with the circuit number at the panel and at the first outlet nearest the panel. E-Z Code Markers (Thomas and Betts) or equal shall be used to label the circuits.

3.15 LIGHTING FIXTURES

A. This Contractor shall submit for approval seven (7) portfolios with full description and manufacturer data sheets of all fixtures (including ballasts and lamps), that he proposes to use.

B. This Contractor shall furnish and install all lighting fixtures and lamps as indicated on the Electrical Drawings and in accordance with these specifications.

C. This Contractor shall be held responsible for the complete equipment of all fixture outlets with fixtures of the proper design as shown.

D. All fixtures shall be securely anchored to prevent any possible chance of their falling.

E. Continuous runs of fixtures shall be installed straight and true.

F. Recessed fixtures shall be complete with plaster frames, supporting brackets and hanger wires.

G. Stem lengths shall be adjusted to meet conditions where required. Furnish aligners to ensure vertical alignment (ball aligner).

H. Electrical Contractor shall coordinate outlets with Acoustic Tile Contractor and other trades and locate outlets in center or at intersections of acoustical tile in all acoustical tile ceilings.

I. Recessed fixtures in t-bar ceilings shall be attached to t-bar ceiling with integral t-bar clips, two at each end of fixture.

J. When the light fixture is equipped with an integral emergency battery pack, the light fixture shall be connected so that it is controlled via the room light switch and is automatically energized when power has fails.

3.16 PHOTO CONTROLS

A. See plans for requirements.

3.17 MOTOR DISCONNECTS

A. Disconnects shall be fused safety switches with dual element fuses. Heavy Duty rated with quick-make, quick-break operating mechanism. Fuse rating shall comply with motor manufacturer's recommendations. Switch shall be UL listed. Disconnects shall have an external operating handle, lockable in the open or closed position.

B. Disconnect switches shall be located so as not to obscure any part of the HVAC unit's nameplate data.

C. Each disconnect switch shall have an engraved Bakelite nameplate identifying the panel and circuit number that feeds the motor. Nameplates shall comply with specifications for "Identification of Switches and Apparatus".

3.18 DRY TYPE TRANSFORMERS

A. Transformer shall be Class H insulation with temperature rise not exceeding 115 degrees C., in a maximum ambient of 40 degrees C., with rated nameplate load connected to the secondary side, at rated voltage. Unless otherwise noted, the transformer shall comply with the Energy Efficiency levels mandated by the Department of Energy.

B. Transformer shall be built in accordance with the latest revised IEEE, ANSI and NEMA standards.

C. Case temperature shall not exceed 35 degrees C., above ambient.

D. Designs shall incorporate built-in vibration dampening systems.

E. Terminal compartment shall be located to ensure termination of cable leads in temperature levels not to exceed 60 degrees C., and to provide for side or bottom entrance of conduit. Enclosures shall be weatherproof and rodent proof. Ventilation openings shall be louvered type. Screening will not be acceptable.

F. Transformer shall be furnished with 2 taps above and below rated voltage, each 2½%.

G. Transformer shall be suitable for non-linear loads and have a U.L. rating of K-4, when indicated on the drawings.

H. Acceptable manufacturers shall be Square "D", General Electric, Eaton, Siemens or approved equal.

PART 4 - EXECUTION AND INSTALLATION

4.01 CONDUIT SYSTEMS

A. concealed conduit system shall be installed for all interior wiring including controls. Conduit shall be run continuously between outlets, etc., and with the minimum number of bends.

B. PVC 40 shall be used for underground runs.

C. Where underground conduit cannot be run below building footings and the Contractor shall provide PVC-80 sleeves through the footings (Contractor shall obtain approval for all sleeve sizes and locations with the Structural Engineer before installation).

D. All conduit shall be delivered to the site of construction in their original bundles. Each length of conduit shall bear the label of the National Board of Fire Underwriters. All conduit subjected to rough usage while on the job before installation and not acceptable to the Architect shall be removed from the premises upon notice.

E. Conduit installed in masonry walls shall be rigid steel galvanized conduit, PVC or EMT, not in same cell as re-bars.

F. The joints in all conduits installed under concrete slabs on the ground, or underground, or exposed to the weather, shall be made liquid and gas tight. All underground conduit outside of the buildings shall be buried to a depth of not less than 24" below finish grade. Utility services shall comply with utility company requirements. Two or more conduit runs installed in a common trench shall be separated horizontally by at least four inches (4"). Electrical conduit runs installed in a common trench with other utility lines shall be separated horizontally from such lines by at least twelve inches (12"). Provide a detectable warning tape, 12" above the top of the conduit and the full length of trench.

G. Changes in direction shall be made with conduit elbows or long radius bends made on the job. Where two or more conduits are grouped in exposed locations, the sweeps shall be struck from the same center forming concentric arcs.

H. All joints in conduit shall be made with standard coupling. In making joints, conduits must be truly and accurately cut and threaded (where applicable) with straight thread, smoothly reamed and squarely butted. All conduit shall be kept corded and dry during construction, using plastic caps or conduit pennies held in place with conduit bushings. Should dirt or moisture collect in any conduit, the Contractor shall swab them out to the satisfaction of the Architect.

I. Conduits ending at the motors shall be carried as close as possible to the terminal blocks making allowance for the movement of the motors when they are equipped with slide rails. The connection between the conduit terminals on the motor and the conduit shall be made with liquid-tight flexible conduit using the proper fittings.

J. All conduits where they enter panel enclosures, pull boxes, or outlet boxes shall be secured in place by galvanized locknut inside of box.

K. Where conduits are run exposed, they shall be installed straight and true with reference to the adjacent construction.

L. Any conduit installed under the building shall be under the slab. The top of any conduit below floor slab shall be a minimum of 4" below the bottom of the concrete slab.

M. All boxes for bracket outlets shall be equipped with a 3/8" "No-Bolt" fixture stud. These boxes shall be so set that when in place the fixture shall be at right angles to the ceiling or walls.

N. All empty conduit shall be equipped with a nylon pull rope continuous from outlet-to-outlet or end-to-end.

O. Flexible conduit will be permitted for connecting lighting fixtures to junction boxes.

P. Flexible connections in outdoor and damp locations shall be flexible liquid-tight metal conduit or non-corrosive seamless metallic tubing with watertight connections.

Q. Install roof jacks for this construction in accordance with other sections of this Specification.

R. The maximum allowed length of flex conduit at equipment connections is 18".

S. Expansion joints for conduit shall be provided where required to compensate for thermal expansion and contraction.

T. At all sub-panels and terminal cabinets, stub two 1"C and two ¾"C into the accessible attic space. If the attic space is not accessible, stub conduits to a location as directed by Architect or Engineer. Provide additional conduit stubs when indicated on the drawings.

U. Support conduits on roof with prefabricated pipe supports (B-Line "Dura-Blok Series" or equal), spaced 8 ft. O.C. maximum. Minimum clearance from roof to framing channel shall be 4". Framing channel length shall be as required plus 50% spare length. Installation shall comply with manufacturer's recommendations.

V. Any conduit entering underground pull boxes shall be sealed to prohibit water from entering the conduit. Conduits with conductors shall be sealed with a sealing compound after all conductors have been installed. All spare (empty) conduits shall be identified with either the "origination" or "destination" (example: to pull box 150' to the south, from Main Switchboard, etc.). The contractor shall use a scrap piece of ¾" PVC conduit, approximately 5" in length and tie the nylon pull string thru it. Write the description on the conduit using an indelible/permanent marker.

4.02 OUTLETS

A. In general, the locations of electrical outlets shall be as shown on the drawings; however, the Contractor shall make any changes necessary to suit conditions on the job or rearrangement of built-in fixtures and equipment as directed by the Architect or a representative.

B. The Contractor shall study the general building plans with relation to spaces surrounding each outlet in order that the work may fit the work of others and that when fixtures or other equipment are installed, they will be symmetrically located according to room layout. Refer all conflicts and discrepancies promptly to the Architect.

4.03 OUTLET BOXES

A. Outlets for concealed wiring shall be flush with the finished wall or ceiling surfaces. Pull boxes, junction boxes and all others to which no fixture or device is to be attached, shall be fitted with blank cover plates, and painted to match surroundings. To reduce noise transmission between rooms, outlet boxes shall not be installed back-to-back. Where outlets are side by side and faced into opposite rooms, the boxes shall be at least 6" apart, except in fire rated walls space boxes at least 24" apart. If the boxes are connected together, the connection shall be flexible and shall have openings packed with fiberglass.

B. The Electrical Contractor shall inform himself of wall thickness throughout the building and shall provide outlet boxes of suitable depth that can be flush mounted and yet will be deep enough to contain the particular apparatus involved. The location of exposed pull or junction boxes will be subject to the Architect's approval.

C. Outlets from which lights are suspended shall have approved 3/8" fixture studs fastened through from back of box. All outlet boxes and particularly those supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures, not from acoustic ceilings. All lighting fixture outlets shall be coordinated with mechanical, architectural, or other equipment to eliminate conflicts and provide a workable, neat installation.

D. Where more than one switch occurs at the same location, use multiple gang outlet boxes covered by a single plate; provide box partitions as required by the C.E.C. Switches controlling lights and/or outlets on emergency power shall be kept entirely independent of all other switches not on emergency power by mounting in a separate box.

E. Outlet box extensions shall be UL listed and shall be attached to box with threaded metal screws. "Flash guards" are not permitted to be used as box extensions.

4.04 LOCATIONS OF OUTLETS

A. The Architect reserves the right to make reasonable changes in the indicated locations before work is roughed in without additional charge to the Owner.

B. Where wainscot occurs at the 4'-6" level, the switch shall be mounted lower in the wainscot as near the 4'-0" level as possible, but in no case, shall the switch be partially in the wainscot and partially in the wall. It shall be the Electrical Contractor's responsibility to verify all door swings. Switches, unless specifically noted, shall be on the strike side of the door. If switch is indicated on hinged side of door, verify location with Architect.

4.05 CONDUCTOR INDENTIFICATION INSTALLATION

A. The drawings indicate the arrangement of outlets on each branch circuit and the circuit tags show the number of the circuit, and the board to which it will be connected.

B. Circuits indicated with the same numbers shall be connected to the same breaker on the panelboard.

C. All feeders and branch circuits shall be tagged in all pull boxes and in the gutters of all panels to which they connect.

D. All wiring shall be done in identified neutrals.

E. No wire shall be installed until all work of other contractors that might cause injury to the said wire has been completed. Care shall be used to pull wires to ensure that no damage occurs to the insulation. A wire lubricant shall be used for pulling in wires.

F. In making the connection of all branch circuits to the terminals of switches, base plugs, etc., the wires shall be looped around the binding screws or be fitted with connecting lugs. At the ceiling outlets, this Contractor shall leave not less than 6" of free ends on each wire for connections to the fixtures.

G. No splices shall be permitted except in outlet boxes, and in panelboard gutters.

H. Switches and receptacles shall be securely fastened to the outlet box. Where the outlet box covers are back of the finished walls the switch or receptacle shall be built out from the same with washers so that it is rigidly held in place to the box. The floating of any switch or receptacle will not be permitted.

I. All signal and communications conductors shall be identified in terminal cabinets as to type of system e.g.: clock, bell, fire alarm, etc. and location of other end of conductor by room number or name as directed by Owner. Identification shall be by numbers at terminal strips and a numbered directory in cardholder inside terminal cabinet.

J. Fire alarm system cabling and wiring shall be color-coded as follows:

Initiating Devices:	-Addressable cable, red jacket.
Signaling Devices:	-Black and Red wires for horns, strobes or horn strobes. -Speaker cable, blue jacket for speakers.

K. All power wiring size #6 AWG and smaller, shall be factory color-coded. For larger than #6, mark conductors on each end and at all junction and/or pull boxes with a 1" bank of colored pressure-sensitive plastic tape. For isolated ground wires, mark with a 1" band of green tape, followed by a 1" band of yellow tape, followed by a 1" band of green tape. Colors for each phase and the neutral shall be consistent throughout the system. Color code shall be as follows:

WIRE	120/208V
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equip. Ground	Green

The white or gray conductor shall be the neutral at each outlet. All switches shall be installed in "hot" leg. On all lighting circuits the switch leg shall be purple from switch to fixture. All travelers from switch to switch on 3 and 4-way switches shall be pink. This color code shall be followed by Contractor for all fixture whips except for factory-manufactured whips. When factory manufactured whips are used, color code shall apply to all wiring except the factory whip.

L. Conductors having white, gray or green covering shall not be used to indicate anything other than neutral or grounding. This limitation applies to all power, lighting, and control circuits.

M. Installation of conductors shall be made in a neat and workmanlike manner to meet Code requirements and shall be run continuous without weld, splice or joint between boxes. Do not install wires in conduit unless the entire system of conduit and outlet boxes is permanently in place. All conductors shall be pulled using a UL approved wire lubricant.

N. Make all terminations at motors using 3M Series 5300 Motor Lead/Cable Splicing Kits. Make connections per 3M written installation procedures.

O. On all bolted electrical connections, the Contractor shall use Belleville washers.

P. All wiring to be neatly bundled and tied with nylon cord or plastic straps.

Q. When approved by the Electrical Engineer, splices in underground pull boxes shall be made with crimp on compression connectors and insulated with heat shrink sleeves or with splice kits listed by the manufacturer for wet locations. Wire nuts are not permitted. Cables and/or conductors for fire alarm and signals systems shall not be spliced.

4.06 GROUNDING

A. The conduit system supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded, in accordance with Title 24 of the California Code of Regulations. The neutral shall only be grounded at the main service location unless specifically noted otherwise on the drawings or required by the California Electrical Code.

B. This Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc.: where it is not possible to obtain good contacts, the conduits shall be bonded around the boxes with a #6 AWG gauge conductor with ground clamps.

C. All equipment cases, motor frames, etc. shall be completely grounded to satisfy applicable code requirements.

D. At each building, the interior hot and cold-water piping and the interior aboveground gas piping shall be bonded to the building service equipment per C.E.C. #250.104.

E. Do not use underground gas piping as a grounding electrode.

F. Pull a green equipment ground conductor in all power conduits, both metallic and non-metallic.

G. Isolated ground conductor shall begin at the isolated ground bus in the panel in the building served and shall not be connected to any neutral conductor or any item not isolated from the system ground. All isolated ground circuits shall have a separate neutral conductor (not used for more than one circuit). The isolated ground conductor cannot extend upstream from the building served.

H. Where there is more than one building supplied from a common service, provide a grounding electrode at each building per C.E.C. #250.32.

I. At each telephone backboard and/or data backboard, provide a power distribution block (one pole with two primary openings and six secondary openings) and mount at + 18" A.F.F. unless otherwise noted. Run ¾"C - 1 #6 AWG to the ground bar of the nearest panel or the ground bus of the main switchboard. The power distribution block shall be Square D #LBA 163206 or equal.

4.07 MOUNTING HEIGHTS OF EQUIPMENT

Unless otherwise specified elsewhere or shown on the plans, the following mounting shall apply:

A.	Panelboards:	6'-0" top of box
B.	Disconnect Switches:	4'-0" to center line
C.	Contactors:	4'-0" to center line

4.08 IDENTIFICATION OF SWITCHES AND APPARATUS

All switchboard circuits, externally operated switches and apparatus used for the operation of or control of circuits, appliances, or equipment shall be properly identified with an engraved Bakelite nameplates, 1" x 3", black letters on white background. All such nameplates shall be of the self-adhesive type and attached onto the apparatus by screws or rivets. Card holders in any form are not acceptable.

4.09 EARTHQUAKE PROOFING OF FIXTURES

A. Fixtures weighing more than 50 pounds shall be supported independently of the outlet box.

B. Pendant type fixtures shall be designed so that they may swing horizontally in any direction a minimum of 45 degrees from the vertical. Pendant shall have ball aligner at top, and swivel connection at fixture. If there is an obstruction within the 45 swing of the fixture the Contractor shall provide a State approved restraint to keep fixture from swinging into the obstruction.

C. All fixtures mounted in or on suspended ceilings shall be fastened to the ceiling-framing members in accordance with C.E.C. #410.36(B). Recessed fixtures in t-bar ceilings shall be provided with integral t-bar clips, one near each corner to attach it to the t-bar ceiling frame.

D. Recessed fixtures in T-bar ceilings shall be attached to the building structure above with #12 Ga. slack safety wire at two diagonal corners of each fixture (two wires per fixture).

4.10 FIRE RATING AREAS

A. Where light fixtures, conduit, cabinets, or boxes penetrate fire rated ceilings, walls or floors provide a fire rated enclosure or fire stop. Rating of enclosure or fire stop shall match or exceed rating of area penetrated. Verify location of fire rated areas with architectural drawings and with General Contractor.

B. Where outlet boxes are recessed on opposite sides of a fire rated wall, boxes shall be separated by a horizontal distance of at least 24 inches. Where the wall opening for a steel electrical outlet box exceeds 16 sq. inches in area, or an aggregate of more than 100 sq. inches for any 100 sq. feet of wall or partition area, fire stopping is required.

C. Penetrations in walls, floors or ceilings requiring protected openings shall be fire-stopped.

D. Fire-stopped shall be of an approved material, securely installed and be in conformance with the 2019 C.B.C., Section 714.3.1 and 714.3.2.

E. All required fire-stopping and joint sealants as a result of the work in Divisions 26, 27, and 28 is the responsibility of each individual trade. Refer to Sections 07 400 and 07 9210, respectively.

PART 5 - COORDINATION

5.01 HEATING, AIR CONDITIONING, PLUMBING AND OTHER MECHANICAL WORK

A. The Mechanical Contractor shall furnish equipment such as motors, starters, thermostats, wiring diagrams, etc. However, the Electrical Contractor shall be responsible for furnishing and installing all fused disconnect switches, conduits, wire, fittings, etc. for power connections.

B. Install all electrical equipment where it is not already installed as a part of a unit furnished by the Equipment Contractor. (See drawings of respective contractors).

C. The Electrical Contractor shall furnish fused disconnect switches for pumps, motors and air conditioning and handling units, if they are not furnished by others. Fuses shall be dual element, rating per equipment manufacturer's recommendations. Disconnects shall comply with requirements for "Motor Disconnects" as specified earlier in this section.

D. All disconnect switches (whether provided with unit or by Contractor) shall have a circuit identification engraved nameplate as specified under "Motor Disconnects".

E. Thermal overload protection shall be furnished for all motors where such protection is not included as a part of another contract.

F. All motor outlets, disconnect switch locations and control outlets shown on the plans are approximate only. Verify exact location of same with Equipment Contractor.

G. All line and low voltage controls, including conduits, outlets, wiring and connections shall be furnished and installed by the Mechanical Contractor. (Division 23).

H. Furnish and install a weather-resistant duplex receptacle with ground fault circuit interrupter protection within 25 ft. of all rooftop H.V.A.C. units. Provide a diecast weatherproof "while-in-use" lockable cover, Red Dot #CKSUV or equal.

I. Coordinate with General Contractors, Mechanical Contractors and equipment suppliers before bid is submitted and again before rough-in is started to verify that all systems are complete and all components are provided including starters, disconnects, relays, solenoids, control conduit and wire, etc.

PART 6 - MISCELLANEOUS

6.01 MISCELLANEOUS EQUIPMENT

A. Contractor shall be responsible for electrical hook up and connections to all electrical equipment whether furnished by this Contractor or others, including wiring, conduit, disconnects, circuit breakers etc., even if not shown on drawings. Verify all locations and requirements with equipment supplier before rough-in.

B. When there are fire sprinklers, the Electrical Contractor shall connect bell, flow and tamper switches and other electrical devices as required by Sprinkler Contractor and local and state fire marshal. Verify requirements with General Contractor before bid.

6.02 INTERRUPTION OF SERVICE

A. Interruption of service in existing buildings shall not be made at a time which will inconvenience the Owner. Before making any final connections to the existing buildings or doing any other work that will interrupt the service, the Contractor shall consult with the Owner and schedule the work at Owner's convenience even if it is necessary to make such connections after regular working hours.

B. This Contractor shall do all rerouting and reconnecting of existing electrical facilities made necessary by this construction. Care shall be taken not to disrupt existing facilities. If any facilities are disrupted, this Contractor shall replace or repair them at the Contractor's expense and to the satisfaction of the Architect.

6.03 CHANGES

A. Electrical Contractor shall consider the number of outlets for electric equipment shown on plans as final, but the Architect reserves the right to shift same, within reason, to a location and position which will meet more completely final requirements.

6.04 GUARRANTEE AND TEST

A. All electrical equipment testing, and related costs shall be included in the Contractor's bid.

B. Contractor shall obtain approval from the Architect of proposed independent testing agencies before any testing is started.

C. Equipment of all kinds installed by this Contractor shall be tested to determine whether it fulfills the requirements of these specifications. The Contractor shall furnish all labor necessary to adjust the operation of the apparatus and make the connections for the tests. After the tests have been completed, the Contractor shall restore all connections, apparatus, etc., to their original condition.

D. Should any piece of apparatus or any material or work fail in any of these tests, it shall be immediately removed and be replaced with new material by this Contractor at the Contractor's expense and the portion of the work replaced be again tested by the Contractor.

E. All circuit breakers, 100 amps or more, shall be tested by an independent testing agency in accordance with NETA specifications and a report submitted to the Architect. Any circuit breaker that does not pass the test shall be replaced.

F. The entire installation shall be free from short circuits and improper grounds. Panels and circuits shall be tested for grounds and shorts. Each individual circuit shall be tested at the panel with the equipment connected for proper operation. Ground tests shall meet the requirements of the California Electrical Code. Upon completion of the work, a final inspection by the Architect and other interested authorities shall be conducted. This Contractor shall guarantee to repair or replace at the Contractor's expense any material or equipment that develops defects or is determined not to be in conformance with the plans and specifications, during a period of one year after work is accepted by the Owner.

G. The grounding electrode system at the main electrical service equipment shall be tested by an independent testing agency in accordance with the three-point fall of potential method as specified in IEEE Standard 81-1983. The maximum ground resistance shall be 25 OHMS. A copy of the test report shall be submitted to the Architect and Engineer of record.

H. All feeder cables #2 and larger shall be tested for insulation resistance. Test report must include number of cables per phase & type of cable insulation.

I. Three copies of the test report shall be submitted to the Electrical Engineer prior to the final job walk.

J. The independent testing agency performing the above-mentioned tests shall be NETA or NICET certified or approved by the electrical engineer.

6.05 ELECTICAL TESTS

A. Measure system neutral insulation resistance to ensure no shunt ground paths exist. Remove neutral ground disconnect link. Measure neutral insulation resistance and replace link.

B. Determine the relay pickup current by primary injection at the sensor and operate the circuit-interrupting device.

C. Test the relay timing by injecting one hundred fifty percent (150%) and three hundred percent (300%) of pickup current, or as specified by manufacturer.

D. Test the system operation at fifty-seven percent (57%) rated voltage.

E. Test zone interlock systems by simultaneous sensor current injection and monitoring zone blocking function.

6.06 TEST PARAMETER

A. System neutral insulation shall be a minimum of one hundred (100) ohms.

B. Relay pickup current shall be set to a value between 20% and 25% the rating of the main circuit breaker. The setting shall be the in-service setting unless otherwise specified.

C. Relay time delay shall be the closest possible calibrated setting to .1 seconds. This shall be the in-service setting unless otherwise specified.

6.07 DEMOLITION

A. Remove and/or relocate electrical facilities as required to clear areas for new construction.

6.08 UTILITY COMPANY SERVICES CHARGES

All service charges shall be paid by the Owner. Monthly energy charges shall be paid by the Electrical Contractor.

END OF SECTION 26 7000

SECTION 270200
Communications General Requirements
(Structured Cabling Systems and Pathways and Spaces systems for all Voice and Data systems)

PART 1 SUMMARY

The Scope of Work covered by this document is to furnish and install the Structured Cabling Systems and Pathways and Spaces systems. This work will provide for the structured cabling system (SCS) for all Voice and Data systems.

1.00 Telecommunications system shall include the following systems:

A. Structured Cabling System (SCS) For Telecommunications Systems
1. Pathways for Telecommunications Systems
2. Grounding and Bonding System (GBS) For Telecommunications Systems
3. Fire stopping for Telecommunications Systems

1.01 ADDITIONAL REQUIREMENTS

A. Coordination of work: Contractor shall be responsible for coordination of work among project specification divisions and contractor/subcontractors involved in this project. This coordination of Work Includes following instructions provided the Construction Manager or General Contractor if project is managed by such.

B. General compliance requirements: Provide a complete and operable system in compliance with project drawings, specifications, referenced standards, applicable building codes, and Authority Having Jurisdiction (AHJ) requirements. Scope of this contract includes materials, equipment, labor, configuration, programming, testing, startup and commissioning services, and documentation costs for complete and operable system that meets all requirements indicated on drawings or contained in specifications. Comply with all contract documents, specifications, drawings, manufacturer's instructions, and Owner and AHJ requirements. In case of conflict among applicable documents or standards, contractor shall notify owner's representative in writing of apparent conflict, and then comply with most stringent requirements unless otherwise directed in writing from owner's representative. Work includes all items required for complete system whether or not identified in specification or drawings.

C. Information about general construction and architectural features and finishes shall be derived from structural and architectural drawings and specifications only.

D. Work related to telecommunications system shall be installed by an SCS manufacturers authorized or certified trained installer. Owner reserves the right to review and approves any personnel assigned to this project in a supervisory or managerial role.

E. SCS contractor shall have had at least 3 years of comparable experience with telecommunications projects. Comparable projects shall equal or exceed size and complexity of work on drawings.

F. Complete and usable work: Refer to and comply with requirements in section 27 02 67 outlined below.

1.02 RELATED DOCUMENTS AND DRAWINGS

A. General: The project drawings and general conditions of Contract shall apply to this section.

B. Coordination: Coordinate with work specified in other sections and divisions of specifications.

C. Reference: Codes and standards as referenced in Section 27 02 20 may define additional specifications or requirements not specifically called out within this division. However, contractor shall adhere to most stringent requirements as defined herein, or as defined by reference within section 27 02 20.

D. Architectural and Engineering specifications may have additional conditions or requirements that affect the work defined by this division of specifications. Contractor shall be responsible for the coordination of all conditions and other trade requirements that may impact schedule, scope of work, work progress, or other factors that may affect the overall ability for contractor to execute the requirements of this division of specifications.

1.03 CODES AND STANDARDS

A. General: All work, including but not limited to: cabling, pathways, support structures, wiring, equipment, installation and workmanship shall comply with the latest editions of the requirements of the Authority Having Jurisdiction (AHJ), California Electrical Code, all applicable local rules and regulations, equipment manufacturer's instructions, and the National Electrical Contractor's Association (NECA) Standard of Installation. In case of discrepancy or disagreement between the documents noted above, the Contractor shall satisfy the most stringent requirements.

B. Other sections of this document contain References to Codes and Standards that are applicable to the section.

1.04 CODES

A. California Electric Code (CEC)

B. National Fire Protection Association (NFPA)
1. NFPA 72, National Fire Alarm Code
2. NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment
3. NFPA 76, Recommended Practice for the Fire Protection of Telecommunications Facilities
4. NFPA 101, Life Safety Code

1.05 REFERENCE STANDARDS

A. Telecommunications Industry Association (TIA)
1. TIA-526-7, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant – OFSTP-7
2. T-526-14-A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant – SFSTP-14
3. TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises
4. TIA-568-C.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements
5. TIA-568-C.2, Commercial Building Telecommunications Cabling Standard—Part 2: Balanced Twisted Pair Cabling Components
6. TIA-568-C.3, Optical Fiber Cabling Components Standard
7. TIA-569-B, Commercial Building Standards for Telecommunications Pathways and Spaces
8. TIA-606, Administration Standard for Commercial Telecommunications Infrastructures
9. ANSI J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

B. Other Reference Materials
1. BICSI Telecommunications Distribution Methods Manual (TDMM)
2. BICSI Wireless Design Reference Manual (WDRM)
3. Institute of Electrical and Electronic Engineers (IEEE)
4. National Electrical Manufacturers Association (NEMA)
5. Underwriters Laboratories (UL) Cable Certification and Follow Up Program

1.06 DEFINITIONS

Access Floor - A floor system that has removable floor panels.

Building Backbone Cabling – Cabling used to connect Floor Distributors (FD) or other local collection points to the Building Distributor (BD). Building backbone cabling typically carries aggregate traffic and, as such, impacts multiple network devices and users. Building backbone cabling may include either fiber optic or copper cabling or both.

Building Distributor (BD) – Termination point from which all building backbone cabling emanates and interconnection point for the network backbone. Commonly referred to as BDF and Intermediate Cross-connect (IC). There is one BD for each building and it feeds all FD's in the same building. The BD should be located so that all FD's served are within 300 cable meters (984 cable feet). All BD's are linked to the

Campus Backbone Cabling – Cabling used to connect Building Distributors (BD) or other key network segments to the Campus Distributor (CD). With rare exceptions, campus backbone cabling carries aggregate traffic and typically impacts entire buildings worth of network devices and users and, as such, link redundancy with diverse routing is highly recommended. Campus backbone cabling almost exclusively consists of fiber optic cabling. Copper cabling may be used in short-distance (< 90m) applications. In such cases, lightning protection will usually be required by code.

Campus Distributor (CD) – Termination point from which all campus backbone cabling emanates and highest-level interconnection point for the network backbone. Commonly referred to as NOC and Main Cross-connect (MC). On smaller campuses, there is one CD for the campus. On larger campuses there might be several CD's with each CD serving several buildings. Besides linking to each of the BD's it serves, the CD is also the network interconnection point for data center links and links to service providers.

Category 3 (Cat 3) – A category of transmission performance, defined in EIA standards, that specifies electrical properties up to 10 MHz. Cat 3 is the minimum performance grade permissible and is used typically for analog voice distribution.

Category 5e (Cat 5e) / Class D – A category/class of transmission performance that specifies electrical properties up to 155.5 MHz. Capable of supporting copper-based, four-pair Gigabit Ethernet (IEEE 802.3ab 1000BASE-T)

applications. Category 5e is defined in TIA/EIA 568B.2 standard. Class D is defined in the ISO 11801 standard.

Category 6 (Cat 6) / Class E – A category/class of transmission performance that specifies electrical properties up to 250 MHz. Refer to the TIA/EIA 568B family of standards for more information on Category 6 and ISO/IEC 11801 for more information on Class E requirements. Also refer to CENELEC EN50173.

Category 6A (Cat 6) / Class E_A– A category/class of transmission performance that specifies electrical properties up to 500 MHz and capable of supporting data applications operating at 10Gbps. Refer to the TIA/EIA 568B family of standards for more information on Category 6 and ISO/IEC 11801 for more information on Class EA requirements.

Certification – The testing and documentation of the transmission performance (e.g., Category 5e / Class D) of a permanent link or channel, based on sweep frequency (where applicable) testing of numerous parameters with results compared to a range of acceptable values. This project requires 100% certification (with documentation) of all permanent link cabling at the time of installation. Channel certification is optional and is the responsibility of the group using the channel.

Channel – The entire physical pathway between active equipment ports, inclusive of all patch cords, patch panels, jacks and cabling segments.

Conduit - A raceway of circular cross-section.

Entrance Facility (EF) – Termination point of service provider cables that have entered the building and location of service demarcation point (MPOE) and interconnection point to the network. Commonly referred to as Telco Room and Entrance Facility (EF). The EF is linked to the CD, where present, or to the BD.

Floor Distributor (FD) – Termination point for horizontal cabling and interconnection point for network access. Commonly referred to as IDF and Horizontal Cross-connect (HC) - FD quantities and locations are determined by building size and geometry so that all points served are within 90 cable meters (295 cable feet) of an FD. The FD feeds all Telecommunications Outlets (TO's) in its service zone. All FD's in a building are linked to the building's Building Distributor (BD) via backbone cabling.

Horizontal Cabling – Cabling used to connect individual work area outlets to local Floor Distributors (FD) or other collection points. Unlike backbone cabling, horizontal cabling does not typically carry aggregate traffic and, as such, impacts only single network devices or users. In buildings, horizontal cabling almost exclusively consists of copper cabling. Fiber optic cabling may be used where situations dictate but, unlike horizontal copper cabling, horizontal fiber optic cabling is not installed in advance as default building facilities. At this writing, horizontal copper cabling in many networks is capable of supporting Gigabit (1Gb/s) Ethernet applications as well as other applications of similar bandwidth.

Permanent Link – A stationary cabling segment, consisting of the permanently installed cable and the permanently affixed jack at both ends (typically at the outlet faceplate and closet patch panel, or on a patch panel on both ends). The concept is based on the assumption that, while patch cords might be disconnected or moved over time, the permanent cable and jacks will not be disturbed and the electrical characteristics of the permanent link will remain unaltered.

Plenum -A space within the building designed for the movement of environmental air; i.e., a space above a suspended ceiling or below an access floor.

Raceway - Any channel designed for holding wires or cables; i.e. conduit, electrical metal tubing, busways, wireways, ventilated flexible cableway.

1.07 PROJECT DRAWINGS

A. **Building composite floor plans:** Provide building floor plans showing outlet locations and jack configuration, types of jacks, run distance for each jack cable, and cable routing/locations. Identify TO's that, according to location and available pathway systems, require cable length greater than allowed by standards. Recommend alternatives for Owners Representative's consideration.

B. **Telecommunications space plans/elevations:** Include enlarged floor plans of TRs indicating layout of equipment and devices, including receptacles and grounding provisions. Submit detailed plan views and elevations of telecommunications spaces showing racks, termination blocks, and cable paths.

C. **Logical Drawings:** Provide logical riser or schematic drawings for all systems. Include schematic symbol key.

1.08 SUBSTITUTIONS

A. **Substitution requests:** Substitution requests will be considered only if submitted to Owner's Representative not less than 7 working days prior to project bid date. Acceptance or rejection of proposed substitution is at Owner's Representatives sole discretion. No exceptions. Requests for substitutions shall be considered *not approved* unless approval is issued in writing by Owner's Representative.

B. **Rejection:** For equipment, cabling, wiring, materials, and all other products indicated or specified as *no substitutions* or *no alternates*, Owner does not expect nor desire requests for substitutions and alternate products other than those specified. Owner reserves right for Owner's Representative to reject proposed substitution requests and submissions of alternates without review or justification.

1.09 WARRENTY

1.10 CONTRACTOR'S WARRENTY

A. **General requirements:** Comply with additional requirements in contract general requirements and extended warranties required in other specification sections. Refer to all other 27xxx sections for specific additional warranty requirements that exceed or are in addition to those of this section.

B. **Contractor warranty:** Provide all services, materials and equipment necessary for successful operation of entire telecommunications system and SCS system for a period of one year after system acceptance. Scope of warranty includes all equipment, devices, wiring, accessories, software, hardware, installation, programming, and configuration required to maintain a complete and operable system. Provide manufacturer's published recommended preventative maintenance procedures during warranty period. This shall apply to all items except those specifically excluded, or items wherein a longer period of service and warranty is specified or indicated. All warranties shall be effective for one year, minimum, from date Certificate of Final Acceptance is issued. Use of systems provided under this section for temporary services and facilities shall not constitute final acceptance of work nor beneficial use by Owner and shall not institute warranty period. The warranty shall cover repair or replacement of defective materials, equipment, workmanship, and installation that may be incurred during this period. Warranty work is to be done promptly and to Owner's satisfaction. In addition, warranty shall cover correction of damage caused in making necessary repairs and replacements under warranty. Additional warranty responsibilities are:
   1. Obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's designated name. Replace material and equipment that require excessive service during guarantee period as determined by Owner.
   2. Provide 2-business day service beginning on date of Substantial Completion and lasting until termination of warranty period. Service shall be at no cost to Owner. Service can be provided by installing contractor or by a separate service

organization. Choice of service organization shall be subject to Owner's approval.

3. Submit name and a phone number that will be answered on a 24-hour basis each day of week, for duration of service.
4. Submit copies of equipment and material warranties to Owner before final acceptance.
5. At end of warranty period, transfer manufacturers' equipment and material warranties still in force to Owner. If warranty work problems cannot be corrected immediately to Owner's satisfaction, advise Owner in writing, describing efforts to correct situation, and provide analysis of cause for problem. If necessary to resolve problems, provide at no cost services of manufacturer's engineering and technical staff at site in a timely manner to analyze warranty issues, and develop recommendations for correction, for review and approval by Owner.

C. **Pathways Material and Installation warranty:** Provide all services, materials, and equipment necessary to warrant the installation and performance of all pathway materials for a period of one year after beneficial use. Scope of warranty includes all equipment, devices, installation, and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

D. Grounding and Bonding Material and Installation warranty: Provide all services, materials, and equipment necessary for successful operation of GBS for a period of one year after beneficial use. Scope of warranty includes all equipment, devices, installation, and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

E. Firestopping Material and Installation warranty: Provide all services, materials, and equipment necessary to warrant the performance of all Firestopping material for a period of one year after beneficial use, or longer if required by the local AHJ. Scope of warranty includes all equipment, devices, installation, and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

1.11 SCS MANUFACTURES EXTENDED WARRENTY

A. SCS Systems will be covered by a two-part certification program provided by a single manufacturer and that manufacturer's certified vendor. Manufacturer shall administer a follow on program through the Vendor to provide support and service to the purchaser. The first part is an assurance program, which provides that the certified system will support the applications for which it is designed, during the 20-year warranty of the certified system.

B. The second portion of the certification is a 20-year warranty provided by the manufacturer and the vendor on all products within the system (cords, telecommunications outlet/connectors, cables, cross-connects, patch panels, etc.).

C. In the event that the certified system ceases to support the certified application(s), whether at the time of cutover, during normal use or when upgrading, the manufacturer and vendor shall commit to promptly implement corrective action.

D. The cabling system must conform to the current issue of industry standard ANSI/TIA/EIA-568. All performance requirements of this document must be followed. As well, workmanship and installation methods used shall be equal to or better than that found in the BICSI (Building Industry Consulting Service International) ITSIM manual.

1.12 COMPLETENESS OF WORK

A. Complete and usable work: The contractor is responsible for providing complete and usable work according to contract documents. All materials and equipment shall be provided with all accessories and additional work required for field conditions, as well as additional work and accessories required for complete, usable, and fully functional construction and systems, even if not explicitly specified or indicated.
   1. Telecommunications system in this Contract shall be provided as complete and operable systems in full compliance with requirements on drawings and specification requirements.
   2. Drawings are diagrammatic and specifications are performance-based, and Contractor shall provide all work required to comply with drawings and specifications, even if not explicitly indicated or specified.
   3. Contractor shall be responsible for coordinating installation of electrical systems with all field conditions and work of other trades. Minimum clearances and work required for compliance with, California Electrical Code (CEC), and manufacturer's instructions shall be provided.
   4. Comply with additional requirements indicated for access and clearances.
   5. Contractor shall verify all field conditions and dimensions that affect selection and provision of materials and equipment, and shall provide any disassembly, reassembly, relocation, demolition, cutting and patching required to provide work specified or indicated, including relocation and reinstallation of existing wiring and equipment.
   6. Contractor shall protect from damage resulting from Contractor's operations existing facility, equipment, and wiring. Extra charges for completion and contract time extension will not be allowed because of field conditions or additional work required for complete and usable construction and systems. Comply with additional requirements indicated for access and clearances.

B. Drawings and specifications form complementary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Except where explicitly modified by a specific notation to contrary, it shall be understood that indication or description of any item, in drawings or specifications or both, carries with it instruction to furnish and install item, provided complete.

C. Terms: As used in this specification, provide means furnish and install. Furnish means "to purchase and deliver to project site complete with every necessary appurtenance

and support," and install means "to unload at delivery point at site and perform every operation necessary to establish secure mounting and correct operation at proper location in project."

D. Supplementary items: Provide supplementary or miscellaneous items, appurtenances, devices and materials necessary for a sound, secure and complete installation. Examine project drawings and other Sections of specifications for requirements that affect work of this section. Completely coordinate work of this section with work of other Sections and provide a complete and fully functional installation. Refer to all other drawings and other specifications sections that indicate types of construction in which work shall be installed and work of other sections with which work of this section must be coordinated.

1.13 PROJECT CONDITIONS

A. Field verification: Carefully verify location, use and status of all material, equipment, and utilities that are specified, indicated, or deemed necessary for removal. Verify that all materials, equipment, and utilities to be removed are completely inactive and will not be required or in use after completion of project. Replace with equivalent any material, equipment and utilities that were removed by Contractor that are required to be left in place.

B. Existing utilities: As applicable, do not interrupt utilities serving facilities occupied by Owner or others unless permitted under following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify owner in writing at least 14 days in advance of proposed utility interruptions. Do not proceed with utility interruptions without Owner's written permission.
   2. Equipment installation:
      a. Determine suitable path for moving unit substation into place; consider Project conditions.
      b. Verify clearance requirements and locate equipment to meet installation tolerances.
      c. Revise locations and elevations from those indicated to those required to suit Project.

1.14 DELIVERY STORAGE AND HANDLING

A. General: Contractor shall be responsible for the deliveries, storing and handling of all materials relative to the SCS systems, including materials supplied by others that are part of the SCS installation contract. Material shall be stored and protected according to manufacturer's instructions. Contractor shall be responsible for the security of all material during installation. For all material provided by contractor, or delivered to contractor on site, contractor assumes full responsibility and liability for any material shortages, damage, or loss due to storage and handling methods.

1.15 EXAMINATION

A. General: Prior to submitting a proposal, Contractor shall examine site, review Project drawings and specifications, and determine exact extent of work required. Contractor shall include in their proposals all materials, labor, and equipment required to complete required work indicated. Work that is necessary to obtain complete and usable Project as specified herein shall be included in Contractor's proposal, even if not indicated or specified.

B. Bidders' questions: Should bidders have questions as to intent of drawings and specifications, quality of materials to be used, and work to be performed, questions shall be submitted in writing to Owner's Representative in manner dictated by Owner's Representative. All answers and clarifications to drawings and specifications will be issued in writing.

C. Extra payment will not be allowed for claims due to unfamiliarity with work to be performed by other trades, existing conditions at job site, local or state laws and codes, and alterations due to field conditions.

1.16 ADDITIONAL COSTS

A. General: Project acceptance inspections, final completion inspections, substantial completion inspections, and acceptance testing/demonstrations shall be conducted after verification of system operation and completeness by Contractor.

B. Inspections and testing: For Project acceptance inspections, final completion inspections, substantial completion inspections, and/or testing/demonstrations that require more than one site visit by Owner's Representative or Architect/Engineer to verify Project compliance for same material or equipment, Owner reserves right to obtain compensation from Contractor to defray cost of additional site visits that result from Project construction or testing deficiencies/incompleteness, incorrect information, or non-compliance with Project provisions. Owner's Representative will notify Contractor of hourly rates and travel expenses for additional site visits and will issue an invoice to Contractor for additional site visits. Payment of additional site visit costs by Contractor is required within 30 days of invoicing. Owner reserves right to deduct additional costs defined herein that are indicated on past due invoices from Project amount due Contractor.

C. Exclusions: Contractor shall not be eligible for extensions of Project schedule or additional charges resulting from additional site visits that result from Project construction or testing deficiencies/incompleteness, incorrect information, or non-compliance with Project provisions.

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SECTION 270400
Communications Execution

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. General: Sequence, coordinate, and integrate various elements of telecommunications system, materials, and equipment. Comply with following requirements as a minimum.

B. Coordinate systems, equipment, and materials installation with other building components.

C. Verify all dimensions by field measurements.

D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for wiring, cabling, and equipment installations.

E. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

F. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of Work. Give particular attention to large equipment requiring positioning prior to closing in building.

G. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom and access for service and maintenance as possible.

H. Coordinate connection of materials, equipment, and systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

I. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by Contract Documents, recognizing that portions of Work are shown only in diagrammatic form. In case of conflict among individual system requirements, request direction in writing from Owner's Representative.

J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed in both exposed and un-exposed spaces.

K. Install cabling, wiring, and equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

L. Provide access panel or doors where units are concealed behind finished surfaces.

M. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

N. Comply with all requirements and work indicated on drawings.

O. Avoid interference with structure and with work or other trades, preserving adequate headroom and clearing doors and passageways to satisfaction of Owner and according to code requirements.

P. Install equipment and cabling/wiring so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof-mounted equipment shall be installed and supported on structural steel or roof curbs as appropriate.

Q. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall and ceiling mounting of equipment as required.

R. Provide steel supports and hardware for proper installation of hangers, anchors, guides, and other support hardware.

S. Obtain and analyze catalog data, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

T. Structural steel and hardware shall conform to ASTM standard specifications. Use of steel and hardware shall conform to requirements of AISC Code of Practice: Section Five.

U. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that would void warranty.

1.02 EQUIPMENT INSTALLATION

A. General: Install equipment according to manufacturer's written instructions. Install equipment level and plumb. Install wiring and cabling between equipment and all related devices.

B. Mounting: If neither the Owner's Instructions nor the individual section call out the required hardware mounting, use the following.
   1. For equipment at walls, bolt units to wall or mount on structural steel channel strut bolted to wall.
   2. For equipment not at walls, provide freestanding racks fabricated of structural steel members and slotted structural steel channel strut.
   3. Use feet consisting of 0.25-inch-thick steel plates, 6 square inch, bolted to floor.
   4. Use feet for welded attachment of vertical posts not over 3 feet on center.
   5. Connect posts with horizontal U channel steel strut and bolt control equipment to channels.

C. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally using methods and materials as recommended by manufacturer.

D. Connections: Tighten wiring connectors, terminals, bus joints, and mountings, to include lugs, screws, and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. In absence of published connection or terminal torque values, comply with torque values specified in UL 486A and UL 486B.

1.03 DEMOLITION, REMOVAL, AND PROTECTION OF WORK

A. Demolition and removal: Cut, remove, and legally dispose of selected equipment, components, and materials as indicated, including but not limited to removal of material, equipment, devices, and other items indicated to be removed and items made obsolete by new Work. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

B. Protection of work: Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. During cutting and patching operations, protect adjacent installations. Patch finished surfaces and building components using new materials specified for original installation and experienced Installers.

1.04 PENETRATIONS AND SLEEVES

A. General: Coordinate work with other sections. SCS Installation Contractor shall be responsible for the provision of cabling sleeves and conduits unless specifically provided by the Electrical Contractor. SCS Installation Contractor shall coordinate with Electrical Contractor to determine exact requirements.

B. When required, set sleeves in forms before concrete is poured. Provide core drilling as necessary if walls are poured or otherwise constructed without sleeves and wall penetration is required. Do not penetrate structural members. Provide sleeves and packing materials at all penetrations of foundations, walls, slabs (except on-grade), partitions, and floors. Sleeves shall meet requirements of pertinent specifications. Lay out penetration and sleeve openings in advance, to permit provision in work. Set sleeves and conduit in forms before concrete is poured. Provide remedial work where sleeves and conduits are omitted or improperly placed.

C. Sleeve fill: Sleeves that penetrate outside walls, basement slabs, footings, and beams shall be waterproof.
   1. Fill slots, sleeves and other openings in floors or walls if not used.
   2. Fill spaces in openings after installation of conduit or cable.
   3. Fill for floor penetrations shall prevent passage of water, smoke, fire, and fumes.
   4. Fill shall be fire resistant in fire floors and walls, and shall prevent passage of air, smoke and fumes. See section 27 05 32 - Firestopping for Telecommunications Systems.
   5. Sleeves through floors shall be watertight and shall extend 2 inches above floor surface.

6. Where raceways passing through openings are exposed in finished rooms, finishes of filling materials shall match and be flush with adjoining floor, ceiling, and wall finishes.

D. Conduit sleeves:
   1. Annular space between conduit and sleeve shall be at least 1/4 inch.
   2. Sleeves shall not be provided for slabs-on-grade unless specified or indicated otherwise.
   3. For sleeves through rated fire walls and smoke partitions, comply with requirements for firestopping. See section 27 05 32 - Firestopping for Telecommunications Systems.

E. Supports: Do not support piping risers or conduit on sleeves.

F. Future use: Identify unused sleeves and slots for future installation.

1.05 CLEANING

A. Contractor is responsible for clean-up of debris on a daily basis. Cost of clean-up is the responsibility of the Contractor.

B. During progress of work, remove equipment and unused material. Put building and premises in neat and clean condition. Perform cleaning and washing required to provide acceptable appearance and operation of equipment to satisfaction of Owner's Representative.

C. After completion of Project, clean exterior surface of all equipment, including concrete residue, dirt, and paint residue. Final cleaning shall be performed prior to Project acceptance by Owner's Representative.

1.06 SPECIAL RESPONSIBILITIES AND INFORMATION

A. Coordination of information: Cooperate and coordinate with work of other sections in executing work of this section. Perform work such that progress of entire project, including work of other sections, shall not be interfered with or delayed. Provide information as requested on items furnished under this section, which shall be installed under other sections. Obtain detailed installation information from manufacturers of equipment provided under this section.

B. Information gathering: Obtain final rough-in dimensions or other information as needed for complete installation of items furnished under other sections or by Owner. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other sections. Give full information so that openings required by work of this section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at no expense to Owner.

C. Housekeeping pads: Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted equipment.

D. Maintenance of equipment and systems: Maintain equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions.

E. Use of premises: Use of premises shall be restricted as directed by Owner's Representative and as required below:
   1. Cleaning and rubbish removal: Remove and dispose of dirt and debris and keep premises clean. During progress of work, remove equipment and unused material. Put building and premises in neat and clean condition and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Owner's Representative.
   2. **Rubbish Removal:** Provide for the removal from the site of all spoils, debris, boxes, packaging, crates, and trash generated from the work.
   3. **Storage:** Store materials maintaining an orderly, clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off ground by means of pallets or racks and covered with tarpaulins.

F. Protection of fireproofing:
   1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, if possible, prior to start of spray fireproofing work.
   2. Conduits and other items that would interfere with proper application of fireproofing shall be installed after completion of spray fireproofing work.
   3. Patching and repairing of fireproofing due to cutting or damaging to fireproofing during course of work specified under this section shall be performed by installer of fireproofing and paid for by section responsible for damage and shall not constitute grounds for an extra to Owner.

G. Temporary utilities: Refer to contract general requirements regarding requirements.

H. Movement of materials: Unload materials and equipment delivered to site. Pay costs for rigging, hoisting, lowering and moving equipment on and around site, in building or on roof.

1.07 DIVISION OF WORK

A. General: Division of work responsibility matrix at the end of this section is for Contractor's reference to clarify roles of various manufacturers, installers, subcontractors, and trades involved in telecommunications system Project.

B. Contractor holding contract with Owner is responsible for coordinating work of all subcontractors to provide a complete and usable Project complying with contract provisions of Project documents.

C. Failure to coordinate work by subcontractors and suppliers will not be considered justification for additional compensation or extension of schedule.

END of SECTION

SECTION 270500 Common Work Results for Communications
Grounding and Bonding for Communications Systems

PART 1 GENERAL

1.01 WORK INCLUDES

Provide all labor, materials, and equipment for the complete installation of work called for in the Contract Documents.

1.02 SCOPE OF WORK

A. This section includes the minimum requirements for the equipment and cable installations in communications equipment rooms (Telecommunications Closets).

B. Included in this section are the minimum composition requirements and installation methods for the following:
   1. Grounding Electrode System
   2. Busbars
   3. Bonding accessories

1.03 QUALITY ASSURANCE

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

1.04 SUBMITTALS

A. Provide product data for the following:
   1. Manufacturers cut sheets, specifications, and installation instructions for all products.

PART 2 PRODUCTS

2.01 GROUNDING ELECTRODE SYSTEM

A. Grounding Electrode System
   1. When required the Grounding Electrode System shall meet the following
      a. Active grounding system constantly replenishing moisture into the soil
      b. Provide low resistance to ground
      c. Provide season to season stability
      d. Be maintenance-free for 30 years
      e. Contain no hazardous materials or chemicals
   2. Approved Manufacturers:
      a. Cooper BLine, Burndy, or approved equal

2.02 WALL-MOUNT BUSBARS

A. Telecommunications Main Grounding Busbar (TMGB)
   1. Telecommunications Main Grounding Busbar (TMGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
   2. The busbar shall be 4" (100 mm) high and 20" (510 mm) long and shall have 30 attachment points (two rows of 15 each) for two-hole grounding lugs.
   3. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 27 lugs with 5/8" (15.8 mm) hole centers and 3 lugs with 1" (25.4) mm) hole centers.
   4. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
   5. The busbar shall be UL Listed as grounding and bonding equipment.
   6. Approved manufactures:
      a. Chatsworth (CPI), Erico Caddy, Cooper BLine, or approved equal

B. Telecommunications Grounding Busbar (TGB)
   1. Telecommunications Grounding Busbar (TGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
   2. The busbar shall be 2" (50 mm) high and 12" (300 mm) long and shall have 9 attachment points (one row) for two-hole grounding lugs.
   3. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 6 lugs with 5/8" (15.8 mm) hole centers and 3 lugs with 1" (25.4 mm) hole centers.
   4. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
   5. The busbar shall be UL Listed as grounding and bonding equipment.
   6. Approved manufactures:
      a. Chatsworth (CPI), Erico Caddy, Cooper BLine, or approved equal

2.03 BONDING ACCESSORIES

A. Below Grade:
   1. Exothermic-welded type connectors.

B. Above Grade:
   1. Bonding Jumpers: compression type connectors, using zinc-plated fasteners and external tooth lock washers.
   2. Ground Busbar: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.
   3. Rack and Cabinet Ground Bars: one-hole compression-type lugs using zinc plated or copper alloy fasteners.
   4. Cable Shields: Make ground connections to multi-pair communications cables with metallic shields using shield bonding connectors with screw stud connection.

C. Grounding conductor splices shall be joined with mechanical crimped sleeve designed to have two crimps per side with proper indents markings. Crimp sleeves shall be copper alloy.

D. Grounding conductor shall be terminated with a mechanical crimped type lug designed to have two crimps, spade section of have two bolts and made of copper alloy.

E. Two Mounting Hole Ground Terminal Block
   1. Ground terminal block shall be made of electroplated tin aluminum extrusion.
   2. Ground terminal block shall accept conductors ranging from #14 AWG through 2/0.
   3. The conductors shall be held in place by two stainless steel set screws.
   4. Ground terminal block shall have two 1/4” (6.4 mm) holes spaced on 5/8” (15.8 mm) centers to allow secure two-bolt attachment to the rack or cabinet.
   5. Ground terminal block shall be UL Listed as a wire connector.

F. Compression Lugs
   1. Compression lugs shall be manufactured from electroplated tinned copper.
   2. Compression lugs shall have two holes spaced on 5/8” or 1” centers, as stated below, to allow secure two bolt connections to busbars.
   3. Compression lugs shall be sized to fit a specific size conductor, sizes #6 to 4/0, as stated below.
   4. Compression lugs shall be UL Listed as wire connectors.

G. C-Type, Compression Taps
   1. Compression taps shall be manufactured from copper alloy.
   2. Compression taps shall be C-shaped connectors that wrap around two conductors forming an irreversible splice around the conductors; installation requires a hydraulic crimping tool
   3. Compression taps shall be sized to fit specific size conductors, sizes #2 AWG to 4/0, as stated below.
   4. Compression taps shall be UL Listed.

H. Pipe Clamp with Grounding Connector
   1. Pipe clamp shall be made from electroplated tinned bronze. Installation hardware will be stainless steel.
   2. Pipe clamp shall be sized to fit up to two conductors ranging in size from #6 to 250 MCM; conductors must be the same size.
   3. Pipe clamp installation hardware shall be sized to attach to pipes, sizes 1" to 6" (.75" to 6.63" in diameter), as stated below.
   4. Pipe clamp shall be UL Listed as grounding and bonding equipment.

I. Equipment Ground Jumper Kit

J. Approved Manufacturers:
   1. Cooper BLine, Burndy, or approved equal

2.04 BONDING CONDUCTORS

A. Cable Tray Bonding Conductor
   1. Green # 6 AWG insulated bonding jumper with appropriate lugs or manufactured braided copper grounding jumper equal to a # 6 AWG cable.

B. Equipment Fame Bonding Conductor
   1. Bonding Conductor shall be run neatly and uniformly to the equipment, racks and trays.

C. Bonding Conductor (BC)
   1. Green insulated copper bonding conductor, size as required by CEC.
   2. The BC shall be, as a minimum, the same as the TBB.
   3. Bare conductors are acceptable where plenum or exposed areas limit the use of insulated conductors.

D. Telecommunications Bonding Backbone (TBB)
   1. Green insulated copper conductor, minimum as specified in the table below, size 6 AWG. The TBB shall be sized at 2 kcmil per linear foot of conductor length. Insulation shall meet fire ratings of its pathway.
   2. Table 1 – Conductor Sizing

Maximum TMGBB to TGBB Length (L) (feet)	Conductor cross-sectional area (minimum), AWG
L ≤ 13ft	# 6
4 < L ≤ 14 – 20ft	# 4
6 < L ≤ 21 – 26ft	# 3
8 < L ≤ 27 – 33ft	# 2
10 < L ≤ 34 – 41ft	# 1
13 < L ≤ 42 – 52ft	# 1/0
16 < L ≤ 53 – 66ft	# 2/0
20 < L ≤ 67 – 84ft	# 3/0
26 < L ≤ 85 – 105ft	# 4/0
32 < L ≤ 106 – 125ft	250mcm
38 < L ≤ 126 – 150ft	300mcm
46 < L ≤ 151 – 175ft	350mcm
53 < L ≤ 176 – 250ft	500mcm
76 < L ≤ 251 – 300ft	600mcm
Greater than 301ft	750mcm
For lengths in excess of those shown above, the conductor cross-sectional area should be calculated as 2kcmil/ft.	

E. Ground Rods
   1. Copper clad steel, 3/4-inch diameter by 10 feet long, conforming to UL 467.

PART 3 EXECUTION

3.01 INSTALLATION

A. Outdoor grounding and bonding connections.
   1. All outdoor grounding and bonding (earthing) connections shall be accomplished using exothermic welding.

B. Wall-Mount Busbars
   1. Attach busbars to the wall with appropriate hardware according to the manufacturer's installation instructions.
   2. Conductor connections to the TMGB or TGB shall be made with two-hole bolt-on compression lugs sized to fit the busbar and the conductors.
   3. Each lug shall be attached with stainless steel hardware after preparing the bond according to manufacturer recommendations and treating the bonding surface on the busbar with antioxidant to help prevent corrosion at the bond.
   4. The wall-mount busbar shall be bonded to ground as part of the overall Telecommunications Bonding and Grounding System.

C. Rack-Mount Busbars and Ground Bars
   1. When a rack or cabinet supports active equipment or any type of shielded cable or cable termination device requiring a ground connection, add a rack-mount horizontal or vertical busbar or ground bar to the rack or cabinet. The rack-mount busbar or ground bar provides multiple bonding points on the rack for rack and rack-mount equipment.
   2. Attach rack-mount busbars and ground bars to racks or cabinets according to the manufacturer's installation instructions.
   3. Bond the rack-mount busbar or ground bar to the room's TMGB or TGB with appropriately sized hardware and conductor.

D. Ground Terminal Block
   1. Every rack and cabinet shall be bonded to the TMGB or TGB.
   2. Minimum bonding connection to racks and cabinets shall be made with a rack-mount two-hole ground terminal block sized to fit the conductor and rack and installed according to manufacturer recommendations.
   3. Remove paint between rack/cabinet and terminal block, clean surface and use antioxidant between the rack and the terminal block to help prevent corrosion at the bond.

E. Pipe Clamp
   1. Bond metal pipes located inside the data center computer room with a minimum #6 AWG conductor to the TMGB or TGB using a pipe clamp sized to fit the pipe and the conductor and installed according to the manufacturer's recommendations.
   2. Remove paint between the pipe and pipe clamp, clean surface and use antioxidant between the pipe and the clamp to help prevent corrosion at the bond.
   3. Remove insulation from conductors where wires attach to the pipe clamp.

F. Equipment Ground Jumper Kit
   1. Bond equipment to a vertical rack-mount busbar or groundbar using ground jumper according to the manufacturer's recommendations.
   2. Clean the surface and use antioxidant between the compression lugs on the jumper and the rack-mount busbar or groundbar to help prevent corrosion at the bond.

Pathways for Communications Systems

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Install empty raceway system, including underfloor and overhead distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable troughs, service poles, miscellaneous and positioning material to constitute complete system, as indicated for distribution of Telecommunications wiring which includes cables for Data, Voice, Video, Audio, Security and future signal requirements.

B. The location at which all new telecommunications wiring will terminate is called a Telecom Outlet (TO). There are several styles of outlets:
   1. New construction
   2. Existing construction typical
   3. Existing construction variations
   4. Telephone (Voice) only
   5. Data only

C. Furnish and install split channel raceway and outlet boxes as specified in the Drawings and as specified herein.

D. Furnish and install conduit stubs in walls and floors for cable routes.

1.02 QUALITY ASSURANCE:

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.

1.03 SUBMITTALS

A. Product Data: For features, ratings, and performance of each component specified.

B. Submit manufacturer's instructions for storage, handling, protection, examination, preparation, operation, and installation of products. Include application conditions or limitations of use stipulated by any product testing agency. Submit for the following:
   1. Wall Boxes
   2. Raceway
   3. Conduit
   4. Conduit Bushings

C. Shop Drawings:
   1. Component List: List manufacturer, part number, and quantity of each component.
   2. Include dimensioned plan and elevation views of equipment rooms, labeling each individual component. Show raceway assemblies, method of field assembly, workspace requirements, and access for cable connections.

PART 2 PRODUCTS

2.01 TELECOM OUTLETS (TO)

A. Cat6 TO consists of one (1) 4-11/16" square by 2-1/8" deep flush mounted box. Each outlet box shall have a EMT conduit stubbed above the drop ceiling or extended into the hallway cable tray. Conduit size is as follows UON:
   1. For Outlets with 3 or less cables, use a 1" EMT conduit
   2. For Outlets with 3-6 cables, use a 1.25" EMT conduit
   3. For all other sizes, calculate fill ratio at 40% for proper sized conduit

B. Cat6A TO consists of one (1) 5" square by 2-7/8" deep flush mounted box. Each outlet box shall have a EMT conduit stubbed above the drop ceiling or extended into the hallway cable tray. Conduit size is as follows UON:
   1. For Outlets with 3 or less cables, use a 1.25" EMT conduit
   2. For Outlets with 3-6 cables, use a two 1.25" EMT conduit
   3. For all other sizes, calculate fill ratio at 40% for proper sized conduit

C. Existing surface-mounted construction TO typically consists of surface-mounted raceway including base, cover, end fitting, entrance end fitting, and (2) 1" EMT conduits stubbed out top of entrance end fitting to above ceiling or out to nearest hallway distribution system. Size of the raceway is site dependent based on number of conductors to be installed.

D. The intent of the installation of the TOs which consist of the raceway is as follows:
   1. Where ceilings are accessible, the raceway and entrance end fitting shall extend above the ceiling and the conduits installed above the ceiling in the room to the nearest hallway distribution system.
   2. Where ceilings are partially accessible, or if the Drawings and/or Specifications indicate installation of access panels, the raceway shall extend above the ceiling and the conduits installed above the ceiling in the room to the nearest hallway distribution system.
   3. Where ceilings are inaccessible or no ceilings exist, the raceway shall extend up as close to the ceiling as practical to allow installation of conduits as high as possible to the nearest hallway distribution system.

2.02 HORIZONTAL DISTRIBUTION SYSTEMS

A. Conduit System (Renovations only, where conduit exists)
   1. Provide conduits secured to wall above corridor ceilings as shown on the Drawings or as specified herein for installation of telecommunications cables. Any exposed conduit
   2. Corridor conduits shall be 4" EMT, furnished in 10 foot lengths wherever possible, with no sharp edges, reamed as necessary, evenly supported at two locations per 10 foot section spacing. Conduits shall be sized and quantified to account for handling cables in all TO conduits at 40% fill back to the TR and/or ER rooms. Verify size prior to installation. Bushings and/or connectors on ends of EMT are required.
   3. All conduits shall be installed stacked and attached to walls unless conditions exist which prohibit this type of installation. When this condition exists, mount conduits side-by-side supported with 3/8” rod attached to building structure utilizing unistrut channel to form a trapeze. Double nut the top and bottom at the unistrut. Utilize conduit clamp to secure conduits to unistrut.
   4. Provide measured pull line in each conduit rated at 1200 lbs. minimum. Increments must be in 12” steps.
   5. Grounding of conduits is not required per CEC #250-33, Exception No. 2. shall be painted except conduit above suspended ceilings or in mechanical, electrical or telecommunication rooms. Color to match that of surface installed upon or as directed by Owner’s Representative. Coordinate with other trades prior to painting.
   6. Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. Fire rated construction to be verified with AHJ. See Section 27 05 32 for more firestopping information.

B. Corridor Cable Tray System
   1. Complete wall mounted or suspended aluminum cable tray system and necessary accessories shall be provided as shown on plans. Install entire cable tray system in accordance with manufacturer’s minimum installation practices and all local governing codes.

2. Coordinate installation of cable tray with other trades to allow a minimum of 12" above, 12" in front, and 12" below of clearance from piping, conduits, ductwork, etc. Allowance must be provided for access to the tray with reasonable room to work. Obstructions to the tray must be minimized and cannot block more than 6 feet of the tray at any point in the run.
3. Submittal drawings, in the form of 8 ½"x 11" catalog cut sheets, shall be provided for the following items: cable tray, fittings, accessories and load data.
4. Cable tray shall not be loaded beyond 60% of manufacturer's recommended load capacity.
5. Install wall mounted cable tray on both sides of hallway as shown on drawings and where applicable.
6. Where a new cable tray distribution system encounters a wall, install sufficient 4" EMT sleeves through the wall so cabling does not exceed 20% fill.
7. Where cable tray is exposed below ceiling, install the appropriate solid bottom inserts to conceal cables.
8. Install cable tray dropouts where large quantities of cables exit the distribution system.
9. Cable tray must be sized to facilitate sufficient growth capacity for migration cable plant to coexist in same tray as existing cable plant, wherever possible.
10. Manufacturer of cable tray in corridors and telecom rooms shall be:

C. Telecommunication Room Cable Tray System
   1. TR cable tray shall completely wrap all walls within the room. Cable tray shall extend over all equipment frames.
   2. Cable tray shall be a minimum width of 2" high x 12" wide. Cable tray may be sized upwards if fill ratio requirements need to be met based on cable quantities.
   3. Manufacturer of tubular ladder type cable tray in telecommunication rooms shall be Cooper BLine, Chatsworth (CPI), CommScope or approved equal.
   4. Cable tray shall be 12 inch cable runway.
   5. Rectangular steel tubing cross members welded at 12-inch intervals. Finish in black enamel. CommScope, Part Number CR-SLR-10L-12W or equivalent.
      a. 12-inch Wall Angle Assembly Kit – CommScope Part Number CR6-12WRSK or equivalent.
      b. 3-inch Channel Rack–To-Runway Mounting Plate - CommScope Part Number CRR2RRMK or equivalent.
      c. End Closing Tube - CommScope Part Number CRPECK or equivalent.
      d. Corner Clamp - CommScope Part Number CRTJSK or equivalent (2 required per End Closing Tube to complete assembly).

D. All open pathway/trays shall be installed a minimum of six (6) inches away from any light fixture or other source of EMI (Electromagnetic Interference).

E. All pathways shall be grounded per CEC Article 250.

F. Provide external grounding strap at expansion joints, sleeves and crossover and at other locations where pathway/tray continuity is interrupted.

G. Support all pathways from building construction. Do not support pathways from ductwork, piping, or equipment hangers.

H. Install cable tray level and straight unless noted on the construction drawings.

2.03 STATION CONDUITS

Station conduit is defined as conduit that originates at the TO and rises within the walls or is exposed from a raceway and extends up into the drop ceiling or over to the hallway distribution system.

A. Provide station conduits from TOs to above the drop ceiling or extend over to the hallway distribution systems consisting of 1" EMT minimum or appropriate size as shown on the Drawings or as specified herein for installation of telecommunications cables.

B. Provide an insulating press fit bushing on all telecommunications conduits including interconnecting nipples and stub to distribution system. To prevent conflicts with other cables or conduits to cable tray, the conduit shall be stubbed not less than 6" above or below conduit/cable tray center line. Where space permits, every effort shall be made to bend station conduits down such that the flow of installed cables promotes the minimum length back to the TR and the least number of bends in the cables. Bushings must be rated to be used in an environmental air handling space (Plenum).

C. Manufacturer of insulating bushing on all telecommunication conduits shall be:
   1. Arlington, Erico Caddy or equivalent

D. Provide pull line in each empty conduit to hallway distribution system.

E. Indelibly mark station conduit at hallway distribution end with Room # that conduit serves.

F. The use of 90 degree electrical pulling elbows is prohibited.

G. Do not include more than two 90 degree bends between pulling points when installing station conduit runs. If the path of the station conduits requires more than 180 degrees of total bends, installation of an appropriate sized junction box is required. See section 2.4 for junction box requirements.

H. Place an appropriate sized junction box in each individual station conduit run that exceeds 100 feet in length.

I. The use of a third bend in a conduit is only acceptable if:
   1. The total conduit run is reduced by 15%.
   2. The conduit size is increased to the next trade size.
   3. One of the bends is located within 12" of the cable feed end.

2.04 JUNCTION BOX REQUIREMENTS FOR STATION CONDUITS

A. If the station conduit route exceeds the 180 degree of total bends limitation, an appropriate sized junction box is required within a straight section of the conduit run.

B. Each station conduit run requires a separate junction box. The sharing of a junction box by multiple conduits is prohibited.

C. A junction box shall not be used in place of a bend. All junction boxes in station conduit paths shall be installed within a straight section of the conduit run.

2.05 SERVICE ENTRANCE CONDUITS

A. Entrance conduits shall be continuous into the building and to the ER. Securely fasten all entrance conduits to the building to withstand any cable placing operation. Do not include more than two 90 degree bends between pulling points when installing entrance conduits.

B. On exterior wall penetrations, seal both sides of the wall around outside of conduit with hydraulic cement to prevent water from entering the building. Seal the inside of the conduit on both sides with conduit plugs, water plugs, or duct sealer to prevent water, vapors, or gases from entering the building.

2.06 PATHWAY REQUIREMENTS FOR ENTRANCE CONDUITS

A. If the entrance conduits exceeds the 180 degree of total bends limitation, an appropriate sized junction box, manhole, or handhole is required.

B. As-built drawings of entrance conduit path required to be submitted to Owner’s Representative before covered with soil.

2.07 RISER CONDUITS

A. Riser conduits shall only be used when noted on the Construction Documents for special applications only. Riser conduits are not required as a general rule for the riser system.

B. Minimum of (2) 4” conduits shall be installed between the ER room and each TR room as shown on the Drawings.

C. Conduits entering ER and TR rooms shall be reamed or bushed and terminated not more than 4" from entrance wall and within 12” of room corners.

D. Conduits entering ER and TR rooms from below floor shall be terminated not more than 4" above finished floor.

E. Conduits for riser cables shall be continuous and separate from all other conduit or enclosed raceway systems. Do not include more than two 90-degree bends between pulling points when installing riser conduits. Where junction boxes are required, locate in accessible areas, such as above suspended ceilings in hallways.

F. Conduits shall not be less than 4" trade size and be equipped with a measured pull line at 12” increments rated at a minimum 1200-pound test.

G. Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. Fire-rated construction to be verified with AHJ. See Section 27 05 32 for more firestopping information.

H. Provide an insulating press fit bushing on all telecommunications riser conduits. Bushings must be rated to be used in an environmental air handling space (Plenum).

I. Manufacturer of insulating bushing on all telecommunication conduits shall be Arlington or equal.

J. Riser conduits shall not be used for the distribution of horizontal cables.

2.08 FIRESTOPPING

A. In all buildings, floor/ceiling assemblies, stairs, and elevator penetrations must be sealed with a 2-hour fire stop assembly at a minimum, unless otherwise noted.

B. Contact Owner’s Representative to identify walls which are fire-rated construction. Walls must be sealed with a 2-hour fire stop assembly at a minimum.

C. Communication pathways requiring fire stopping shall utilize removable/re-usable fire stopping putties for ease of Moves, Adds, and Changes.

D. All fire stopping penetrations shall conform to the recommended practices listed in UL1479 or ASTM.

E. See Section 27 05 32 - Firestopping for Telecommunications Systems

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. The intention of the telecommunications conduits is to provide a route between ER and TR rooms, routes from the TRs throughout building floors to hallways, and routes from hallway distribution systems into rooms to individual TOs for telecommunications cabling.

B. Installation of new pathways shall not interfere with existing pathways in such a way that installation of new cables within the existing pathway is made more difficult.

3.02 EXAMINATION

C. Examine areas to receive cable management system. Notify the Owner's Representative of conditions that would adversely affect the installation or subsequent utilization of the system.

D. Do not proceed with installation until unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Install in accordance with recognized industry practices, to ensure that the equipment complies with requirements of the CEC, and applicable portions of NFPA 70B and NECA "Standards of Installation" pertaining to general electrical installation practice.

B. Coordinate installation with other trades.

C. Field verification is required before installation.

D. Install cable management system at locations indicated on the drawings and in accordance with manufacturer's instructions.

Hangers and Supports for Communications Systems

PART 1 GENERAL

1.01 WORK INCLUDES

The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of non-continuous cable supports as described in this specification.

1.02 SCOPE OF WORK

This Section includes the minimum requirements for the support structures for the Communications Systems for the project as outlined in the Bid Document.

A. Non-continuous cable supports (2.3A)

B. Adjustable non-continuous cable support sling (2.3B)

C. Multi-tiered non-continuous cable support assemblies (2.3C)

D. Non-continuous cable support assemblies from tee bar (2.3D)

E. Non-continuous cable support assemblies from drop wire/ceiling (2.3E)

F. Non-continuous cable support assemblies from beam, flange (2.3F)

G. Non-continuous cable support assemblies from C & Z Purlin (2.3G)

H. Non-continuous cable support assemblies from wall, concrete, or joist (2.3H)

I. Non-continuous cable support assemblies from threaded rod (2.3I)

J. Raised floor non-continuous cable support assemblies (2.3J)

K. Cantilever-Mounted Option for non-continuous cable supports (2.3K)

L. Installation accessories for non-continuous cable supports (2.3L)

1.03 SUBMITTALS

A. Submit product data on non-continuous cable support devices, including attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

1.04 QUALITY ASSURANCE

A. Non-continuous cable supports and cable support assemblies shall be listed by Underwriters Laboratories for both Canadian and US standards (cULus).

B. Non-continuous cable supports shall have the manufacturers name and part number stamped on the part for identification.

1.05 COORDINATION

A. Coordinate installation of hangers, supports and cables with other trades.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with these specifications, non-continuous cable supports shall be as manufactured by:

2.02 NON-CONTINUOUS CABLE SUPPORT SYSTEMS

A. Non-continuous cable supports
   1. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.

2. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
3. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
4. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
5. Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.

B. Adjustable non-continuous cable support sling
1. Constructed from steel and woven laminate; sling length can be adjusted to hold up to 425 4-pair UTP; rated for indoor use in non-corrosive environments. Rated to support Category 5e and higher cable, or optical fiber cable; cULus Listed.
2. Adjustable non-continuous cable support sling shall have a static load limit of 100 lbs.
3. Adjustable non-continuous cable support sling shall be suitable for use in air handling spaces.
4. If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, C and Z purlin clips.

C. Multi-tiered non-continuous cable support assemblies
1. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.
2. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.

D. Non-continuous cable support assemblies from tee bar
1. Tee bar support bracket with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

E. Non-continuous cable support assemblies from drop wire/ceiling
1. Fastener to wire/rod with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

F. Non-continuous cable support assemblies from beam, flange
1. Fastener to beam or flange with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

G. Non-continuous cable support assemblies from C & Z Purlin
1. Fastener to C or Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.

H. Non-continuous cable support assemblies from wall, concrete, or joist
   1. Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.

I. Non-continuous cable support assemblies from threaded rod
   1. Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed.
   2. The multi-tiered support bracket shall have a static load limit of 300 lbs.
   3. U-hooks and Double J-hook shall attach directly to threaded rod using standard nuts.

J. Raised floor non-continuous cable support assemblies
   1. Fastener to raised (access) floor pedestal with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments; cULus Listed.

K. Cantilever-Mounted cable supports
   1. U-hook shall be able to be assembled to a wide variety of wall mount brackets.
   2. Spacing of individual U-hooks as needed, max of 4’ to 5’ apart.
   3. U-hooks may have the optional attachment of a cable roller for ease in pulling cables.

L. Installation accessories for non-continuous cable supports
   1. Cable Pulley
      a. Non-continuous cable supports may be used as an installation tool when a removable pulley assembly is included. The pulley shall be made of plastic and be without sharp edges. The pin and bail assembly must be able to be secured to the J-Hook during cable installation. The pulley must remain secured while cables are being pulled.
      b. The pin and roller assembly must be removed after cables are installed.

   2. Cable Protector
      a. The protective steel tube shall fit over threaded rod and be at least 4” in length.
      b. The tube shall prevent damage to cables placed in or pulled through CAT-CMTM U-hooks. The tube shall not inhibit the pulling of cables.

2.03 FINISHES

A. ASTM B633 Standard Specification for Electro-deposited Coatings of Zinc on Iron and Steel

B. ASTM B 695 Standard Specification for coatings of Zinc Mechanically Deposited on Iron and Steel

C. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

D. ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

E. Non-continuous cable supports used where only mildly corrosive conditions apply shall be stainless steel, AISI type 304.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation and configuration shall conform to the requirements of the current revision levels of California Electrical Code (CEC), ANSI/ EIA/TIA Standards 568 & 569, applicable local codes, and to the manufacturer's installation instructions.

B. Do not exceed load ratings specified by manufacturer.

C. Adjustable non-continuous support sling shall have a static load limit of 100 lbs.

D. Follow manufacturer's recommendations for allowable fill capacity for each size non-continuous cable support.

E. Locate pathways per Telecommunications Drawings.

Firestopping for Telecommunications Systems

PART 1 GENERAL

1.01 SCOPE

A. This SECTION describes the requirements for furnishing and installing firestopping for fire-rated construction. This includes all openings in fire-rated floors, walls and other rated elements of construction, both blank (empty) and those accommodating items such as cables, conduits, pipes, ducts, etc.

B. Fire blocking for Concrete Floor or Wall Sleeved Cables.

C. Fire blocking for Gypsum Wall Sleeved Cables.

D. Fire blocking for Concrete Block Wall Sleeved Cables.

1.02 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 7 Specification Sections, apply to this Section.

1.03 SUBMITALS

A. Submit manufacturer's product literature and installation procedures for each type of Firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance and limitation criteria and test data. Submit cured samples of firestop materials.

B. Product Data: Shall be clearly marked to indicate all technical information which specifies full compliance with requirements of this section and Contract Documents, including the following:
   1. Copy of UL illustration of each proposed system indicating manufacturer's approved modifications.
   2. Each condition requiring penetration seals in proposed UL systems materials, anchorage, methods of installation and actual adjacent construction.

1.04 QUALITY ASSURANCE

A. Firestopping systems (materials and design) shall conform to both Flame (F) ratings and Time (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.

1.05 COORDINATION

A. Coordinate layout and installation of Firestopping System with other trades.

B. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Materials and products required for work of this section shall not contain asbestos or polychlorinated biphenyls (PCB).

B. Manufacturers: 3M, STI, & Hilti

C. Firestopping System must be approved by the local AHJ before purchase or installation.

2.02 GENERAL

Provide and install firestopping materials to meet applicable codes and installation requirements for each firestopping application. Products using caulking, putties, wrap strips, mortars, composite boards and/or mechanical devices shall be used as appropriate for the specific condition.

2.03 CAULKING

When caulking is used, provide and install flexible caulking materials. Cured firestop materials 1/8 thick shall be able around a 1" mandrel without breaking.

2.04 FIRESTOP

Do not use any firestop products which re-emulsify, leach active intumescent ingredients or dissolve when placed in water after curing. Product must withstand the passage of cold smoke, either as inherent property of the system or by the use of a separate product included as part of the UL system or device, and designed to perform this function.

2.05 PENETRATION SEALS

A. General:
1. Penetration seals (firestopping material) shall be asbestos-free and capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ASTM E814 and UL 1479.
2. Materials shall meet and be acceptable for use by all three model building codes, Basic/California Building Code, Building Code and Standard Building Code, per National Evaluation Service, Inc. report # NER-243.
3. Materials shall meet requirements of NFPA 101 and CEC.
4. Materials shall be suitable for the firestopping of penetrations made by steel, glass, plastic and insulated pipe, conduit, bus duct, non-insulated pipe and ductwork.
5. On insulated pipe, fire-rating classification must not require removal of insulation.
6. The rating of penetration seals shall not be less than the rating of the time-rated floor or wall assembly.
7. Systems shown below are examples and other equal systems may be approved or required by the AHJ.

B. 2-hour Rated Concrete Floor:
1. Penetrants: Multiple pipes.
2. UL System: No. 93.

C. 2-hour Rated Concrete Floor:
   1. Penetrants: Maximum 30" dia. Metal pipe/conduit.
   2. UL System: No.319

D. 1-2 –Hour Rated Gypsum Board Wall:
   1. Penetrant: Metal pipe/conduit.
   2. UL System: No. 147

E. 2-Hour Rated Gypsum Board Wall:
   1. Penetrant: Metal pipe/conduit.
   2. UL System: No. 147.

F. 3-Hour Rated Concrete Wall:
   1. Penetrant: Metal duct, maximum 2' square and maximum dimension of 30".
   2. UL System: No. 105.

G. Walls Below Grade:
   1. Penetrants: Pipe sleeves.
   2. Seal: Thunderline "Link Seal" casing seal.

PART 3 EXECUTION

3.01 INSPECTION

Examine the areas and condition where Firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable to the Architect.

3.02 CONDITIONS REQUIRING FIRESTOPPING

A. General – Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safing, or otherwise.

B. At any point where a fire rated wall is penetrated with cable or conduit.

C. Penetrations
   1. Penetrations include conduit, cable wire, pipe, duct or other elements which pass through one or both outer surfaces of a fire rated floor, wall or partition.
   2. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether of not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved firestop any annular space between the sleeve and wall opening.

D. Provide firestopping to fill miscellaneous voids and openings in fire-rated construction as specified herein.

3.03 INSTALLATION

A. General
   1. Installation of Firestops shall be performed by a applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
   2. Apply Firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
   3. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of Firestop.

B. Field Quality Control
   1. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.
   2. Follow safety procedures recommended in the Material Safety Data Sheets.
   3. Finish surfaces of firestopping which is to remain exposed in the completed work to a uniform and level condition.
   4. All areas of work must be accessible until inspection by the applicable Code Authorities.
   5. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

C. Calculate the maximum cable fill ratio for each Firestopping System and cable type. Do not exceed the maximum fill ratio.

D. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.

3.04 WARRANTY

A. Comply with General Conditions, and include but not be limited to:
   1. Repairs and replacement of penetration seals which fail in joint adhesion, cohesion, abrasion, resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability, or appear to deteriorate in any other manner not clearly specified in submitted manufacturer's data as an inherent quality of the material for exposure indicated.

3.05 CLEANING

A. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.

B. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

C. Conduits and Backboxes for Communications Systems

PART 1 GENERAL

1.01 OUTLETS CAT5E AND CAT6

A. Each data outlet in a wall or floor shall be served by one (1) 1 in. conduit and a double-gang deep device box with a single-gang mud ring.

B. Wall mounted telephones shall be served by one 0.75 in. conduit and a single-gang deep device box with a single-gang mud ring. The outlet box shall be mounted at a center height of 48 in. above the finished floor, unless otherwise specified on the drawing, and shall have a clearance of 12 in. of wall surface on all sides.

C. All outlet conduits shall be stubbed into accessible ceiling space.

D. All outlet conduits shall have burrs and any other abrasive elements removed and an insulating bushing shall be installed on both ends.

E. No section of conduit shall be longer than 30 m (100 ft.) between pull points.

F. No more than 180 degrees of conduit bends shall be permitted between pull points.

G. The minimum inside radius for any bend of an outlet conduit shall be six times the inside diameter of that conduit.

1.02 OUTLETS CAT6A

A. Each data outlet in a wall or floor shall be served by two (2) 1.25 in. conduits and a 5-Square double-gang deep device box with a single-gang mud ring.
   1. Approved manufactures: Steel City, Rand-L, or approved equal

B. All outlet conduits shall be stubbed into accessible ceiling space.

C. All outlet conduits shall have burrs and any other abrasive elements removed and an insulating bushing shall be installed on both ends.

D. No section of conduit shall be longer than 30 m (100 ft.) between pull points.

E. No more than 180 degrees of conduit bends shall be permitted between pull points.

F. The minimum inside radius for any bend of an outlet conduit shall be six times the inside diameter of that conduit.

1.03 CONDUITS

A. Electric metallic tubing: Comply with UL 797. Tubing shall have hot dipped galvanized exterior, enamel-coated interior.

B. Flexible conduit shall not be used in lieu of conduit bends and offsets.

C. PVC conduit: Comply with UL 651, listed for use with 90 degrees C conductors operating at 90 degrees C.

1.04 STANDARDS COMPLIANCE

A. General standards: Comply with current revision of TIA 569 as amended

1.05 SUBMITTALS

A. Provide product data for the following:
   1. Manufacturers cut sheets, specifications, and installation instructions for all products (submit with bid).

1.06 COORDINATION

A. Coordinate installation of labels with other trades.

PART 2 PRODUCTS

2.01 APPROVED PRODUCTS

A. Dry location device boxes: Manufacturer shall be:
   1. Steel City, Rand-L, Hubbell, or Raco
      Equivalent products by other manufacturers may be used where approved in writing by Owner's Representative.

B. Wet location boxes: Manufacturer shall be:
   1. Steel City, Rand-L, Hubbell, or Raco
      Equivalent products by other manufacturers may be used where approved in writing by Owner's Representative.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation and configuration shall conform to the requirements of the current revision levels of California Electrical Code (CEC), ANSI/ EIA/TIA Standards 568 & 569, applicable local codes, and to the manufacturer's installation instructions.

B. Install conduits using techniques, practices, and methods that are consistent with Category 6 or higher requirements and that supports Category 6 or higher performance of completed and linked signal paths, end to end.

C. Follow manufacturer's recommendations for allowable fill capacity for each size non-continuous cable support.

Cable Trays for Communications Systems

PART 1 GENERAL

1.01 SCOPE

A. Continuous, rigid, welded steel or stainless-steel wire mesh cable management system.

B. Cable tray systems are defined to include, but are not limited to, straight sections, supports and accessories.

1.02 RELATED DOCUMENTS:

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

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain cable tray components through one source from a single manufacturer.

B. Comply with CEC California Electrical Code, Article 392: Cable Trays; provide UL Classification and labels.

1.04 COORDINATION

A. Coordinate layout and installation of cable tray with other trades.

B. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following:
1. Chatsworth, Bline

2.02 MATERIALS AND FINISHES:

A. Cable Tray Materials:
1. Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, bent, and surface treated after manufacture.

B. Cable Tray Finishes:
1. Finish for Carbon Steel Wire after welding and bending of mesh;
2. Electrodeposited Zinc Plating: ASTM B 633, Type III, SC-1.
3. Powder-Coated Trays – UL classified Black powder-coated surface treatment over Electrodeposited Zinc Plating (or plain steel) using ASA 61 black polyester coating.

C. Cable tray will consist of continuous, rigid, welded steel wire mesh cable management system, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where tray(including UL Classified painted tray) acts as Equipment Grounding Conductor (EGC). Wire mesh cable tray will have continuous Safe-T-Edge T-welded top side wire to protect cable insulation and installers.

D. Provide splices, supports, and other fittings necessary for a complete, continuously grounded system.
1. Straight Section Lengths: 118 inches (3,000 mm).
2. Wire Diameter: Patented design includes varying wire sizes to meet application load requirements; to optimize tray Strength; and to allow tray to remain lightweight.
3. Safe-T-Edge: Patented Safe-T-Edge technology on side wire to protect cable insulation and installers' hands.

E. CF Series Cable Tray Size:
1. Depth: Cable tray depth will be 4 inches
2. Width: Cable tray width will be 6 ,12, 18, or 24 inches as shown on Telecommunications Drawings:
3. Length: Cable tray section length will be 118 inches (3000mm) unless otherwise shown on drawings.
4. Fill Ratio: Cable tray may be filled to total fill capacity per CEC. Minimum 20% spare capacity recommended to accommodate future cabling changes or additions.
5. Load Span Criteria:

6. Cable tray will be capable of carrying a uniformly distributed load of 50 pounds per foot on an 8 ft support span, according to load tests of standard shown in Item A above.

2.03 CABLE TRAY SUPPORTS & ACCESSORIES

A. Fittings/Supports: Wire mesh cable tray fittings are field-fabricated from straight tray sections, in accordance with manufacturer's instructions. Supports will include the FAS (Fast Assembly System) where possible so that screws, bolts, and additional tools are not required for cable tray mounting; installation time is reduced; and tray path can adapt to installation obstacles without the need for additional parts. Place supports so that support span does not exceed that shown on the drawings.
   1. FAS System support methods to mount from ceiling and wall structures with 1/4", 3/8" or 1/2" threaded rod, if applicable
   2. Splices, including those approved for electrical continuity (bonding), as recommended by cable tray manufacturer. Select one of the following splicing methods, if applicable:
      a. UL Classified EDRN Fast Splice: No hardware required.
      b. UL Classified SWK Splice Washer Kit: Swaged set for splicing, turns, bends, tees
      c. UL Classified ED Universal Splice Bar: Cut & bend to fit any configuration.
      d. Preclick Splice: Bolted connection optional
      e. UL Classified EDT Splice Plate: Bolted connection
      f. UL Classified CE 25 & CE 30 Square Splice Washers: Use with EZ BN ¼" Nut & Bolt
      g. UL Classified CE 40 Square Splice Washer: Use with EZ BN ¼" to splice trays on bends, adjustable tees.
      h. FASLock Splice: For sweeps and bends with tray 12" (300mm) and wider.
      i. UL Classified EZ T 90 kit: For Tees and 90s
      j. UL Classified RADT90 kit: For 5-1/2" radius Tees and 90s

B. Accessories: As required to protect, support, and install a cable tray system. Select from the following accessories, if applicable:

2.04 EQUIPMENT GROUNDING CONDUCTOR FUNCTION & GROUNDING

A. UL Classified cable trays (including painted tray) may act as Equipment Grounding Conductors.

B. Use UL Classified splicing methods to ensure cable tray is electrically continuous and bonded as recommended.

C. Ground cable trays at end of continuous run.

D. Test cable tray system per NFPA70B, Chapter 18 to verify grounding less than 1 ohm.

E. Ground cable trays against fault current, noise, lightning, and electromagnetic interference by mounting grounding wire to each 10' cable tray section with grounding clamp.

PART 3 EXECUTION

3.01 EXAMINATION:

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of cable trays. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install cable tray level and plumb according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Cutting: Field-fabricate changes in direction & elevation by cutting & bending cable tray.
   1. Cut cable tray wires in accordance with manufacturer's instructions.
   2. Cable tray wires must be cut with side-action bolt cutters with offset head to ensure integrity of protective galvanic layer.
   3. Remove burrs and sharp edges from cable trays.

3.03 UNDERGROUND DUCTS AND RACEWAYS FOR COMMUNICATIONS SYSTEMS

A. Outdoor telecommunications pathways connect building, pedestals, maintenance holes, handholds, and towers. These pathways consist of underground, direct-buried or aerial. Underground or direct-buried are generally preferred over aerial because of aesthetics and security. Generally, underground duct banks are preferred over direct-buried because of security, ease of future cable installation and maintenance.

B. Conduit Types
   1. Examples of conduit types include:
      — DB-120 – For direct burial or encasement in concrete;
      — Rigid Nonmetallic Conduit Schedule 40 – For direct burial or encasement in concrete;
      — Rigid Nonmetallic Conduit Schedule 80 – For direct burial or encasement in concrete;
      — Multiple Plastic Duct (MPD) – For direct burial or installation in conduit;
      — Rigid Metallic Conduit – For direct burial or encasement in concrete;
      — Intermediate Metallic Conduit – For direct burial or encasement in concrete;
      — Innerduct Polyethylene (PE) – For direct burial or installation in conduit;
      — Innerduct Polyvinyl Chloride (PVC) – For direct burial or installation in conduit

C. Installation
   1. The length of conduit between pulling points shall not exceed 600 ft (183m).
   2. Manufactured bends should be used whenever possible. No section of conduit shall contain more that two 90-degree bends, or equivalent between pull points.
   3. Conduits should be installed such that a slope exists to allow drainage and prevent the accumulation of water.
   4. When conduits connect maintenance holes, a slope of .125 in per foot (10 mm per meter) should exits from the middle of the span to each maintenance hole.
   5. Conduits must be buried at a minimum depth of 18 in. (45.7 cm).

Identification for Communications Systems

PART 1 GENERAL

1.01 WORK INCLUDES

A. Work covered by this Section shall consist of furnishing labor, equipment and materials necessary for the labeling of the telecommunications infrastructure as described on the Drawings and/or required by these specifications.

1.02 SCOPE OF WORK

A. This Section includes the minimum requirements for the Identification and labeling of the Communications Systems for the project as outlined in the Bid Document.

1.03 SUMMARY

A. Administration of the telecommunications infrastructure includes documentation of cables, termination hardware, patching and cross-connection facilities, conduits, other cable pathways, Telecommunications Rooms, and other telecommunications spaces. All facilities shall apply and maintain a system for documenting and administering the telecommunications infrastructure.

B. Industry Labeling Standards and Conventions shall be used unless otherwise stated in the bid documents or by the Owner's Representative.

C. Telecommunications Infrastructure Records must be maintained in a computer spreadsheet, or in a computer database. Paper records are encouraged but are optional. A cable record is prepared for each backbone cable. The record will show the cable name and must describe the origin point and destination point of the cable. The cable record will record what services and/or connections are assigned to each cable pair or strand. An equipment record is prepared for services distributed from a certain piece of equipment, such as a router, or a system such as the telephone system PBX.

D. Installer shall maintain accurate, up-to-date Installation or Construction Drawings. At a minimum, the Installation Drawings shall show pathway locations and routing, configuration of telecommunications spaces including backboard and equipment rack configurations, and wiring details including identifier assignments.

E. Installer shall provide a complete and accurate set of as-built drawings. The as-built drawings shall record the identifiers for major infrastructure components including; the pathways, spaces, and wiring portions of the infrastructure which may each may have separate drawings if warranted by the complexity of the installation, or the scale of the drawings.

1.04 QUALITY ASSURANCE

A. All labels shall be installed in a neat and workmanlike manner. All methods of labeling that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative.

B. Labels shall be of the quality and manufacture indicated. The labels and labeling equipment specified are based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

C. Strictly adhere to all Building Industry Consulting Service International (BICSI), Electronic Industries Alliance (EIA) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data labeling.

PART 2 PRODUCTS

2.01 LABELS

A. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

B. Where insert type labels are used provide clear plastic cover over label.

C. Outside plant labels shall be totally waterproof even when submerged.

PART 3 EXECUTION

3.01 IDENTIFICATION & LABELING

A. The size, color, and contrast of all labels should be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure.

B. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labeled component.

C. All labels shall be printed or generated by a mechanical device.

3.02 TELECOMMUNICATION IDENTIFIERS

A. Outside Plant cabling shall be clearly marked using permanent means. Outside plant shall use the following system of numbering and labeling:
   1. Fiber Optic:
      a. Identify: far-end building name, building number, fiber-type and strand-count
      b. Label at entrance and exit points of tunnel system and at conduit entry points between 12 inches and 36 inches from the conduit or at closet point that is clearly visible and long cable length in tunnel at 200 foot intervals.
      c. Label at termination panels at both ends.
   2. Copper:
      a. Identify: far-end building name, building number and strand-count
      b. Label at entrance and exit points of tunnel system and at conduit entry points between 12 inches and 36 inches from the conduit or at closet point that is clearly visible and long cable length in tunnel at 200-foot intervals.

B. Riser cabling shall be clearly marked using permanent means. Riser cabling shall use the following system of numbering and labeling:
   1. Fiber Optic:
      a. Identify: far-end EF / ER / TR, fiber-type and strand-count.
      b. When small facilities are fed from a primary location and treated as an ER, riser shall be labeled similar to Outside Plant Fiber Optic.
   2. Copper:
      a. Identify: far-end EF / ER / TR and pair-count
      b. Termination points shall be labeled as to actual pair at every fifth (5th) pair-point.

3.02 LABELING PROCEDURES

A. To be consistent with ANSI/TIA/EIA standards and industry practices, it is important that both labeling and color coding be applied to all telecommunications infrastructure components. Labeling with the unique identifier will identify a particular component. Proper color coding will quickly identify how that component is used in the overall telecommunications infrastructure of the facility.

B. Visibility and durability:
   1. The size, color, and contrast of all labels should be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure.

2. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labeled component.
3. Labels are generally of either the adhesive or insert type. All labels must be legible, resistant to defacement, and maintain adhesion to the application surface.
4. Outside plant labels shall be totally waterproof, even when submerged.
5. Labels applied directly to a cable shall have a clear vinyl wrapping applied over the label and around the cable to permanently affix the label.
6. Other types of labels, such as tie-on labels, may be used. However, the label must be appropriate for the environment in which it is used and must be used in the manner intended by the manufacturer.

C. Mechanical generation
1. All labels shall be printed or generated by a mechanical device.
2. Handwritten labels are NOT acceptable.

END of SECTION

SECTION 271000
STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems.
   1. Includes intersystem bonding termination.
   2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

C. Section 260536 - Cable Trays for Electrical Systems.

D. Section 260533.16 - Boxes for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products.

F. Section 262726 - Wiring Devices.

G. Section 270529 - Hangers and Supports for Communications Systems.

H. Section 270533.13 - Conduit for Communications Systems.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.

D. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).

G. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

H. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures

– Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).

I. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.

J. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

K. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.

L. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

M. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).

N. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

O. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

P. UL (DIR) - Online Certifications Directory; Current Edition.

Q. UL 444 - Communications Cables; Current Edition, Including All Revisions.

R. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

S. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

T. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.

C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Sustainable Design Documentation: Submit manufacturer's product data on cable and cable insulation showing compliance with specified lead content requirements.

D. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

E. Evidence of qualifications for installer.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

G. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

H. Field Test Reports.

I. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on drawings.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
   3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.

3. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

C. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

A. Conduit: See section 270533.13.

B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

C. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:
      a. HILTI Firestop.

2.03 COPPER CABLE AND TERMINATIONS

A. Manufacturers:
   1. CommScope; _____: www.commscope.com/#sle.
   2. Siemon Company; _____: www.siemon.com/#sle.
   3. Leviton, Belden.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Copper Backbone Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
   2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.
   3. Cable Capacity: Quantity of pairs as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

C. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   3. Cable Capacity: 4-pair.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
      c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.

5. Cable Jacket Color - Voice and Data Cable: Blue.
6. Cable Jacket Color - Wireless Access Point Cable: Blue.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

E. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
3. Product(s):
   a. CommScope; SYSTIMAX RJ45 Jacks; MGS400 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.
   b. CommScope; Uniprise RJ45 Jacks; UNJ600 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.

F. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each pair of patch panel ports.
   b. Length: 1 Meter.
3. Patch Cords for Work Areas:
   a. Quantity: One for each work area outlet port.
   b. Length: 3 Meter.
4. Product(s):

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:

B. Fiber Optic Backbone Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
3. Cable Capacity: Quantity of fibers as indicated on drawings.
4. Cable Applications:
   a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
   b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
5. Cable Jacket Color:
   a. Single-Mode Fiber (OS1/OS2): Yellow.

C. Fiber Optic Horizontal Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
3. Cable Capacity: 2-fiber.
4. Cable Applications:
   a. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
   b. General Applications: Use listed NFPA 70 Type OFN/OFNG general purpose cable, Type OFNR riser cable, or Type OFNP plenum cable.

5. Cable Jacket Color:
   a. Single-Mode Fiber (OS1/OS2): Yellow.
6. Product(s):

D. Fiber Optic Interconnecting Devices:
1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.
4. Product(s):

E. Fiber Optic Patch Cords:
1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each pair of patch panel ports.
   b. Length: 1 Meter.
3. Patch Cords for Work Areas:
   a. Quantity: One for each work area outlet port.
   b. Length: 3 Meter.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
   a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
   b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
   c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
   d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:
1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
   a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
   b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
   c. Provide incoming cable strain relief and routing guides on back of panel.
   d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
   e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
1. Size: As indicated on drawings.
2. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:
1. Manufacturers:

a. Chatsworth.
b. Substitutions: See Section 016000 - Product Requirements.

2. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
3. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
   a. Load Rating: 400 pounds (_____ kg).
4. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
   a. Load Rating: 800 pounds (_____ kg).
5. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.
   a. Load Rating: 1200 pounds (_____ kg).
6. Cabinets: Steel construction with corrosion resistant finish.
7. Locks: Keyed alike.
8. Products:
   a. Chatsworth.

E. Cable Management:
   1. Manufacturers:
      a. Chatsworth.

2.06 COMMUNICATIONS OUTLETS

A. Manufacturers:
   1. Leviton.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Outlet Boxes: Comply with Section 260533.16.
   1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.

C. Wall Plates:
   1. Comply with system design standards and UL 514C.
   2. Accepts modular jacks/inserts.
   3. Capacity:
      a. Voice Only Outlets: 2 ports.
      b. Data or Combination Voice/Data Outlets: 4 ports.
   4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match electrical wall plate color.

2.07 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

2.08 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

2.09 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches (300 mm) from power conduits and cables and panelboards.
   3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
   4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

B. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

C. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.
      a. Mounting Heights: Unless otherwise indicated, as follows:
         1) Telephone Outlets for Side-Reach Wall-Mounted Telephones: ____ inches (____ m) above finished floor to top of telephone.
         2) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches (1.2 m) above finished floor to top of telephone.
      b. Locate outlet boxes so that wall plate does not span different building finishes.
      c. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables. No nylon ties allowed(ZipTie).
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches (3000 mm).
   2. At Outlets - Copper: 12 inches (305 mm).
   3. At Outlets - Optical Fiber: 39 inches (1000 mm).

C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
   3. Use T568B wiring configuration.

D. Fiber Optic Cabling:
   1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
   2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:
   1. Install to plywood backboards only, unless otherwise indicated.
   2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

G. Floor-Mounted Enclosures: Connect adjacent cabinets together and remove interior side panels.

H. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Test backbone cables after termination but before cross-connection.
   2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
   3. Test operation of shorting bars in connection blocks.
   4. Category 3 Backbone: Perform attenuation test.
   5. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.
   6. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
   7. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Testing - Fiber Optic Cabling:
   1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
   2. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
   3. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

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SECTION 281000
ACCESS CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access control system requirements.

B. Access control units and software.

C. Access control point peripherals, including readers and keypads.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Electrically operated door hardware, for interface with access control system.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260533.13 - Conduit for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 283111 - Building Intrusion Detection: For interface with access control system.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

E. UL 1076 - Proprietary Burglar Alarm Units and Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other installers to provide suitable door hardware as required for both access control functionality and code compliance.

2. Coordinate the placement of readers with millwork, furniture, equipment, etc. installed under other sections or by others.

3. Coordinate the work with other installers to provide power for equipment at required locations.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:
1. Conduct meeting with facility representative and other related equipment manufacturers to discuss access control system interface requirements.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

D. Design Data: Standby battery/UPS calculations.

E. Certify that proposed system design and components meet or exceed specified requirements.

F. Evidence of qualifications for manufacturer.

G. Evidence of qualifications for installer.

H. Evidence of qualifications for maintenance contractor (if different entity from installer).

I. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

J. Manufacturer’s detailed field testing procedures.

K. Field quality control test reports.

L. Maintenance contracts.

M. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

N. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

O. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

P. Software: One copy of software not resident in read-only memory.

Q. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Deliver blank credentials to Owner as directed.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70.
   2. NFPA 101 (Life Safety Code).
   3. The requirements of the local authorities having jurisdiction.
   4. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with access control systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.
   1. Contract maintenance office located within 100 miles (160 km) of project site.

E. Maintenance Contractor Qualifications: Same entity as installer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 ACCESS CONTROL SYSTEM REQUIREMENTS

A. Provide new access control system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Battery Backup: Provide batteries/uninterruptible power supplies (UPS) as required for 1 Hour minutes full operation.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.
   1. Access Control Units and Readers: Listed and labeled as complying with UL 294.

2.02 ACCESS CONTROL UNITS AND SOFTWARE

A. Provide access control units and software compatible with readers to be connected.

B. Unless otherwise indicated, provide software and licenses required for fully operational system.

2.03 ACCESS CONTROL POINT PERIPHERALS

A. Provide devices compatible with control units and software.

B. Provide devices suitable for operation under the service conditions at the installed location.

C. Door Locking Devices (Electric Strikes and Magnetic Locks): Comply with Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Wiring Method: Unless otherwise indicated, use cables (not in conduit).
   1. Use suitable listed cables in wet locations, including underground raceways.
   2. Use suitable listed cables for vertical riser applications.
   3. Use listed plenum rated cables in spaces used for environmental air.
   4. Conceal cables unless specifically indicated to be exposed.
   5. Use power transfer hinges complying with Section 087100 for concealed connections to door hardware.
   6. Route exposed cables parallel or perpendicular to building structural members and surfaces.
   7. Do not exceed manufacturer's recommended maximum cable length between components.

D. Provide grounding and bonding in accordance with Section 260526.

E. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Program system parameters according to requirements of Owner.

E. Test for proper interface with other systems.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.
   3. Instructor: Manufacturer's authorized representative.
   4. Location: At project site.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

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Section 31 1000
Site Clearing

PART 1 - GENERAL

1.01 Summary

A. Section Includes:
1. Protecting existing vegetation to remain.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and removing site utilities.
6. Temporary erosion- and sedimentation-control measures.

B. Related Sections:
1. Section 01 5000 "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities**,** and temporary erosion- and sedimentation-control measures.
2. Section 01 7300 "Execution" for field engineering and surveying.
3. Section 02 4119 "Selective Demolition" for partial demolition of buildings or structures.

1.02 Definitions

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.03 Material Ownership

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.04 Informational Submittals

A. A Dust Control Plan approved by the San Joaquin Valley Air Pollution Control District (SJVAPCD).

1.05 Project Conditions

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify Underground Service Alert at 1-800-227-2600 at least 2 working day in advance of construction to locate utilities in the public way.

C. The Contractor shall be responsible for retaining a qualified utility locating service to locate all other private utilities in the work area. It shall be the responsibility of the Contractor to determine the existence and location of those utilities shown on the drawings or indicated in the field by locating services. Any additional costs incurred as a result of Contractor's failure to verify locations of existing utilities prior to beginning of construction in their vicinity shall be borne by the Contractor and assumed included and merged into the contract price.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.01 Materials

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 2000 "Earth Moving."
   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.01 Preparation

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 Temporary Erosion And Sedimentation Control

A. The State of California Regional Water Quality Board requires that all projects disturbing one acre or more of land shall file a Notice of Intent to the Board and must implement a Storm Water Pollution Prevention Plan (SWPPP) in order to meet the requirements of the Construction General Permit 2012-0006-DWQ. Construction work shall not commence until the SWPPP is completed and a Waste Discharger Identification (WDID) number is assigned.
   1. The Owner will prepare the SWPPP, pay all fees to the Regional Water Quality Control Board (RWQCB) and obtain a WDID number. The Owner will also be responsible for annual fees payable to the Regional Water Quality Control Board (RWQCB) until termination of the permit.
   2. The Contractor is responsible for retaining a qualified a Qualified SWPPP Practitioner (QSP), implementing the SWPPP and ensuring that all documents are kept up to date and in compliance with State requirements, including submitting annual reports and filing the Notice of Termination (NOT) with the RWQCB.

B. The San Joaquin Valley Air Pollution Control District regulates all dust control and emission standards throughout the Central Valley. Regulation VIII – Fugitive PM10 Prohibitions requires that a Dust Control Plan (DCP) be completed for this project. Construction work shall not commence until the DCP is completed and approved by the District. It shall be the Contractor’s responsibility to prepare the DCP, pay all applicable fees and implement all measures listed in the Plan.

C. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways,

according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

D. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

E. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

F. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 Tree And Plant Protection

A. General: Protect trees and plants remaining on-site according to requirements in Section 01 5639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.04 Existing Utilities

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
   1. Arrange with utility companies to shut off indicated utilities.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.05 Clearing And Grubbing

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Grind down stumps and remove roots, obstructions, and debris to a depth of 24 inches below exposed subgrade.
   3. Use only hand methods for grubbing within protection zones.
   4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to at least 90% relative compaction.

3.06 Topsoil Stripping

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil 1 to 3 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
   1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 3 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
   1. Limit height of topsoil stockpiles to 72 inches.
   2. Do not stockpile topsoil within protection zones.
   3. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.07 Site Improvements

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.08 Disposal Of Surplus and Waste Materials

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

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Section 31 2000
Earth Moving

PART 1 - GENERAL

1.01 Summary

A. Section Includes:
1. Preparing subgrades for slabs-on-grade, walks and pavements.
2. Preparation of areas for buildings and structures.
3. Subbase course for concrete walks.
4. Aggregate subbase, bases & recycled bases.

B. Related Sections:
1. Section 01 3200 "Construction Progress Documentation" for recording preexcavation and earth moving progress.
2. Section 01 5000 "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Section 03 3000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Section 31 1000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.02 Definitions

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Satisfactory Soil: Native or Borrow soil as described in Article 2.1.

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

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.03 Action Submittals

A. Product Data: For each type of the following manufactured products required:
1. Warning tapes.

1.04 Informational Submittals

A. Material Test Reports: For each borrow soil material proposed for fill and backfill as follows:
1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

1.05 Quality Assurance

A. Preexcavation Conference: Conduct conference at Project site.

1.06 Project Conditions

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify Underground Service Alert for area where Project is located before beginning earth moving operations.

D. Contractor shall retain (at Contractor's sole expense) a qualified utility locator service to locate underground utilities for work areas not covered by Underground Service Alert.

E. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 31 1000 "Site Clearing," are in place.

PART 2 - PRODUCTS

2.01 Soil Materials

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Native soil free of deleterious matter, not containing particles greater than 3 inches in maximum diameter and less than 3% organics by weight (ASTM D-2974) is classified as a Satisfactory Soil. Import fill soil that is non-expansive and granular in nature with the following acceptance criteria:
1. Percent Passing 3-Inch Sieve: 100
2. Percent Passing ¾-Inch Sieve: 95
3. Percent Passing No. 4 Sieve: 60-100
4. Percent Passing No. 200 Sieve: 40
5. Plasticity Index: Less than 14
6. Expansion Index (ASTM D4829): Less than 20
7. Organics: Less than 3 percent by weight
8. R-Value: 50 minimum
9. Sulfates: Less than 0.05 percent by weight
10. Min. Resistivity: Greater than 2,000 ohms-cm
11. Maximum Water Soluble Sulfate (SO_4) in Soil, percent by weight: 0.20

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Course: Aggregate Subbase Course shall conform to Section 25 of the Caltrans Specifications. The class of aggregate subbase shall be noted on the Drawings.

E. Base Course: Aggregate Base Course shall be Class 2 and shall conform to the provisions of Section 26 of the Caltrans Specifications. The gradation of the Class 2 aggregate base shall be as specified for 1-1/2 inch maximum aggregate.

F. Decomposed Granite: Decomposed granite must be crushed granite rock screening graded from 3/8-inch particles to dust. The material must have a minimum California R-Value of 50 and comply with the following gradation:

Grading Requirements

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95-100
No. 8	75-80
No. 16	55-65
No. 30	40-50
No. 50	25-35
No. 100	20-25
No. 200	5-15

Note: Gradation based upon AASHTO T11-82 and T27-82

G. Engineered Fill: Native on-site soils and/or imported fill meeting the requirements listed under the section "Satisfactory Soils" will be acceptable for use as Engineered Fill.

H. Bedding Course: Compacted sand material or a naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Special Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

J. Special Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Sand: ASTM C 33; fine aggregate.

L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 Accessories

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.

3. Orange: Telephone and other communications.
4. Green: Sewer systems.

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

C.

1. Blue: Water Systems.

PART 3 - EXECUTION

3.01 Preparation

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 Dewatering

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 Earthwork, General

A. Earthwork: All earthwork required on the Drawings, and the following Sections regardless of the character of surface and subsurface conditions encountered shall be included in the Contract Sum. Excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Fill unauthorized excavations as required by the Geotechnical Engineer at no additional cost to the Owner.

3. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
   a. 24 inches outside of concrete forms other than at footings.
   b. 12 inches outside of concrete forms at footings.
   c. 6 inches outside of minimum required dimensions of concrete cast against grade.
   d. 6 inches beneath bottom of concrete slabs-on-grade.
   e. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.04 Excavations At Edges Of Tree And Plant-Protection Zones

A. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.05 Preparation Of Areas To Receive Fill

A. All paving, hardscape, and building areas to receive fill shall be scarified to a depth of 8 inches below the stripped ground surface and moisture conditioned to near optimum moisture content, and compacted to at least 90 percent of the maximum density obtain by ASTM Test Method D1557.

B. Material And Compaction For Soil Fill

C. Material for fill shall be Engineered Fill. Place fill on subgrades free of mud, frost, snow, or ice. Fills shall be uniformly moisture-conditioned to near optimum moisture content, placed in horizontal lifts less than 8 inches in loos thickness, and compacted to at least 90 percent as determined by ASTM Test Method D1557. Disking and/or blending may be required to uniformly moisture condition soils used for engineered fill.

3.06 Preparation Of Building Areas

A. Excavate Earth material to a minimum depth of four (4) feet below existing grade in the proposed structure, building area or one (1) foot below bottom of proposed foundations, whichever is deeper. Excavation shall extend five (5) feet beyond the outside edges of exterior footings.

B. The bottom of the excavation shall be reviewed by the soil engineer or his or her representative prior to any backfill operations.

C. The top eight (8) inches of materials exposed at the bottom of the excavation shall be scarified and compacted to a minimum of 90 percent of ASTM D1557.

D. Moisten excavated and imported soils to near optimum moisture consistent with effective compaction and soils stability. Compact moistened soils to a minimum of 90 percent of the maximum density obtained by ASTM Test method D1557.

E. The upper two (2) feet of the finished subgrade shall be non-expansive soil. The on-site soil with Expansion Index greater than 20 must be placed two (2) feet below finish subgrade.

F. A moisture cut-off/containment system should be provided at the free edges (not adjacent to buildings or pavement curbing) of exterior concrete slabs. This cut-off could consist of a 10-mil PVC membrane draped vertically for a depth of 18 inches.

G. It will be necessary to maintain the moisture in conditioned subgrade if the moisture conditioning is performed prior to the time of concrete placement. This could be achieved by periodic watering to provide sufficient moisture to counter evaporative loss. The frequency of moisture application will vary based on ambient temperature, humidity and wind conditions.

3.07 Preparation Of Pavement Areas

A. Areas where driveways and concrete/asphalt pavement are proposed shall be scarified to a depth of 12 inches minimum below the grading plane in cut areas or 12 inches below existing grade in areas to receive fill. Scarification shall extend to a minimum of two feet beyond the outside edges of pavement, moisture conditioned to near optimum and compact to a minimum of 90 percent of the maximum density as obtained by ASTM D1557. The top eight (8) inches of the finished subgrade below pavement areas shall be compacted to a minimum of 95% relative compaction per ASTM Test Method D1557.

3.08 Preparation at Exterior Concrete Flatwork Areas:

A. Areas Under concrete walkways, ramps, curb and gutter, and other hardscapes not mentioned in previous Sections shall be excavated to a minimum depth of 12 inches below existing grade or one (1) foot below bottom of proposed concrete, whichever is deeper. Excavation shall extend to a minimum of 2 feet beyond the outside edges of concrete improvements.

B. The bottom of the excavation shall be reviewed by the soil engineer or his or her representative prior to any backfill operations.

C. Scarify the top 8 inches of subgrade and moisture conditioned to near optimum and compacted to at least 90% of the maximum density obtained by ASTM Test Method D1557.

D. The upper one (1) foot of the finished subgrade shall be non-expansive soils. The on-site soil with Expansion Index greater than 20 must be placed two (2) feet below finished subgrade.

3.09 Subgrade Inspection

A. Notify Geotechnical Engineer when excavations have reached required subgrade. Testing shall be in accordance with the "Field Quality Control" Section.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. See Section 321313 "Concrete Paving" for special requirements for preparation inspection and testing of subgrade and base course.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Geotechnical Engineer, without additional compensation.

3.10 Aggregate Bases, Subbases, Recycle Bases, Decomposed Granite

A. Aggregate Bases: Aggregate Base Course for Hot-Mix Asphalt Concrete and Cement Concrete Pavement shall be Class 2 and shall conform to the provisions of Section 26 of the Caltrans Specifications. The gradation of the Class 2 aggregate base shall be as specified for 1-1/2 inch maximum aggregate. Base course shall be compacted to at least 95 percent and shall have a thickness as noted on the Drawings.

B. Aggregate Subbases: Aggregate Subbase Course shall conform to Section 25 of the Caltrans Specifications. The Class of the subbase shall be noted on the Drawings. Subbase course shall be compacted to at least 95 percent and shall have a thickness as noted on the Drawings.

C. Recycled Base and Subbase Courses: Aggregate Base or Subbase may be composed of salvaged oiled earth and asphalt concrete from the existing roadway recycled and mixed with imported materials to meet the requirements of the base or subbase class noted on the Drawings. The Contractor will be responsible for paying for the "R" Value testing of the salvaged materials. The Contractor must show that the "R" Value of the salvaged material meets or exceeds the requirements of the base or subbase class noted on the Drawings. The amount of recycled/reclaimed material in the mix shall not exceed 50 percent of the total volume of the aggregate used.

D. Decomposed Granite: Decomposed Granite shall be compacted to 95 percent relative compaction and shall have thickness as noted on the drawings. Do not install decomposed granite work during rainy conditions. Finished Decomposed Granite surface should be smooth and uniform.

3.11 Excavation For Utility Trenches

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to a minimum of 12 inches higher than top of pipe or conduit unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper (or as shown on drawings) than bottom of pipe drawings and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
   1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.12 Utility Trench Backfill

A. Place backfill on subgrades free of mud, frost, snow, or ice. Backfill shall be placed and compacted in accordance with the details on the Drawings and the specifications listed below.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with satisfactory soil while removing shoring and bracing.

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 24 inches below the bottom of the finished asphalt or concrete pavement section. Initial backfill shall be compacted to 90 percent.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation with at least 95 percent compaction under pavement areas. Final backfill may be compacted to at least 90 percent in building, hardscape, and unpaved areas.

F. Install detectible warning tape directly above utilities, 18 inches below finished grade or 8 inches below the bottom of compacted subgrade layers below pavements and slabs, whichever is deeper.

3.13 Backfill, General

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.

6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.14 Soil Fill, General

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

B. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use engineered fill.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.15 Soil Moisture Control

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to or above optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 Placement Of Soil Backfills And Fills

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

3.17 Grading

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 Inch
   2. Walks: Plus or minus 1 Inch
   3. Pavements: Plus or minus 1/2 Inch

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 Inch when tested with a 10-foot straightedge.

3.18 Storage Of Soil Materials

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.19 Field Quality Control

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material and maximum lift thickness comply with requirements.
   3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Any imported fill materials to be used for engineered fill shall be sampled and tested by the Testing Agency for compliance with the section “Satisfactory Soils” prior to being transported to the site.

D. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

E. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

F. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Mass Fills, Subgrade, and Building Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2500 sq. ft, but in no case fewer than three tests
   2. Pavement Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 5000 square feet. or less of paved area or building slab, but in no case fewer than three tests.
   3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
   4. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 200 feet or less of trench length, but no fewer than two tests.

G. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained at no cost to the Owner.

H. Additional testing and work required due to the Contractor's failure to meet the requirements of the Geotechnical Report and these specifications shall be paid for by the Contractor.

3.20 Protection

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

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by the Geotechnical Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 Disposal Of Surplus And Waste Materials

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Geotechnical Engineer.
   1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

Section 31 20 01
Pumptrack Earthwork

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following items of work within the pumptrack area:

1. Preparing subgrades for pumptrack asphalt pavements.
3. Subbase course for pumptrack asphalt pavements.
4. Excavating and backfilling trenches for underground utilities and drainage systems.
5. Grading of areas to receive topsoil/mulch.
7. Moving and spreading previously stockpiled topsoil.

B. References: See 32 18 01

1.02 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation (Over-Excavation): Excavation below subgrade elevations of unsatisfactory soil materials as directed by the Owner's Representative. Additional excavation and replacement material may be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10-feet (3 m) in width and pits more than 30-feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by the Owner's Representative.

F. Fill: Soil materials used to raise existing grades to subgrade elevation.

G. Structural Fill: Satisfactory soil material obtained from on-site excavations required for embankment construction within the zone of influence and meeting the specified material requirement.

H. General Fill: Satisfactory soil material obtained from common excavation, unsuitable material excavation, and off-site borrows, locations if necessary for backfilling and embankment construction in all areas not within the zone of influence and meeting the specified material requirements. General fill material shall also include crushed aggregate materials resulting from building and site improvement demolition activities. Crushed concrete, asphalt, brick and masonry free of finishes, paints, coatings, wire mesh and reinforcing steel may be used as general fill material with a maximum particle size of 2-inches in diameter.

I. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material ¾-cubic yards or more in volume that when tested by the Independent Testing Agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100-blows per 2-inches.

J. Subbase Course: Layer placed between the subgrade and base course for asphalt paving.

K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

L. Utilities include on-site underground pipes, conduits, ducts, and cables.

1.03 SUBMITTALS

A. Product Data for the following (where required and if specified):

1. All import material per source.
2. All Class II Aggregate Base Material.
2. Drainage fabric.
3. Separation fabric.

B. Samples: For the following where required and if specified:

Samples of off-site borrow material for testing by Independent Testing Agency. Material must be reviewed by Pumptrack Designer and Pumptrack Specialty Work Contractor

1.04 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted by the Owner's Representative.

1.05 REQUIRED INSPECTION POINTS

A. During the course of construction, approval of Engineer and Pumptrack

B. Designer shall be required:

Approval Required On:	Prior to:
1. Site mass grading layout/staking	Mass grading of site
2. Rough grading	Layout of riding lanes
3. Layout/staking of riding lanes	Layout of riding features (jumps, berms, rollers, prefabricated features, etc.)
4. Layout/staking of riding features features/lanes	Construction/Installation of riding
5. Approval of all feature subgrades.	Installation of asphalt base course
6. Installation of base course	Installation of asphalt paving

C. Various inspection points may be waived by the Pumptrack Designer as documented in a written format to the Client and Contractor. In the event the Contractor continues operations without receiving the above approvals or written waiver, the inspector may, at his discretion, require the Contractor to return all construction status to the previous approval point. There shall be no additional payment for any removal or reconstruction required under this section.

D. The location of riding features (jumps, berms, rollers, prefabricated features, etc.) as depicted in the design plans shall be considered approximate and requiring field fit (e.g. heights, lengths, widths, spacing between features) with oversight from the Pumptrack Designer. Staking shall be reviewed and approved by the Pump Tack Designer prior to starting construction and rough grading and paving activities. The Contractor shall not be eligible for additional compensation for field fit design changes other than those that cause a significant change in quantities.

1.06 DUST CONTROL

A. The Contractor shall comply with local and regional ordinances pertaining to dust control.

B. The Contractor shall take adequate measures to control dust on the site. The Contractor shall have on the site an adequate number of watering vehicles to control dust by his operations.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups free of rock or gravel larger than 2-inches (50-mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. On-site materials approved for use as engineered fill shall be approved by the Owner's provided testing agency.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups ML, MH, CH, OL, OH, and PT, or a combination of these group symbols which are not suitable for the support of foundations, floor slabs, pavements, or other elements.

D. Backfill and Fill: Satisfactory soil materials.

E. Granular Backfill: Satisfactory soil material obtained from on-site or off-site source meeting the requirements of B-borrow as defined by the CDT Standard Specifications and generally used for backfill of trenches located under or within 5-feet of pavements, walks and structures.

F. Crushed Rock Base shall be a Class II Aggregate Base or equal as approved by the Owner's Representative.

2.02 ACCESSORIES

A. Filter Fabric: Nonwoven geotextile specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods.

1. Grab Tensile Strength: 110-pounds; ASTM D 4632.
2. Tear Strength: 40-pounds; ASTM D 4533.
3. Puncture Resistance: 50-pounds, ASTM D 4833.
4. Water Flow Rate: 150-gallons-per-minute per square foot; ASTM D 4491.
5. Apparent Opening Size: No. 100 U.S. Standard Sieve Size; ASTM D 4751.

PART 3 EXECUTION

3.01 PREPARATION

A. All grading and earthwork shall be performed in accordance with recommendations of the project Geotechnical Report. If discrepancies are discovered between this Specification and the Geotechnical Report, the Geotechnical Report shall take precedence.

B. All Pumptrack features shall be graded in ride order to the greatest extent possible. Contractor shall coordinate with Pumptrack Designer to confirm general layout and shape.

C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

D. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

E. Protect unattended open excavations by placing construction fencing and warning tape completely around the excavation.

3.02 DEWATERING

A. Prevent surface water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Dewater excavations as necessary due to groundwater infiltration.

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

3.03 EXCAVATION

A. Explosives: Do not use explosives unless approved by Owner's Representatives or authorities having jurisdiction.

B. Classified Excavation: Excavation to required subgrade elevations classified as earth and rock. Excavation will be classified as earth excavation or rock excavation as follows:

1. Earth excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with soil and other materials encountered that are not classified as rock or unauthorized excavation.
2. Intermittent drilling, blasting, or ripping to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

3.04 STABILITY OF EXCAVATIONS

Comply with OSHA, State statutes, local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.05 EXCAVATION FOR PUMPTRACK ASPHALT PAVEMENTS

Excavate surfaces under pavements to indicated cross sections, elevations, and grades to within a tolerance of plus or minus 0.10-feet.

3.06 EXCAVATION FOR DRAINAGE AND UTILITY TRENCHES

A. Excavate trenches to indicated slopes, lines, depths, and invert elevations.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12-inches higher than top of pipe or conduit, unless otherwise indicated.

Clearance: 12-inches on each side of pipe or conduit or as indicated on the Drawings.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.

1. For pipes or conduit less than 6-inches in nominal diameter and flat-bottom multiple duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6-inches or larger in nominal diameter, shape bottom of trench to support bottom 90-degrees of pipe circumference. Fill depressions with tamped sand backfill or material as indicated on the Drawings.
3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6-inches below invert elevation to receive bedding course.

3.07 APPROVAL OF SUBGRADE

A. Prior to the placement of any fill material for riding feature (jumps, berms, etc.) construction, the Contractor shall layout (stake, chalk, flag, etc.) the location of each pumptrack feature in order of riding direction as shown on the plans. Layout of riding features must be approved by the Pumptrack Designer or Pumptrack Designer-approved representative before feature construction. After approval of the layout, riding features shall be constructed or installed in the sequence of riding direction as shown on the plans. All features shall be tested by the Pumptrack Designer or Pumptrack Designer-approved representative prior to the construction of the next feature in the sequence.

A. Notify Owner's Representative and Pumptrack Designer when excavations have reached required subgrade.

B. Proof roll subgrade and subsequent lifts of fill material within the limits of all pavements in accordance with the requirements of the Geotechnical Engineer.

C. If unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owner's Representative.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile suitable soil materials separate from topsoil and unsuitable material stockpiles without intermixing. Place, grade, and shape stockpiles to drain surface water.

Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees or immediately next to property lines.

3.09 BACKFILL

Backfill excavations promptly, but not before completing the following:

1. Acceptance of construction below finish.
2. Testing, inspecting, and approval of underground utilities.
3. Removal of trash and debris from excavation.
4. Removal of temporary shoring and bracing, and sheeting.

3.10 DRAINAGE AND UTILITY TRENCH BACKFILL

A. Place and compact bedding course on unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, barrels of pipes, joints, fittings, and bodies of conduits.

B. Place and compact haunching and initial backfill in loose lifts not exceeding 8-inches in thickness. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

C. Coordinate backfilling with utilities testing.

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

E. Place and compact final backfill as indicated on the Drawings.

1. Final backfill for riding lanes and in miscellaneous areas shall be of approved earth material containing no stones over 4-inches in diameter. Such back- filling shall be deposited in lifts with a maximum 12-inches loose thickness and compacted by hand tamping or mechanical tamping devices. Excess earth to replace settlement shall be neatly rounded over the trench.
2. Final backfill for trenches under paved areas and in areas requiring granular backfill as indicated on the Drawings shall be approved granular material including "B"-borrow. Final backfill shall be placed in 8-inch maximum lifts and compacted by mechanical tamping devices.

F. Pipe bedding and backfill lifts shall be compacted to a dry density not less than the following maximum dry density as determined by the Standard Proctor Test (ASTM D-698).

USAGE	COMPACTION %
Bedding	90
Haunching	90
Initial Backfill	90
Final Backfill under Pavements	90
Final Backfill in Seeded Areas	90

G. Install warning tape as required by the Technical Specifications directly above utilities, 12-inches below finished grade, except 6-inches below subgrade under pavements and slabs.

3.11 FILL

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

Where new fill is to be placed on existing slopes that are 5:1 or greater, construct benches a minimum of 10-feet in width cut into the existing slop prior to the placement of fill.

B. After areas to receive embankment have been stripped of topsoil and before embankment is placed, the slab areas and areas to be paved shall be proofrolled. Isolated soft pockets that are located during the proofroll phase shall be excavated and replaced with structural backfill. The material removed from the soft pockets shall be disposed of on-site as directed by the Geotechnical or reused as fill materials in yard areas only. The Geotechnical Engineer shall identify such required replacement of soft pockets.

C. Place fill material on approved subgrade or on a previously approved lift in layers to required elevations for each location listed below.

1. Under grass, use satisfactory excavated or borrow soil material.
2. Under Pumptrack asphalt pavements, use Class II aggregate base material.

3.12 MOISTURE CONTROL

Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction as necessary to attain the specified density.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
3. Stockpile or spread and dry removed wet satisfactory soil material.

3.13 COMPACTION

A. 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.

B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each excavation.

C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of the Standard Proctor maximum dry density according to ASTM-D 698:

1. Under all Pumptrack asphalt pavements, compact the subgrade and each lift of fill material to at least 90-percent maximum dry density.
2. Under lawn or unpaved areas, compact the top 6-inches below subgrade and each layer of backfill or fill material to at least 90-percent maximum dry density.
3. All fill shall be compacted to the specified density. When the results of the in-place density tests indicate that the compaction limits are not obtained; the areas shall be reworked and retested until the specified limits are reached at the Contractors expense.

3.14 GRADING

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

1. Provide a smooth transition between existing adjacent grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

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

1. Unpaved Areas: Plus or minus 0.15-feet.
3. Asphalt Pavements: Plus or minus 0.10-inches.

3.15 SUBBASE AND BASE COURSES

A. Under the Pumptrack asphalt pavements, place 4-inches of Class II subbase course material on prepared subgrades. In addition, place base course material over subbases to pavements where required by the Drawings. All Class II aggregate base shall be compacted to 95-percent relative compaction and comply with the requirements of the Geotechnical Report.

1. Compact subbase and base courses.
2. Shape subbase and base to required crown elevations and cross-slope grades.
3. When thickness of compacted subbase or base course is 6-inches or less, place materials in a single layer.
4. When thickness of compacted subbase or base course exceeds 6-inches, place materials in equal layers, with no layer more than 6-inches thick or less than 3-inches thick when compacted.

3.17 FIELD QUALITY CONTROL

A. Independent Testing Agency Services: Testing agency shall inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements. Provide equipment and manpower to conduct proofroll inspections per the requirements of the Contract Documents.

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

C. Owner will provide all initial testing; failed test will be paid for by the Contractor using the same testing Agency or approved equal.

3.18 PROTECTION

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

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces that have become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions. Scarify or remove and replace material to depth directed by the Geotechnical Engineer; reshape and recompact at optimum moisture content to the required density.

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

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
2. If settling is observable at areas that were excavated or filled, during the period of one year after the Final Acceptance of the Contract Work, the Contractor shall be responsible for removing surface materials (lawn, pavement or other finishes), adding backfill material, compacting backfill, and replacing surface material to restore appearance, quality and conditions of surface or finish to match adjacent work and eliminate evidence of restoration at the Contractor's expense.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Excess suitable soils shall be disposed of on-site at a location to be determined by Owner's Representative.

B. Excess topsoil shall be used to construct mounds on the site or shall be removed from the site at the direction of the Owner's Representative.

END OF SECTION 31 20 01

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Section 31 2316
Excavation

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Investigation Report - Prepared by Soils Engineering, Inc. dated January 13, 2023:; bore hole locations and findings of subsurface materials.

B. Section 31 1000 - Site Clearing: Vegetation and existing debris removal.

C. Section 31 2000 - Earth Moving.

D. Section 31 2323 - Fill: Fill materials, backfilling, and compacting.

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

2.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 1000 for clearing, grubbing, and removal of existing debris.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

2.03 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Cut utility trenches wide enough to allow inspection of installed utilities.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

2.04 SUBGRADE PREPARATION

A. See Section 31 2323 for subgrade preparation at general excavations.

2.05 FILLING AND BACKFILLING

A. See Section 31 2323 for fill, backfill, and compaction requirements at general excavations.

2.06 CLEANING

A. Remove excavated material that is unsuitable for re-use from site.

B. Remove excess excavated material from site.

2.07 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION 31 2316

Section 31 2316.13
Trenching

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.03 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2021, with Errata (2022).

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.03 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove excavated material that is unsuitable for re-use from site.

G. Remove excess excavated material from site.

H. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

I. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: _____.

3.07 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 31 2316.13

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Section 31 2323
Fill

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving, site structures, utilities within the building, and planter areas..

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 31 2000 - Earth Moving.

B. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.03 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2021, with Errata (2022).

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

B. Structural Fill - Fill Type Class II: Complying with State of California Highway Department standard.

C. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.

D. Topsoil: See Section 32 9300.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2000 for additional requirements.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:
   1. As recommended by Geotechnical Report

2. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

3.05 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 31 2323

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Section 32 0190
Operation and Maintenance of Planting

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Maintain plants in manner that promotes health, growth, color and appearance, to quality levels specified; replace dead, dying, and damaged plants at no extra cost to Owner.
   1. It is Contractor's responsibility to determine type and quantity of soil amendments and fertilizer required.
   2. Perform soil analysis to determine type and quantity of soil amendments; test enough soil samples to obtain a comprehensive analysis; submit reports.

B. Maintain newly planted landscape plants, including turf (lawns), turf (playfields), trees, shrubs, hedges, vines, ground cover, perennials, flowering bulbs, and annuals.

C. Operate permanent irrigation system.

D. Clean up landscaped areas.

E. Maintenance Period: The time frame covered by these requirements is 90 days:
   1. Start Date: The date upon which the new plantings are accepted as complete by Owner.

1.02 RELATED REQUIREMENTS

A. Section 32 8423 - Irrigation System.

B. Section 32 9219 - Seeding.

C. Section 32 9223 - Sodding.

D. Section 32 9300 - Plants.

1.03 REFERENCE STANDARDS

A. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

B. ANSI Z133.1 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

C. ASTM D4972 - Standard Test Methods for pH of Soils; 2019.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Soil Tests and Analysis: Submit report showing number of samples, test results, and recommendations for soil amendments and fertilizer.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. If soil analysis has not already been performed, take sufficient samples to obtain a comprehensive analysis; perform analysis in accordance with ASTM D4972.

3.02 LANDSCAPE MAINTENANCE - GENERAL

A. Obtain and follow the maintenance instructions provided by the installer of new plant materials.

B. Protect existing vegetation, pavements, and facilities from damage due to maintenance activities; restore damaged items to original condition or replace, at no extra cost to Owner.

C. General Cleanup: Remove debris from all landscape areas at least once a week and from turf areas before each mowing.
1. Debris consists of trash, rubbish, dropped leaves, downed branches and limbs of all sizes, dead vegetation, rocks, and other material not belonging in landscaped areas.
2. Remove debris from site and dispose of properly.

D. Watering, Soil Erosion, and Sedimentation Control: Comply with federal, state, local, and other regulations in force; prevent over-watering, run-off, erosion, puddling, and ponding.
1. Repair temporary erosion control mechanisms provided by others.
2. Repair eroded areas and replant, when caused by inadequate maintenance.
3. Prevent sediment from entering storm drains.

E. Trees: Exercise care to avoid girdling trees; provide protective collars if necessary; remove protective collars at end of maintenance period.

F. Fertilizing: Apply fertilizer only when necessary.

G. Drainage Channels: Remove obstructions in gutters, catch basins, storm drain inlets, yard drains, swales, ditches, and overflows.
1. Remove grates from catch basins to clean.
2. Prevent encroachment of other vegetation on turfed surface drainage channels.

H. Health Maintenance: Inspect all plants regularly for health:
1. Eradicate diseases and damaging pests, regardless of severity or speed of effect.
2. Treat accidental injuries and abrasions.
3. If a plant is unhealthy but not yet dead, according to specified definitions, determine reason(s) and take remedial action immediately.
4. Remove dead plants immediately upon determining that they are dead.

I. Pesticide and Herbicide Application: Comply with manufacturer's instructions and recommendations and applicable regulations.
   1. Obtain Owner's approval prior to each application.
   2. Apply in manner to prevent injury to personnel and damage to property due to either direct spray or drifting, both on and off Owner's property.
   3. Use backflow preventers on hose bibbs used for mixing water; prevent spills.
   4. Inspect equipment daily before application; repair leaks, clogs, wear, and damage.
   5. Do not dispose of excess mixed material, unmixed material, containers, residue, rinse water, or contaminated articles on site; dispose of off site in legal manner.
   6. Rinse water may be used as mix water for next batch of same formulation.
   7. Contractor is responsible for all recordkeeping, submissions, and reports required by laws and regulations.

J. Replanting: Perform replacement and replanting immediately upon removal of dead plant.

3.03 IRRIGATION

A. Irrigation: Do not allow plants to wilt; apply water as required to supplement rainfall; do not waste water; do not water plants or areas not needing water; do not water during rainfall; shut off water flow when finished; repair leaks.
   1. New automatic irrigation system may be used.
   2. Do not drive water trucks over turf, seeded areas, or planting beds.
   3. Provide backflow preventers on hose bibbs used for irrigation hoses.

B. Automatic Irrigation System: Obtain and follow manufacturer's operating and maintenance instructions.
   1. Adjust to water landscape areas only.
   2. Adjust sprinkler heads, drippers, valves, pumps, and controllers as required for optimum operation.
   3. Drain and prepare for freezing weather; prepare and start up in spring.
   4. During system warranty period notify Architect and system installer promptly of defects and leaks that adversely affect irrigation performance.

3.04 TURF MAINTENANCE

A. Maintain turf in manner required to produce turf that is healthy, uniform in color and leaf texture, and free from weeds and other undesirable growth.
   1. Grass Density - Lawns: 20 plants per square foot, minimum.
   2. Bare Spots - Lawns: 2 percent of total area, maximum; 6 inches square, maximum.
   3. Keep turf relatively free of thatch, woody plant roots, diseases, nematodes, soil-borne insects, stones larger than 1 inch in diameter, and other materials detrimental to grass growth.
   4. Limit broadleaf weeds and patches of foreign grass to a maximum of 2 percent of the total area.

B. Mowing: During growing season(s) mow turf to uniform height, in manner that prevents scalping, rutting, bruising, and uneven or rough cutting.
   1. Prior to mowing clean all debris and leaves from turf surface.

2. Schedule frequency of mowing so that no more than one-quarter to one-third of grass leaf length is removed during a cutting.
3. Make each successive mowing at approximately 45 degrees to the previous mowing, if practical.
4. Cool Season Grasses:
   a. Reduce mowing height in fall and spring.
   b. Use rotary type mowers; mulcher type mowers may be used.
5. Warm Season Grasses:
   a. Increase mowing height slightly as fall approaches.
   b. Use reel type mowers; do not use mulcher mowers.

C. Summer Mowing Height for Lawns:
   1. Bermuda, Hybrid: 1 inches.

D. Trimming: Immediately after each mowing, neatly trim perimeter of each turf area and around obstructions within turf area; match height and appearance of adjacent turf.
   1. Adjacent to Pavements: Cut edges of turf to form a distinct, uniform turf edge.
   2. Adjacent to Planting Beds and Permanently Mulched Areas: Cut edges of turf to form a distinct, uniform turf edge.
   3. Around Other Trees and Poles: Where no planting bed or mulched area exists, trimming with string trimmer is acceptable.
   4. At Fences: Trim on both sides of fence.
   5. Irrigation Heads and Valve Boxes: Trim neatly so grass doesn't interfere with operation.

E. Fertilizer: Apply as recommended by manufacturer and at rate indicated by soil analysis.
   1. Cool Season Grasses: Apply at least once, in Fall before first frost; do not apply high nitrogen fertilizer during Summer; Spring application is optional but must be reduced in quantity.

3.05 PLANTING BED MAINTENANCE

A. Planting beds include all planted areas except turf.

B. Begin maintenance immediately after plants have been installed; inspect at least once a week and perform needed maintenance promptly.

C. Keep planting beds free of pests; remove weeds and grass by hand before reaching 1 inch height.

D. Do not allow climbing, twining, or creeping plants to encroach into other species.

E. Replace mulch as required and remove debris.

3.06 TREE AND SHRUB MAINTENANCE

A. Trees will be considered dead when main leader has died back or when 25 percent or more of crown has died ; except as otherwise indicated for palm trees.

B. Shrubs will be considered dead when 25 percent or more of plant has died.

C. Inspect woody plants for health by scraping up to 1/16 inch square area of bark; no green cambium layer below bark shall be evidence of death.

D. Adjust stakes, guys and turnbuckles, ties, and trunk wrap as required to promote growth and avoid girdling.

E. Pruning: Unless otherwise indicated, prune only to maintain balanced natural shape; follow recommendations of ANSI A300 and ANSI Z133.1 and best local practices for species involved.

F. Shrubs: Prune at least once during maintenance period at best time to influence ultimate shape and size for the particular species.
   1. Prune to balance the plant's form and according to its natural growth characteristics.
   2. Remove water shoots, suckers, and branches not complying with desired shape and size.

G. Hedges: Trim to encourage growth into voids and gaps.

3.07 CLEANING

A. Remove fallen deciduous leaves in Fall; removal may wait until all leaves have fallen.

B. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.

C. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner; Owner's trash collection facilities may be used.

D. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner.
   1. Biodegradable Debris: Owner will designate a compost pile on site where biodegradable debris may be deposited; branches and bark are not considered biodegradable.
   2. Branches and Bark: Owner will designate a wood chip storage area; machine-chip all branch and bark debris.
   3. Non-Biodegradable Debris: Owner's trash collection facilities may be used.

3.08 CLOSEOUT ACTIVITIES

A. 10 days prior to end of maintenance period, submit request for final inspection.

END OF SECTION 32 0190

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Section 32 0710
Pumptrack Speciality Work Qualifications

PART 1 GENERAL

1.01 Section Includes

A. Minimum qualifications for specialty contractor performing Pumptrack work including but not limited to rough and fine grading, placement of base-course and placement of asphalt paving.

1.02 Related Requirements

A. Section 31 2001 - Pumptrack Earthwork

B. Section 32 1801 - Pumptrack Asphalt Paving

1.03 Submittals

A. See Section 01 3300 - Submittals for submittal procedures.

B. Specialty Contractor's qualification statement.

1.04 Quality Assurance

A. Specialty Contractor qualifications: Contractors bidding the Pumptrack features as described above shall have satisfactorily completed the installation of four (4) similar Pumptrack projects in accordance with the project plans and written specifications. Qualifying projects must include Pumptrack specific terrain of comparable size, type and layout and materials built within the last six (6) years.
   1. Only Pumptrack projects where the Contractor bidding the "Specialty Work" has performed all of the same work as described herein shall be considered as acceptable projects to evidence credible experience and qualifications of the bidding Contractor.
   2. The Pumptrack Specialty Contractor shall provide references for all qualifying projects including location of qualifying projects, size, owner, budget, and owners contact information.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION 32 0710

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Section 32 1216
Asphalt Paving

PART 1 - GENERAL

1.01 Summary

A. Section Includes:

1. Hot-mix asphalt paving.

B. Related Requirements:

1. Section 02 4119 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 31 2000 "Earth Moving" for subgrade preparation, fill material and unbound-aggregate base course.
3. Section 32 1373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.02 Preinstallation Meetings

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.03 Submittals

A. Product Data: For each type of product.

1. Manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements. If recycled materials are used, include statement from supplier that mixes containing recycled materials will perform equal to mixes produced from all new materials.
2. Job-Mix Designs: Certificates, signed by the asphaltic concrete paving materials producer and the asphaltic concrete paving subcontractor, stating that the materials and mix design meet or exceed the specified requirements.

1.04 Quality Assurance

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of City of Hanford for asphalt paving work within City road right-of-way.

1.05 Field Conditions

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F .
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 50 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.01 Aggregates

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Aggregates: Aggregates shall conform to Standard Specifications Section 39, California Department of Transportation, 2010 Edition for Asphalt Concrete Type B, 1/2" maximum, medium.

2.02 Asphalt Materials

A. Asphalt Binder: AASHTO M 320, PG 64-10.

B. 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.

C. Water: Potable.

2.03 Auxiliary Materials

A. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

1. Treflan by Elanco Products Co.

2. Oust by Dupont

B. Sand: ASTM D 1073, Grade No. 2 or No. 3.

2.04 Mixes

A. Hot-Mix Asphalt: Dense-graded, 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"; and complying with the following requirements:

1. Type B, 1/2" maximum, medium; Standard Specifications Section 39, California Department of Transportation, 2010 Edition.

PART 3 - EXECUTION

3.01 Examination

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.02 Surface Preparation

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

3.03 Placing Hot-Mix Asphalt

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Where thickness of finished paving exceeds 2.5 inches, spread in two or more layers, with top layer no thicker than 1.5 inches. No lift shall exceed 2.5 inches. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
2. Spread mix at a minimum temperature of 250 deg F.
3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
5. Provide compacted thicknesses shown on the Drawings within a tolerance of minus 0.0 inches to plus 0.5 inches.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.04 Joints

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.05 Compaction

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 93 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 91 percent or greater than 97 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.06 Installation Tolerances

A. Pavement Thickness: Compact to produce the thickness indicated within the following tolerances:

1. Minus 0.0 inches to plus 0.5 inches.

B. Pavement Surface Smoothness: Compact to produce a surface smoothness within a 1/8" tolerance as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas.

3.07 Field Quality Control

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of hot-mix asphalt will be tested for compliance with smoothness tolerances.

D. Flood Test:

1. Perform a flood test in the presence of the Architect and/or Owner's Testing Agency.
2. Method: Flood the entire asphaltic concrete paved area with water by use of a tank truck or hoses.

    a. If a depression is found where water ponds to a depth of more than 1/8" in ten feet, fill or otherwise correct to provide proper drainage.
    b. Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.

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. or less of installed pavement, with no fewer than three 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. Replace and compact hot-mix asphalt where core tests were taken.

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.08 Waste Handling

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 01 7419 "Construction Waste Management and Disposal."

END OF SECTION

Section 32 1313
Onsite Concrete

PART 1 - GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. SSCDOT – Section 40 “Portland Cement Concrete Pavement” and Section 90 “Portland Cement Concrete” of the Standard Specifications, State of California, Department of Transportation (Caltrans) latest edition, except references to method of payment, and references to any state furnished materials.

1.02 Summary

A. Section Includes:

1. Wheelchair Ramps.
2. Curbs and gutters.
3. Walks outside traffic areas.
4. Vee-Gutters and walks in traffic areas except for Concrete Mixture. Concrete mixture shall meet the requirements of Class 2 of Division 32 Section “Concrete Paving”.

B. Related Sections:

1. Division 03 Section " Miscellaneous Cast-in-Place Concrete" for general building applications of concrete.
2. Division 32 Section "Concrete Paving" for Class 2 concrete requirements.
3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

C. All improvements within property owned by a City, County, or State Entity shall be in accordance with the Standards and Specifications of the authority having jurisdiction.

1.03 Definitions

A. Cementitious Materials: Type II gray Portland Cement conforming to the specifications of ASTM C150-02a and the requirements of Caltrans Specification Section 90 for “Type II Modified” portland cement.

1.04 Project Conditions

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F .

PART 2 - PRODUCTS

2.01 Forms

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.02 Steel Reinforcement

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 ; deformed. At the Contractor’s option all Number 4 and smaller deformed bars may be Grade 40 unless noted otherwise on the Drawings.

B. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

D. Zinc Repair Material: ASTM A 780.

2.03 Concrete Materials

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: Type II gray Portland Cement conforming to the specifications of ASTM C150-02a and the requirements of Caltrans Specification Section 90 for "Type II Modified" Portland Cement.

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

D. Water: Potable and complying with ASTM C 94/C 94M.

2.04 Curing Materials

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. It shall be the Contractor's responsibility to verify that all curing compounds used comply with the VOC Emission requirements of the San Joaquin Valley Air Pollution Control District.

2.05 Related Materials

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

2.06 Detectible Warning Materials

A. American with Disabilities Act (ADA) Tactile Warning Surfaces shall be installed where shown on the Drawings. Installation shall be in accordance with 2022 Caltrans Revised Standard Plans A88A. Concrete in locations to receive tactile surfaces shall be blocked out

in such a way that the tactile surface will be flush with the adjacent concrete upon installation.

2.07 Pavement Markings

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than three minutes. It shall be the Contractor's responsibility to verify that all paint compounds used comply with the VOC Emission requirements of the San Joaquin Valley Air Pollution Control District.

1. Color: As noted on the Drawings.

2.08 Wheel Stops

A. Wheel Stops: Precast, 2500-psi minimum compressive strength, 6 inches high by 9 inches wide by 48 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.

1. Dowels: No. 5 Rebar, 18-inch minimum length.

2.09 Concrete Mixtures

A. Concrete shall be Class 3 (Previous years denoted as Class B) and shall contain 505 pounds minimum of Portland Cement per cubic yard conforming to the requirements of Section 90 of the Caltrans Specifications unless noted otherwise on the drawings. Vee-Gutters and concrete walkways in vehicle areas shall meet the requirements of Class 2 Concrete as noted in Division 32 Section "Concrete Paving."

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 2500 psi minimum.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.58.
3. Slump Limit: 5 inches maximum.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Cementitious Materials: Type II gray Portland Cement conforming to the specifications of ASTM C150-02a and the requirements of Caltrans Specification Section 90 for "Type II Modified" portland cement.

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 and 90 deg F , reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F , reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 Examination

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Preparation

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 Edge Forms And Screed Construction

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 Joints

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated on the Drawings.

1. Locate expansion joints at intervals noted on the Drawings.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form 1/4 inch wide contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius unless noted otherwise on the Drawings. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius unless noted otherwise on the Drawings. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.05 Concrete Placement

A. Before placing concrete, inspect and complete formwork installation and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand spreading and consolidation.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F , uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.06 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.

3.07 Detectable Warnings

A. Blockouts: Form blockouts in concrete for installation of detectable warning surfaces as specified in this Section.

1. Tolerance for Opening Size: Plus 1/8 inch , no minus.

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. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.09 Paving Tolerances

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 1/4 inch .
2. Thickness: Plus 3/8 inch , no minus .
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch .
4. Joint Spacing: 3 inches .
5. Contraction Joint Depth: Plus 1/4 inch , no minus.
6. Joint Width for Grooved Joints: Plus 1/8 inch , 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 paving to cure for a minimum of 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils .

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.

3.11 Wheel Stops

A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.

B. Securely attach wheel stops to paving with not less than two No. 5 rebar dowell one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.12 Repairs And Protection

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Additional construction, testing, and replacement costs resulting from damaged or improperly installed infrastructure shall be paid for by the Contractor.

C. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

D. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

E. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

Section 32 1216
Concrete Paving Joint Sealants

PART 1 - GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 Summary

A. Section Includes:

1. Cold-applied joint sealants.
2. Joint-sealant backer materials.

B. Related Requirements:

1. Section 07 9200 "Joint Sealants" for sealing non-traffic and traffic joints in locations not specified in this Section.

1.03 Action Submittals

A. Product Data: For each type of product.

1.04 Informational Submittals

A. Qualification Data: For Installer.

1.05 Quality Assurance

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.06 Field Conditions

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.01 Materials, General

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.02 Cold-Applied Joint Sealants

A. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

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

a. W.R. Meadows "POURTHANE SL"
b. Pecora Corporation "Urexpan NR-201".

2.03 Joint-Sealant Backer Materials

A. Joint-Sealant Backer Materials: Non-staining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

PART 3 - EXECUTION

3.01 Examination

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Preparation

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 Installation of Joint Sealants

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.04 Cleaning and Protection

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.05 Paving-Joint-Sealant Schedule

A. Joint-Sealant Application: Joints within concrete paving.

1. Joint Location:

    a. Expansion and isolation joints in concrete paving.
    b. Contraction joints in concrete paving.
    c. Other joints as indicated.

2. Joint Sealant: Single component, pourable, urethane, elastomeric joint sealant.
3. Joint-Sealant Color: Manufacturer's standard.

B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.

1. Joint Location:

    a. Joints between concrete and asphalt paving.
    b. Other joints as indicated.

2. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION

Section 32 1543
Decomposed Granite Paving

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decomposed granite paving for pathways.

1.02 RELATED REQUIREMENTS

A. Section 31,2200 - Grading.

B. Section 32,1123 - Aggregate Base Courses.

1.03 REFERENCE STANDARDS

A. ASTM C136 – Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D2419 – Sand Equivalent Value of Soils and Fine Aggregates.

C. USP – U.S. Pharmacopeial Convention (1995).

1.04 SEQUENCING:

A. Do not install work specified in this Section prior to acceptance of earth moving.

B. Coordinate work specified in this Section with work specified in other Sections to minimize cutting of and operation of heavy equipment over installed decomposed granite surfacing.

1.05 SUBMITTALS

A. See Section 01,3030 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's product data sheet and installation instructions indicating that product complies with specifications for stabilized decomposed granite surfacing.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect decomposed granite from contamination. Store under cover.

1.08 FIELD CONDITIONS

A. Field Measurements: Each bidder is required to visit the site of the Work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.

B. Do not install Stabilized Aggregate pathway during rainy conditions or below 40 degrees Fahrenheit and falling.

C. Do not install decomposed granite surfacing when subbase is wet at saturated field capacity.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

C. Submit a written warranty executed by the installer agreeing to repair or replace components of Stabilized Aggregate that fail in materials or workmanship within the specified warranty period.

D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

PART 2 PRODUCTS

2.01 DECOMPOSED GRANITE

A. Source from quarry not more than 500 miles from project site.

B. Sand and crushed stone shall consist of inert materials that are hard and durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:

C. Crushed Stone Sieve Analysis Percentage of Weight Passing a Square Mesh Sieve AASHTO T11-82 and T2782

Sieve Size	**Percent Passing**
3/8"	100
#4	90-100
#8	75-80
#16	55-65
#30	40-50
#50	25-35
#100	15-20
#200	10-15

D. Sand Equivalent: 30 minimum in accordance with ASTM D2419.

E. Color: California gold.

2.02 STABILIZED BINDER

A. Stabilizer Solutions, Inc. 33 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website stabilizersolutions.com; email info@stabilizersolutions.com
   1. Stabilizer product for stabilizing pathways.
   2. Patented, non-toxic, organic binder that is a colorless and odorless concentrated powder that binds decomposed granite or crushed 3/8” or 1/4" minus aggregate.

2.03 ACCESSORIES

A. Water: Free from contaminants that would discolor or be deleterious to stabilized decomposed granite surfacing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine grading and subsoil conditions. Do not proceed until conditions are acceptable.

3.02 PREPARATION

A. Base shall be 4” compacted layer of aggregate base. Make any corrections necessary to base furnished and installed to bring base to the elevations shown on the drawing.

B. Pre-soak base material with water and compact to 95% determined by Test Method ASTM D 1557 prior to installing Stabilized Aggregate. Compaction testing to be provided by project owner, one test per 2,000 square feet of base.

C. Although porous, it is recommended to have proper drainage available to ensure no standing water on surface or adjacent to Stabilized Aggregate, including downspouts when placed under roof overhang and surface drains.

D. Before proceeding with installation, notify Owner’s Representative in writing of unsuitable site/base conditions.

3.03 BLENDING STABILIZER

A. Stabilizer® shall be thoroughly pre-mixed with aggregate at the rate of 15-lbs of Stabilizer® per 1-ton of aggregate. Verify with manufacturer correct Stabilizer® rate for your project and climate. Drop spreading of Stabilizer® over pre-placed aggregate or mixing by rototilling is not acceptable. Stabilizer shall be mechanically pre-mixed per manufacturer’s recommendations using an approved mechanical blending unit to adequately blend Stabilizer® with aggregate (Bucket blending is not an approved blending apparatus). Always blend Stabilizer® and aggregate DRY.

3.04 INSTALLATION

A. After pre-blending, place Stabilized Decomposed Granite Aggregate directly on prepared sub-grade. Level to desired grade and cross section. Depth of pathways shall be 3" for heavy foot traffic and light vehicles. DO NOT place on filter fabric. Contact Stabilizer Solutions, Inc. for installation on slopes greater than 8%.

B. Surface shall follow overall contours of landscape. Flat areas shall be crowned for drainage. Slope 1 percent minimum to drain away from structures.

C. 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 depressions or humps greater than 1/4 inch in ten feet.

D. Install stabilizing binder in accordance with manufacturer's instructions.

3.05 WATERING

A. Water heavily for full-depth moisture penetration of profile. Water activates Stabilizer®. Apply 25 to 45-gallons of water per 1-ton to achieve saturation. Randomly test for depth using a probing device, which reaches full depth.

B. Contractor shall wait a minimum of 6 – 72 hours or until such time that the Stabilized Aggregate is able to accept compaction from a 1 to 5 ton roller without separation, plowing or any other physical compromise of the aggregate.

C. If surface aggregate dries significantly quicker than subsurface material, lightly mist surface before compaction.

3.06 COMPACTION

A. Compact Stabilized Aggregate to 85% relative compaction by equipment such as; a 2 to 5-ton double drum roller making 3 to 4 passes. Do not begin compaction for 6 hours after placement and up to 72 hours. DO NOT use a vibratory plate compactor or vibration feature on roller, as vibration separates large aggregate particles. If pumping or pancaking of surface occurs, surface is still too wet to roll.

B. Take care in compacting surface when adjacent to planting and irrigation systems, use 8" or 10" hand tamp. Installation of Stabilized Aggregate more than 3" thick shall be installed in lifts. If 4" thick compacted (2) 2" lifts. If 5" thick compacted (2) 2.5" lifts. If Stabilized Aggregate is pre-moistened before installation entire 4" or 5" lift may be installed.

C. Lightly spray surface area following compaction. Do not disturb aggregate surface with spray action.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Finished surface shall be smooth, uniform and solid with no evidence of chipping or cracking. Cured and compacted pathway shall be firm throughout profile with no spongy areas. Loose material shall not be present on surface after installation, but may appear after use and according to environmental conditions. Pathway shall remain stable underneath loose granite on top with a "natural" look. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

3.08 CLEANING

A. Clean excess Decomposed Granite away in areas not scheduled for installation. .

3.09 PROTECTION

A. Contractor shall furnish and install construction fence around new surface to prevent public access. Fencing shall be maintained in place for a minimum of 12 - 72 hours after completion of installation, or as directed by the Owner' Representative. Drying period may take longer due to weather conditions.

B. Protect stabilized decomposed granite surfacing from damage until Project completion. Repair damaged areas to match specified requirements.

C. Contractor shall notify Owner's Representative that landscape irrigation shall be restricted near Stabilized Aggregate surface until drying period is complete. Standing water on surface and adjacent to path shall be restricted at all times.

3.10 MAINTENANCE

A. Loose aggregate will appear on the surface over time which is a natural occurrence. If excessive aggregate over 1/4 inches occurs, redistribute the stabilized decomposed granite over the entire surface, water thoroughly and re-compact with a minimum one ton drum roller. This process can be repeated as needed.

B. To repair, excavate damaged area leaving a minimum one inch depth of existing stabilized decomposed granite, water and scarify. Scarifying existing stabilized decomposed granite will prevent a cold joint layer between the existing stabilized decomposed granite and the newly imported pre-blended stabilized decomposed granite.

C. Add water to the pre-blended stabilized decomposed granite to activate. Apply moistened pre-blended stabilized decomposed granite to excavated area at or above finished grade.

D. Compact with a walk behind drum roller. Do not allow traffic on stabilized decomposed granite surfacing for one-two days after placement or until compacted stabilized decomposed granite has fully cured.

E. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

3.11 REPAIRS

A. Excavate damaged area to the depth of the Stabilized Aggregate and square off sidewalls.

B. If area is dry, moisten damaged portion lightly.

C. Pre-blend the dry required amount of Stabilizer with the proper amount of aggregate in a concrete mixer.

D. Add water to the pre-blended Stabilized Aggregate. Thoroughly moisten mix with 25 to 45 gallons per 1-ton of pre-blended material or to approximately 10% moisture content.

E. Apply moistened pre-blended Stabilized Aggregate to excavated area to finish grade.

F. Compact with an 8” to 10” hand tamp or 250 to 300 pound roller. Keep traffic off areas for 12 to 48 hours after repair has been completed.

END OF SECTION 32 1543

Section 32 17 23

Painted Pavement Markings

PART 1 GENERAL

1.1 Section includes

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.

1.2 Related requirements

A. Section 32 1216 - Asphalt Paving.
B. Section 32 1313 - Onsite Concrete.

1.3 Reference standards

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
B. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; Current Edition.

1.4 Submittals

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.5 Delivery, storage, and handling

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
B. Store products in manufacturer's unopened packaging until ready for installation.
C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.1 Materials

A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Handicapped Symbols: Blue.

PART 3 EXECUTION

3.1 Examination

A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 Preparation

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of pavement markings.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

3.3 Installation

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.
C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.
E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Width Tolerance: Plus or minus 1/8 inch.
G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.
H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

End of Section

Section 32 1801
Pumptrack Asphalt Paving

PART 1 GENERAL

1.01 SUMMARY

A. Work Included: Provide all labor, materials and equipment complete, for the installation and furnishing of pumptrack aggregate base, asphalt paving (AC) paving, pavement and related work.

B. Related work:

Pumptrack Earthwork – Section 31 20 01

1.02 STANDARDS

A. Unless otherwise shown or specified, all materials and methods shall conform with local codes and ordinances and to the appropriate current sections of the State of California, Department of Transportation Standard Specifications (DTSS) as they reasonably apply to this work.

1.03 QUALITY ASSURANCE

A. Tolerances for subgrade, sub-base and finish grades shall be as specified except that Contractor shall deliver the full aggregate base and asphalt concrete thickness shown. No combination of high and low tolerances that compromise the section will be permitted.

B. Submittals:

1. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
2. Manufacturer Qualifications: Manufacturer shall be a paving-mix manufacturer registered with and approved by the DOT (Dept. of Transportation).

1.04 TESTING AND INSPECTION

Contractor shall notify the Owners' Representative at the completion of the various stages of work as indicated below and shall allow two (2) days for testing and review operations prior to proceeding to subsequent construction.

1. After all Pumptrack site mass grading is complete and Pumptrack riding lanes have been laid out.
2. After all rough grading operations are complete and subgrade has been prepared to receive aggregate base.

3. After final placement and compaction of aggregate base has been prepared to receive asphalt prime or other subsequent operation.
4. When paving equipment is at the site and paving operation is ready to start.

1.05 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.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt 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
2. Slurry Coat: Comply with weather limitations of ASTM D 3910
3. Asphalt Base Course: Minimum surface temperature of 50 deg F at time of placement
4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement

B. Pavement-Marking Paint: Proceed with pavement marking if specified only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 deg F, and not exceeding 95 deg F.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate Base: DTSS Section 26, Class II, with 3/4" maximum size (4-inch Depth)

B. Liquid asphalt for prime coat: DTSS Section 93, SC 70

C. Asphalt emulsion for paint binder: DTSS Section 94, SS1-H

D. Paving Asphalt: DTSS Section 92, steam-refined asphalt grade AR-4000.

E. Mineral aggregates for Type B plant-mixed surfacing: DTSS Section 39, maximum size 1/4", medium gradation.

2.02 MIXES

Proportioning and mixing of the asphalt concrete shall conform to DTSS Section 39.9

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that the sub-base is dry and properly compacted and at the appropriate elevation for receiving aggregate base. Recompact and regrade as necessary prior to placement of aggregate base.

B. Before beginning base and paving work and during construction, Contractor shall take all steps necessary for protection of existing improvements. During paving operations, extreme care shall be taken not to discolor or damage existing pavements, curbs, or other surfaces. If damage occurs, repair same and, if satisfactory repair cannot be made, remove and replace the damaged area as directed.

3.02 PREPARATION

A. Place and compact aggregate base as specified for Class II aggregate base in DTSS Section 26.1. Verify grades to allow for finish paving.

B. Remove loose and deleterious materials from substrate surfaces.

C. Apply prime coat uniformly in accordance with DTSS Section 39.4 and at a rate of 0.25 gallons per square yard. After liquid asphalt has penetrated the surface, the excess shall be removed with sufficient sand to absorb the excess liquid. Remove excess sand. Allow prime coat to cure for 72 hours minimum.

D. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into areas to receive asphalt paving at a rate of .10 gallons per square yard. Avoid smearing or staining adjoining surfaces, appurtenances and surroundings. Remove spillages and clean affected surfaces. Allow tack coat to cure undisturbed before applying asphalt paving.

E. Before placing surfacing, additional prime coat or tack coat shall be applied to areas where the prime coat or tack coat has been destroyed.

3.03 INSTALLATION

A. Hand and Mechanically place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to area inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section and thickness when compacted.

Regulate paver device speeds to obtain smooth, continuous surface free of pulls and tears in asphalt paving mat.

B. Promptly correct surface irregularities in paving course behind paver. Remove excess material forming high spots and fill depressions with asphalt to achieve a smooth, even surface with positive drainage. Finish grades that allow ponding or puddling of water will not be accepted.

C. Compaction: Begin compaction as soon as placed asphalt will bear roller weight without excessive displacement. Compact asphalt paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

D. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Provide barricades as necessary to protect new paving.

E. Shape and cut paving edges to provide straight and unform edges on straight sections and smooth and unform radii on curved sections. See Plan Detail. Tolerances follow:

a) 1-inch in 20-linear feet

b) 1-inch in 20-radial feat

3.04 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, color and placement have been verified with Owner's Representative.

B. Allow paving to age for 30 days prior to applying pavement-marking paint

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings with uniform thickness and straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.05 CLEAN UP

Upon completion of the work under this Section, remove immediately all surplus materials, debris and equipment associated with or used in the performance of this work.

END OF SECTION 32 18 01

Section 32 1813
Synthetic Grass Surfacing

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Synthetic grass.

B. Cushion layer.

C. Infill system.

D. Edge anchoring and borders.

E. Correction of grades and subgrade.

F. Drainage layer.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2200 - Grading.

C. Section 31 2316 - Excavation.

D. Section 31 2316.13 - Trenching.

1.03 REFERENCE STANDARDS

A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

D. ASTM D6662 - Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards; 2022.

E. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment; 2022.

F. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use; 2021.

G. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021.

H. ASTM F1936 - Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field; 2010 (Reapproved 2015).

I. ASTM F2765 - Standard Specification for Total Lead Content in Synthetic Turf Fibers; 2014 (Reapproved 2021).

J. ASTM F2898 - Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood Test Method; 2011 (Reapproved 2019).

K. CPSC Pub. No. 325 - Public Playground Safety Handbook; 2015.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: For all manufactured surfacing products, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.
   1. Include STC certifications where required.

C. Samples: Provide following prior to ordering material:
   1. Two 6"x6" samples of 1" cushion layer topped with synthetic turf and attached with turf adhesive.
      a. Synthetic Grass carpet: Two 12 inch by 12 inch (305 mm by 305 mm) pieces.
      b. Infill material: Two 1-gallon bags for each type.
      c. Seamed synthetic grass carpet: Two 12 inch by 24 inch (305 mm by 610 mm) pieces seemed together for each seaming method indicated on drawings.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Certification: Provide IPEMA certification of ASTM F1292 Critical Fall Height at thickness specified.

1.05 QUALITY ASSURANCE

A. See section 01 4000 - Quality Requirements, for procedures for testing, inspection, mock-ups, reports, certificates, use of reference standards.

B. Maintain one copy of latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

C. Manufacturer Qualifications: Company regularly engaged in manufacturing products specified in this section, with not less than three years of documented experience.
   1. Surfacing installed in minimum 10 sites and been in successful service minimum 5 years.
   2. Manufacturer's Representative: Provide name, company name and address, and qualifications.

D. Installer Qualifications: Company certified by manufacturer for training and experience installing protective surfacing; provide installer's company name and address, and training and experience certificate.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store synthetic grass surfacing to project site in accordance with manufacturer's recommendations.

B. Store materials in dry, covered area, elevated above grade.

1.07 FIELD CONDITIONS

A. Ambient Conditions: Cease work of this section when:
   1. Temperatures are below 55 degrees F.
   2. Humidity levels are above adhesive manufacturer's requirements.
   3. Rain is imminent or falling.
   4. Surfaces are wet or damp.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals - Closeout Submittals, for additional warranty requirements.

B. Provide 5 year minimum warranty from date of substantial completion for materials and installation covering:
   1. Excessive wear.
   2. Fiber tensile strength.
   3. Deterioration or fading from UV light.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gametime. - www.gametime.com
   1. Contact/Sales Representative: Jenn Peterson (800)922-0070 x 1071, email: jpeterson@mrcrec.com
      a. Quote No. 111480-04-01
         1) Part # 47430

(a) GT-Impax - 2.0" FlexGrass consisting of 1.5" of rubber cushion layer and FlexGround premier synthetic turf with 1-1/2" pile height.

B. SYNLawn. - www.synlawn.com

C. Valley Precision Grading, Inc. / TenCate Turf

D. Substitutions: See Section01 6000-Product Requirements.

2.02 SYNTHETIC GRASS SURFACING

A. Synthetic Grass Carpet: Yarn fibers tufted through and adhered to porous fiber backing.

B. Synthetic Grass Infill: 2 pounds per square foot (10 ksm), minimum at 50 to 50 percent granule to synthetic sand.

2.03 MATERIALS

A. Edge Anchoring: Wood-polymer composite lumber complying with ASTM D6662; factory finished, free of sharp vertical edges, protruding elements, and trip hazards, capable of being secured to border.
1. Size(s): 2 inch by 3 inch (51 mm by 76mm).
2. Size: As indicated on drawings.
3. Minimum Edge Radius: 1/2 inch.

B. Border: Permanent element surrounding edge anchoring, consisting of exterior walls:
1. Sidewalks: As indicated on drawings.
2. Concrete Curb: As indicated on drawings.
3. Chain Link Fence: As indicated on drawings.

C. Drainage (Loose Surfacing) Course: Fractured, non-rounded gravel; washed; free of dust, clay, dirt, organic material, hazardous substances, or foreign objects; rounded particles, either naturally or mechanically; sieved in compliance with ASTM C136/C136M in specified gradation range.
1. Percent Passing Sieve Size 1/2 inch: 100 percent.
2. Percent Passing Sieve Size 3/8 inch: 75 to 85 percent.
3. Percent Passing Sieve Size No. 4: 0 percent.
4. Depth: As indicated on drawings.

D. Drainage (Base Stone) Course: Fractured, non-rounded gravel; washed; free of dust, clay, dirt, organic material, hazardous substances, or foreign objects; rounded particles, either naturally or mechanically; sieved in compliance with ASTM C136/C136M in specified gradation range.
1. Percent Passing Sieve Size 1-1/2 inch: 100 percent.
2. Percent Passing Sieve Size 3/4 inch: 75 to 85 percent.
3. Percent Passing Sieve Size 1/2 inch: 40 to 70 percent.
4. Percent Passing Sieve Size 3/8 inch: 75 to 85 percent.
5. Percent Passing Sieve Size No. 4: 0 percent.
6. Depth: As indicated on drawings.

E. Geotextile: Nonwoven polypropylene sheet.

2.04 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Lay out entire project perimeter as indicated on drawings prior to starting work.

B. Measure location of all synthetic grass elements, including perimeter of existing synthetic grass surfacing, access and egress points, hard surfaces, walls, fences, and structures.

C. Verify location of underground utilities and facilities in project area. Damage to underground utilities and facilities will be repaired at Contractor's expense.

3.02 EDGE ANCHORING

A. Layout composite nailer boards. Approval of locations by Architect required prior to installing.

B. Install along full perimeter of synthetic grass.

C. Fasten to border with case hardened screws at 24 inch on center, minimum.

D. Set top of edging flush or recessed 1/2 inch below top of border, maximum.

3.03 SYNTHETIC GRASS

A. Carpet Rolls:
   1. Unroll all carpet in same direction.
   2. Prevent seams from being located over impact mats.
   3. Allow carpet to rest for at least 4 hours after unrolling and prior to seaming.
   4. Smooth seams and edges, eliminate overlaps and gaps.

B. Seaming:
   1. Cut: Straight, with clean and smooth edge.
   2. Method:
      a. Bonding: Adhesive-backed, applied uniformly with complete coverage.

C. Securing: Staple carpet to edging 1 inch (25 mm) on center.

3.04 INFILL

A. Apply during dry weather without signs of moisture on synthetic grass.

B. Thoroughly brush synthetic grass prior to infill installation.

C. Apply infill uniformly in multiple lifts, brush fibers between each application.

D. Measure depth to confirm accordance with plans.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Owner or Owner's representative will inspect synthetic grass after installation to verify that surfacing is of proper type and meets specified design safety and accessibility requirements.

C. Repair or replace rejected work until compliant with specified requirements and design criteria.

D. Confirm rainfall permeability meets design, per ASTM F2898.

E. Confirm impact attenuation meets design, per ASTM F1936.

F. Replace damaged products before Date of Substantial Completion.

3.06 CLEANING

A. Clean surrounding areas of excess construction materials, debris, and waste.

B. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

C. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.07 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Restore adjacent existing areas that have been damaged by work of this section.

END OF SECTION 32 1813

Section 32 1816.13
Playground Protective Surfacing

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protective surfacing for playground area, climbing boulder, and fitness equipment.

B. Subbase under resilient surfacing.

C. Containment curbs.

D. Engineered Wood Fiber (EWF).

E. Subbase under protectinve surfacing.

F. Geotextile Fabric.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 11 6813 - Playground Equipment: Playground layout (staking).

C. Section 32 1123 - Aggregate Base Courses: Subbase for resilient surfacing.

D. Section 32 1313 - Concrete Paving: Subbase for resilient surfacing.

1.03 REFERENCE STANDARDS

A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

B. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2017.

C. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment; 2022.

D. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use; 2021.

E. CPSC Pub. No. 325 - Public Playground Safety Handbook; 2015.

1.04 DEFINITIONS

A. Use Zone: The area beneath and immediately adjacent to a play structure or equipment (play event) that is designated for unrestricted circulation around equipment, and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

B. Critical Fall Height: The maximum fall height at which the protective surfacing meets the requirements of ASTM F1292.

C. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it as defined by ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subbase: A layer under the resilient layer of the protective surfacing but over the subgrade; may be rigid, as in concrete or bituminous, or aggregate.

F. Subgrade: The surface of the ground on which the protective surfacing is installed.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals - Administrative Requirements, for submittal procedures.

B. Product Data: For all manufactured surfacing products, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.
   1. Include IPEMA certifications where required.

C. Samples: For each product for which color must be selected provide color chart showing full range of colors.

1.06 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing products specified in this section, with not less than three years of documented experience.
   1. Surfacing installed in minimum 10 sites and been in successful service minimum 5 years.

1.07 PRE-INSTALLATION MEETING

A. Coordinate with Section 11 6813.

B. Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.

1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
2. Include representatives of Contractor.
3. Notify Architect at least 2 weeks prior to meeting.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals - Closeout Submittals, for additional warranty requirements.

B. Provide minimum 5 year warranty for playground surfacing.

PART 2 PRODUCTS

2.01 Performance CRITERIA

A. Because the safety of the playground depends on strict compliance with the performance criteria, this information is provided for Contractor's information.
   1. The protective surfacing constitutes a resilient layer installed over a non-resilient layer, which is installed over the subgrade, with the top of playground equipment footings and anchorage devices covered by full depth of the resilient portion of the protective surfacing.
   2. The top elevation of the protective surfacing is intended to be flush with adjacent grades.
   3. Use Zone: The protective surfacing has been designed to provide acceptable impact attenuation as defined in ASTM F1292 for Critical Height of ____ feet.

B. If deviation from specified depth is required, it is the Contractor's responsibility to make all changes required to maintain specified top elevation and required impact attenuation at no extra cost to Owner; obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

2.02 MATERIALS

A. Poured-In-Place Membrane Surfacing: Weather-resistant wear layer over impact attenuating substrate over rigid subbase.
   1. Wear Layer: Ethylene propylene diene monomer (EPDM) particles adhered with a ultraviolet-stabilized polyurethane binder to produce an even, uniformly colored surface.
   2. Wear Layer Thickness: 3/8 inch, minimum.
   3. Coefficient of Friction, when wet: 0.8, minimum, when tested in accordance with ASTM D2047.
   4. Wear Layer Color(s): As indicated on drawings. Submit Samples.
   5. Impact Attenuating Substrate: 100 percent recycled shredded styrene butadiene rubber (SBR) shreds or granules with 100 percent solids polyurethane binder to form a resilient material; do not use foam rubber.
   6. Manufacturers:
      a. GameTime, Inc; _____: www.gametime.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   7. Accessories: Provide manufacturer's standard containment curbs and tapered transition elements to support surfacing between changes of surface grade.

B. Engineered Wood Fiber Fill: Manufactured for the purpose of protective surfacing; complying with ASTM F2075; do not use mulch manufactured from recycled pallets, or lumber containing nails or metal fasteners.
   1. Depth: As required to achieve specified Critical Fall Height as defined in ASTM F1292 but not more than depth indicated; maintain top elevation flush with adjacent grades.
   2. Manufacturers:
      a. Fibar Systems; _____: www.fibar.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Geotextile: Nonwoven polypropylene sheet.

D. Containment Curbs: Cast-in-place concrete; free of sharp vertical edges, protruding elements, and trip hazards.
   1. Size(s): As indicated on drawings.
   2. Minimum Edge Radius: 1/2 inch.

E. Aggregate Subbase: See Section 32 1123.

PART 3 EXECUTION

3.01 EXAMINATION

A. Playground equipment installer will perform playground layout prior to installation of footings; verify correctness of layout before starting this work.

B. Verify that playground equipment and site furnishings and irrigation system located within playground area are complete.

C. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at Contractor's expense.

D. Verify that subgrades are at proper elevations and that smooth grading is complete.

E. Verify that proper depth of surfacing is marked on base supports of playground equipment.

3.02 PREPARATION

A. Correct subgrade irregularities to ensure that required depth of protective surfacing can be installed, and subgrade elevation is in accordance with manufacturer's requirements.

B. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

C. Remove rocks, debris, and other similar items.

D. Install containment curbs with top surface flush with intended elevation of top surface of protective surfacing.

3.03 SUBBASE

A. Install aggregate subbase as indicated on drawings and in Section 32 1123. Compact aggregate to maximum 95 percent, in accordance with ASTM D1557.

B. Install with top surface of subbase no higher than grades and levels indicated and not more than 1/4 inch lower than grades and levels indicated.

C. Install in true, even plane, sloped to provide positive drainage.

D. Flatness Tolerance: 1/4 inch in 10 feet, maximum.

3.04 RESILIENT SURFACING LAYER

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

B. Install proper thickness throughout Use Zone(s).

C. Clean and dry surface of subbase.

D. Cover aggregate subbase with geotextile:
   1. Verify that aggregate is free of ruts or protruding objects.
   2. Lap minimum 4 inches width at seams. Adhere seams in accordance with manufacturer's recommendations.
   3. Install smooth, and free of tensile stresses, folds, or wrinkles.
   4. Protect from clogging, tears, or other damage during surfacing installation.
   5. Repair or replace damaged geotextile in accordance with manufacturer's recommendations.

E. Poured In Place Surfacing:
   1. Mix components mechanically on-site in accordance with manufacturer's directions; do not mix by hand.
   2. Install seamlessly; ensure complete bond to subbase.
   3. Cover footings and foundations and adhere tightly around penetrating elements.
   4. Maintain full thickness of resilient layers within Use Zone; cover or abut containment curbs as indicated on drawings; completely cover tapered transition edges.
   5. Hand trowel exposed surface to smooth, even finish.
   6. Impact Attenuation Layer: Install entire layer in one continuous pour on the same day.
   7. Wear Surface: Bond wear surface to substrate with adhesive. Apply adhesive in small quantities so that wear surface can be applied before adhesive dries.
      a. Install surfacing seamlessly. When wear surface is composed of different color patterns, pour surface continuously and seamlessly.
      b. When seams are required due to color change or field conditions, place adjacent wear surface as soon as possible, before initial pour has cured. Coat edge of initial pour with adhesive and apply wear surface mixture immediately.
      c. Add a minimum of 1/16 inch depth to specified surfacing depth to ensure required impact attenuation performance is met.

d. Install wear surface to cover foundations and adhere tightly around elements penetrating the surface.

3.05 LOOSE FILL SURFACING

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, and requirements of authorities having jurisdiction (AHJ).

B. Cover Subgrade with Geotextile:
   1. Lap minimum 4 inches width at seams. Adhere seams in accordance with manufacturer's recommendations.
   2. Install smooth, and free of tensile stresses, folds, or wrinkles.
   3. Protect from clogging, tears, or other damage during surfacing installation.
   4. Repair or replace damaged geotextile in accordance with manufacturer's recommendations.

C. Install loose fill to depths indicated, with smooth even surface flush with tops of containment curbs.

3.06 FIELD QUALITY CONTROL

A. Owner or Owner's representative will inspect playground surfacing after installation to verify that surfacing is of proper type and depth and that playground meets specified design safety and accessibility requirements.

B. Repair or replace rejected work until compliance is achieved.

3.07 CLEANING AND PROTECTION

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation. Clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

E. Protect installed products until Date of Substantial Completion.

F. Replace damaged products before Date of Substantial Completion.

END OF SECTION 32 1816.13

Section 32 3000
Offsite Development

PART 1 – GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 Summary

A. Work Included: Furnishing all labor, materials and equipment necessary to provide, construct and install street improvement to the City of Porterville standards.

B. Work within the Locust Street right-of-way shall conform to the California Department of Transportation (Caltrans) requirements.

1.03 Quality Assurance

A. Standards: Comply with the following standards:

1. City of Porterville Standard Plans and Specifications, latest edition.

B. All work shall comply with the rules and regulations of the Division of Industrial Safety and all other local, state and federal agencies having jurisdiction. Nothing contained herein shall be construed as permitting work that is contrary to such rules, regulations and codes.

1.04 Submittals

A. Submit all product data for work in the public street right-of-way to the City Engineer of Porterville, to include but not limited to:

1. Concrete mix designs and supporting test data.
2. Product data for concrete mix.
3. Asphalt Concrete mix design and product data.
4. Piping data sheets.
5. Manhole material data sheets.
6. Water Meter boxes data.
7. Water Meter assembly data.
8. Backflow Preventer data.

B. All submittals shall comply with City of Porterville requirements.

C. Submit all test reports for compaction.

1.05 Scope Of Work

A. Street improvements include, but are not limited to, demolition, clearing and grubbing, pavement and concrete removal, relocating or reconstructing interfering existing utilities, constructing permanent pavement, underground utilities, concrete curb and gutter, concrete sidewalks and driveway approaches as indicated on the Plans, in these specifications, and in conformance with the City of Porterville Standard Plans and Specifications.

1.06 Existing Conditions

A. Contractor shall be held to have visited the site prior to submitting proposal to determine existing conditions, nature of materials to be encountered and to evaluate other information concerning or affecting the work to be performed under the contract.

B. Before commencing excavation, the Contractor shall notify all utility authorities or utility companies having possible interest in the work of the Contractor's intention to excavate proximate to existing facilities and Contractor shall verify the location of any utilities within the work area.

C. The Engineer has made a diligent attempt to show on the Construction Drawings all pertinent intersecting and parallel utilities which may affect the work. The Contractor shall exercise caution while performing excavation for this project and shall protect existing utilities from damage, in as much as their exact location is unknown until exposed by the excavation.

D. Because of the close proximity of certain existing parallel or intersecting utilities and the depth of the proposed facilities, it may be necessary for the Contractor to provide special protection for the existing utility, and/or provide for its temporary and/or permanent relocation in order to construct the facilities shown on the Plans. Bracing of power poles may be necessary. The contractor shall coordinate said work and shall be responsible for complying with the requirements of the utility authority involved. Full compensation for all costs involved in such special protection and/or relocation, including all appurtenances and incidentals, shall be included in the amount bid for the various bid items, and no separate payment shall be made therefor.

E. All existing utility mains and service lines shall be kept in constant service during the construction of this project. Hand excavating shall be employed where necessary to safely expose existing utilities.

F. Full compensation for all costs involved in locating, verifying, protecting, exposing, relocating, reconstructing and otherwise providing for utilities shall be included in the amount bid for the various items of work and no separate payment shall be made therefor.

1.07 Dust And Traffic Control

A. Dust Control:

1. Dust control shall comply with the San Joaquin Valley Air Pollution Control District Regulation VIII requirements.

2. The contractor shall maintain dust control about the site of the work, including any haul roads to or from the site, by whatever means are necessary, such as watering and sweeping, so as to cause the least possible dust nuisance to the public. Any dust control measure ordered by the Architect and/or City shall be promptly and immediately carried out.

3. If the Contractor fails to provide dust control measures so ordered within a period of 2 hours from the time ordered by the Architect and/or City, the Contractor shall pay to the Owner a penalty of Twenty-five (25) Dollars for each one half (½) hour, or portion thereof, that elapses beyond the 2 hour warning period, until dust control measures ordered by the Architect and/or City are completely carried out and the dust nuisance eliminated or prevented.

4. Such penalty shall be deducted from any monies owed the Contractor. In addition to the penalty as specified above, if conditions warrant, the Owner may employ other forces to eliminate or prevent the dust nuisance. The full cost thereof, in addition to the penalty as herein provided, shall be deducted from any monies owed the Contractor.

5. Full compensation for dust control shall be included in the amount bid for the various items of work and no separate payment will be made therefor.

B. Traffic Control

1. Traffic control measure shall be fully and completely carried out at all times to the satisfaction of the City of Porterville. If the Contractor fails to provide satisfactory traffic control the Owner may obtain services from other sources and deduct from the contract the cost thereof.

2. Through traffic shall be provided for during non-working hours including, but not limited to, weekends, holidays and at night.

3. The Contractor shall comply with all requirements of the City of Porterville encroachment permit(s).

1.08 Protective Measures

A. Furnish, place, and maintain all supports, shoring, and sheet piling which may be required for the sides of excavation or for protection of adjacent existing improvements. The adequacy of such systems shall be the complete responsibility of the Contractor.

B. Maintain all bench marks, monuments and other reference points. If disturbed or

destroyed, replace as directed.

C. Forty-eight (48) hours prior to beginning construction, the Contractor shall notify the owners of all properties adjacent to the proposed construction. The Contractor shall also provide the property owners with an estimate of the length of time that their properties will be affected by his construction activities.

1.09 Permits

A. The Contractor shall secure and pay for all permits required for work under this contract including, but not limited to, the encroachment permit from the City of Porterville.

1. Contractor shall provide Certificates of Insurance and Bond as required by the City of Porterville.

B. All costs associated with obtaining permits as required by construction and as indicated herein shall be included in the price bid for the various items or work and no separate payment will be made therefor.

C. The Contractor shall pay all inspection fees required by governmental agencies.

D. The Contractor shall obtain a permit from the Division of Industrial Safety of the State of California prior to the commencement of construction. Full compensation for said permit shall be included in the price bid for the various items of work and no separate payment will be made therefor.

1.10 Finish Elevations And Lines

A. Unless otherwise stipulated in the contract documents, the Contractor shall secure and pay for the services of a Civil Engineer or Land Surveyor, licensed in the State of California and acceptable to the Architect, to perform all staking required for offsite construction. The cost of surveying and staking shall be included in the price bid for the various items of work and no additional payment will be made therefor.

B. Carefully preserve all data and monuments set by the Owner's Civil Engineer or Land Surveyor and, if displaced or lost, the Contractor's Engineer shall immediately replace to the satisfaction of the Architect and at no additional cost to the Owner.

1.11 Monitoring Of Construction Site

A. The Contractor shall monitor the construction site on a regular basis during non-working hours, including weekends and holidays to ensure that no situations arise, relating to the condition of the work site, which could pose a threat to public safety. In addition, the Contractor shall furnish to the Owner and to the City Engineer, prior to the issuance of the "Notice to Proceed", a list of persons, together with their addresses and home telephone numbers, who are authorized to act on behalf of the Contractor in an emergency arising

out of conditions at the work site after normal work hours.

B. Safe pedestrian crossings shall be maintained at all existing crosswalks and intersections.

C. The Contractor shall secure the site of work at all times. Children shall not be allowed in or along the excavation, on spoil piles or at other undesirable locations within the work. The Contractor shall provide suitable traffic and pedestrian warning devices and signs necessary at or near the work as required by safety considerations and/or jurisdictional authorities. Convenient pedestrian detours and/or flagmen and/or safe temporary bridges over excavations, complete with adequate safety rails, shall be provided as necessary.

1.12 Hours Of Work

A. City of Porterville Noise Ordinance allows construction from 6:00 a.m. to 9:00 p.m. Monday through Friday, and 7:00 a.m. to 5:00 p.m. on Saturday and Sunday.

B. City of Porterville inspectors are available from 7:00 a.m. to 5:00 p.m. Monday through Friday, and 7:00 a.m. to 5:00 p.m. on Saturday and Sunday. Contractor is responsible for payment of all inspection fees, including any surcharges for weekend or special inspections outside of normal inspection hours.

1.13 Compaction And Compaction Tests

A. The Contractor shall be fully responsible for timely compaction and suitability of material for compaction. Where necessary, wet and pumping material shall be removed from the trench or excavation by the Contractor and replaced with suitable approved material as necessary to complete operation within the time allowed.

B. Compaction requirements for all excavations within public streets, shall be in accordance with the City of Porterville Encroachment Permit and in accordance with the City of Porterville Standard Plans and Specifications (not less than 90 percent relative compaction to within 2 feet of the bottom of the finish surface, and the top 2 feet not less than 95 percent relative compaction in paved areas and under concrete curb and gutter, and not less than 90% in sidewalk areas.)

C. Initial compaction testing shall be provided by Owner. The contractor shall file adequate notice to the Architect when he desires compaction testing. Locations of tests shall be determined by the City Public Works Inspector. All required compaction retesting of backfill because of failure to pass original test shall be at the expense of the Contractor.

D. Full compensation for all costs involved in meeting and satisfying the above requirements shall be included in the amount bid for the various items of work and no separate payment will be made therefor.

PART 2 – MATERIALS

2.01 General

A. All materials incorporated in off-site construction shall conform with the City of Porterville Standard Plans and Specifications.

B. Construction of off-site facilities shall be performed in accordance with the City of Porterville Standard Plans and Specifications.

C. The Contractor shall be responsible to protect all other existing and proposed utilities and improvements affected by his work.

D. The Contractor shall cooperate with all other contractors on the job to insure that his activities do not delay or hinder the construction activities of others.

E. All excess earth from trenching and offsite grading may be deposited within the boundaries of the site at a location specified by the Architect for incorporation in site grading activities. All such earth shall be free of organic material, large rocks, hardpan, asphaltic paving and other deleterious materials.

F. The Contractor shall coordinate his efforts with other forces performing on-site work such that said forces are provided with adequate access to the site.

G. The City of Porterville Inspector will have the primary inspection responsibility and will conduct the day-to-day inspection. The contractor shall notify the City of Porterville Engineering Department at (559) 782-7462 forty-eight (48) hours prior to beginning construction. Inspection requests may be made Monday-Friday, 9:00 a.m. to 4 p.m.

END OF SECTION

Section 32 3300
Site Furnishings

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Benches.

B. Tables.

C. Waste and Recycling receptacles.

D. Bike Rack

E. Bike Fixit Station

F. Bottle Filler/Drinking Fountain

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Bollard infill and underground encasement.

B. Section 05 5000 - Metal Fabrications: Anchors to attach site furnishings to mounting surfaces.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

E. ASTM A999/A999M - Standard Specification for General Requirements for Alloy and Stainless Steel Pipe; 2018.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

C. Shop Drawings: Indicate plans for each unit or group of units, elevations with model number, overall dimensions, construction, and anchorage details.

D. Samples: Submit two sets of manufacturer's available colors for metal furnishings.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer’s warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Site Furnishings:
   1. Wishbone Site Furnishings; www.wishboneltd.com
      a. Sales/Representative: Tyler Kyriopoulos, email: tyler@gwpark.com, phone: 435-245-5055.
      b. Quote No. xxx
         1) **Bench Type 1: Backed Bench**
            (a) Model: BayView Bench: BV-6 (6ft bench with armrest)
            (b) Powder Coat Colour: Timeless Rust
            (c) Plastic Lumber Colour: Sand
            (d) Surface Mount
         2) **Bench Type 2: Backless Bench**
            (a) Model: BayView Backless Bench: BVSB-6 (6ft)
            (b) Powder Coat Colour: Timeless Rust
            (c) Plastic Lumber Colour: Sand
            (d) Surface Mount
         3) **6' Rectangular Picnic Table**
            (a) Model: BayView Picnic Table: BVPT-6 (Regular)
            (b) Powder Coat Colour: Timeless Rust
            (c) Plastic Lumber Colour: Sand
            (d) Surface Mount

4) **6' Rectangular Accessible Picnic Table One Side**
   (a) Model: BayView Picnic Table: BVPTWC-6 (Wheelchair Accessible)
   (b) Powder Coat Colour: Timeless Rust
   (c) Plastic Lumber Colour: Sand
   (d) Surface Mount
5) **6' Table with Bench Combo**
   (a) Model: 6' Bistro Bench and Table Combo: BTC-6
   (b) Powder Coat Colour: Timeless Rust
   (c) Plastic Lumber Colour: Sand
   (d) Surface Mount
6) **8' Rectangular Picnic Table**
   (a) Model: BayView 8' Picnic Table: BVPT-8
   (b) Powder Coat Colour: Timeless Rust
   (c) Plastic Lumber Colour: Sand
   (d) Embed Mount
7) **8' Rectangular Accessible Picnic Table**
   (a) Model: BayView 8' Wheelchair Picnic Table: BVPTWC-8
   (b) Powder Coat Colour: Timeless Rust
   (c) Plastic Lumber Colour: Sand
   (d) Embed Mount
8) **Waste and Recycling Receptacle**
   (a) Model: Modena Curved Top Double Recyling Station: MCTRS-39
   (b) Powder Coat Colour: Timeless Rust
   (c) Plastic Lumber Colour: Sand
   (d) Surface Mount
9) **Bike Rack**
   (a) Model: Urban Form Bike Rack: UFBR-35
   (b) Powder Coat Colour: Timeless Rust
   (c) Plastic Lumber Colour: Sand
   (d) Surface Mount

2. Dero, www.dero.com
   a. **Bike Fix-It Station**
      1) Model: Fixit
      2) Finish: Galvanized
      3) Mounting: Embed mount per manufacturer's instructions.
3. Most Dependable Fountains, mostdependable.com
   a. **Bottle Filler/Drinking Fountain**
      1) Model: 10145 SM with optional pet fountain. Heavy-duty outdoor, ADA pedestal bottle filler, hi/low drinking fountain and dog bowl.
      2) Finish: Blue
      3) Mounting: Embed mount per manufacturer's instructions.
4. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify proper installation of mounting surfaces, preinstalled anchor bolts, and other mounting devices; and ready to receive site furnishing items.

B. See Section 05 5000 for anchors to attach site furnishings to mounting surfaces.

C. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install site furnishings in accordance with approved shop drawings, and manufacturer's installation instructions.

B. See Section 03 3000 for bollard infill and underground encasement.

C. Provide level mounting surfaces for site furnishing items.

END OF SECTION 32 3300

Section 32 4000
Landscape Boulders and Stone

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Landscape Boulders

1.02 RELATED REQUIREMENTS

A. Section 01 3300 - Submittals: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

1.03 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Samples - submit the following:
   1. Boulders
      a. Photographs taken at supplier or quarry that are representative of the size range, color, shape, and rock type. Boulders shown should be individually depicted so as to be clearly seen, and not on a palette or in a pile with other rock or rubble.
      b. Owner and Landscape Architect reserve the right to visit supplier's yard or quarry to make final selections.

1.04 QUALITY ASSURANCE

A. Provide all rock in this section from a source less than 200 miles away from project site.

B. Procure all boulders from the same source/quarry.

C. Procure all cobble from the same source.

PART 2 PRODUCTS

2.01 LANDSCAPE BOULDERS

A. Description: Landscape Boulders, quantity and sizes per plans. Boulders should be free of evidence of significant cracks,fissures, and fragmentation, and generally cubical or spherical in shape. Any one dimension of a boulder (height, width, depth) should not be more than 2-times any other dimension.

B. Color: Moss fieldstone

C. Suppliers:

1. Santa Paula Materials, Inc.: 805-525-6858 (Basis of Design)

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that boulders are of good quality without cracks or fissures .

B. Verify subgrades are ready to recieve work.

3.02 INSTALLATION AND PLACEMENT

A. Install in accordance with drawings.

B. Cobble:
1. Install geotextile fabric.
2. Place boulders as shown on Drawings.
3. Place cobble. Geotextile should not be exposed or visible.

END OF SECTION 32 4000

Section 32 8423
Irrigation System

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings,emitters, bubblers, and accessories.

B. Automatic valves

C. Manual valves

D. Control system.

E. Drip Irrigation

F. Pop-up spray/rotary systems

G. Pop-up rotor systems

H. Pump Equipment and Controls

1.02 DESCRIPTION

A. Provide all material, labor, equipment transportation, and services necessary for the furnishing and installation of the complete automatic sprinkler irrigation system as shown on the drawings and as specified herein. The work includes, but is not limited to:
   1. Trenching, stockpiling excavation materials and refilling trenches.
   2. Providing a complete system including piping, valves, fittings, backflow prevention device(s), rotors, sprinklers, automatic controls, dripline, and emitters and final adjustment of heads to ensure complete coverage.
   3. Line voltage connections to all irrigation controllers; low voltage control wiring from controller to remote control valves.
   4. Electrical service and hookup to automatic controller
   5. Pump System Fabrication, Installation, and Start-up
   6. Automatic controller assembly and installation.
   7. Thrust Blocking
   8. Submittals, tests, as-built and record drawings.
   9. Erosion control and repair of damage due to over watering and erosion.
   10. Warranty replacement.
   11. Cleanup, inspection and approval.

1.03 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 31 2316 - Excavation: Excavating for irrigation piping.

C. Section 31 2316.13 - Trenching: Excavating and backfilling for irrigation piping.

D. Section 31 2323 - Fill: Backfilling for irrigation piping.

E. Section 32 9300 - Plants

1.04 REFERENCE STANDARDS

A. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.

B. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Detail Drawings: Submit detailed drawings for Owner approval, for all assemblies not detailed on the drawings.

C. Controller Charts:
1. The Architect shall accept Record drawings before controller charts are prepared. Provide one controller chart for each controller supplied. The chart shall show the area controlled by the automatic controller and shall be the maximum size that the controller door will allow.
2. The chart is to be a reduced drawing of the actual “as-built” system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced. The chart shall be a black line or blue line ozalid print and a different color shall be used to indicate the area of coverage for each station. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum of 10 mils. These charts shall be completed by the Contractor and approved by the Architect prior to final observation of the irrigation system.

D. Operation and Maintenance Data:
1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

E. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Sprinkler/Rotor Heads: One of each type and size.

3. Extra Valve Keys for Manual Valves: One.
4. Extra Valve Box Keys: One.
5. Extra Quick Coupler Keys: One.
6. Prepare and deliver to the Architect, within 10 calendar days prior to completion of construction, two hardcover binders with three rings containing the following information:
   a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative.
   b. Catalog and part sheets on every material and equipment installed under this contract.
   c. Contractor's Guarantee statement that all equipment has been installed per plans and specifications.
   d. Complete operating and maintenance instruction on all major equipment.

F. Irrigation Schedule:
   1. Watering schedule shall include watering times and start times for each valve. Schedule shall indicate watering times for each day of the week as applicable. The schedule shall be broken out to include seasonal adjustments.
   2. Submit the Watering Schedule to the Architect for approval. The amount of water used per the irrigation schedule shall not exceed the projected water usage shown on the irrigation calculations and plans.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, storing and installation of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle that allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping.

1.07 JOB CONDITIONS

A. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Architect. In the event this notification is not performed, the irrigation Contractor shall assume full responsibility for any revision necessary.

1.08 SUBSTITUTIONS

A. Procedure: Submit information in conformance with the substitution requirements of Division 01, General Provisions.

B. Provide descriptive catalog literature, performance charts and flow charts for each item to be substituted.

1.09 REGULATORY REQUIREMENTS

A. Requirements of Regulatory Agencies: All work and materials shall be in full conformance with the latest rules and regulations of the California Plumbing and Electric codes.

B. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

C. Underwriters Laboratories: Electrical wiring, controls, motors, and devices shall be UL listed, and so labeled.

1.10 INSTALLATION MEETINGS

A. Contractor shall be responsible for notifying the Architect or Designated Representative in advance for the following observation meetings, according to the time indicated: (Certain meetings may be grouped if prior approval is granted).
   1. Coordinate one week prior to commencing work of this Section.
   2. Booster Pump assembly: 48 hours. Provide invitation to manufacturer's representative.
   3. Pressure supply line installation and testing: 48 hours.
   4. Automatic controller location: 48 hours.
   5. Coverage test: 48 hours.
   6. Final site review: 7 days.

B. When observations have been conducted by other than the Architect or Designated Representative, show evidence in writing of when and by whom these observations were made.
   1. Final Observation:
      a. The Contractor shall operate each system in its entirety for the Architect or Designated Representative at time of final observation. Any items deemed not acceptable by the Architect or Designated Representative, or not in compliance with these specifications and drawings, shall be reworked to the complete satisfaction of the Architect or Designated Representative.
      b. The Contractor shall show evidence to the Architect or Designated Representative that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

1.11 COORDINATION

A. Coordinate the work with site backfilling, landscape grading and delivery of plant life.

1.12 WARRANTY

A. The warranty for the sprinkler irrigation system shall be made in accordance with the following form.

B. A copy of the warranty form shall be included in the operations and maintenance manual.

C. The warranty form shall be retyped onto the Contractor's letterhead and contain the following information

D. WARRANTY FOR SPRINKLER IRRIGATION SYSTEM

1. We hereby warrant that the sprinkler irrigation system we have furnished and installed is free from defects in materials and work quality, and the work has been completed in accordance with the drawings and specification. We agree to repair or replace any defects in material or work quality that may develop during the period of one year from the date of acceptance, except those that may be caused by ordinary wear and tear, unusual abuse or neglect. We also agree to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense, and we will pay the costs and charges therefore upon demand.
2. PROJECT:_____
3. CONTRACTOR:_____PHONE NO.:_____
4. ADDRESS:_____BY:_____
5. _____
6. DATE OF ACCEPTANCE:_____BY:_____

E. Provide separate warranty for pump systems and controls.

PART 2 PRODUCTS

2.01 IRRIGATION SYSTEM

A. Manufacturers:
   1. As shown on plans.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PIPE MATERIALS

A. PVC Pipe (Sizes up through 3"): ASTM D 2241; 200 psi pressure rated upstream from controls, 160 psi downstream; solvent welded sockets.

B. PVC Pipe (3" - 6" sizes): ASTM D 2241; 200 psi (1.38 MPa) pressure rated upstream from controls, 160 psi (1.10 MPa) downstream; rubber gasketed joints.

C. Pressure and Non-Pressure Main Line Piping and Fittings: Sizes 2 1/2 inches and smaller shall be Schedule 40 PVC.

D. Non-pressure lines (buried): Shall be PVC Schedule 40.

E. Fittings: Type and style of connection to match pipe and shall meet the requirements for service at an operating pressure of 150 pounds per square inch, unless otherwise specified.

F. Pipe Risers at Valves: 160 psi PVC pipe.

G. Solvent Cement: ASTM D2564 for PVC pipe and fittings.

H. Sleeve Material: PVC Material per plan.

I. PVC nipples: Schedule 80 with molded threads.

J. All PVC pipe must bear the following markings:
1. Manufacturer's name.
2. Nominal pipe size.
3. Schedule or class.
4. Pressure rating in AST (not required on drip tubing).
5. NSF (National Sanitation Foundation) approval (not required on drip tubing).
6. Date of extrusion.

2.03 OUTLETS

A. Manufacturer:
1. As indicated on the drawings.
2. Substitutions: See Division 01, General Provisions

B. Emitter: Non-clogging, self-cleaning per the model numbers shown on the drawings.

C. Tree Bubbler: Fixed outlet capable of watering deep root systems directly.

D. Quick Coupler: Two piece body with purple cover .

2.04 VALVES

A. Manufacturers:
1. As indicated on the drawings.
2. Substitutions: See Division 01, General Provisions

B. Ball Valves: Brass construction with locking lever..

C. Backflow Preventers: Bronze body construction, reduced pressure zone type.

D. Backflow Enclosure: Vandal and weather resistant nature manufactured entirely of marine grade aluminum alloy 5052-H32. The mounting base shall be manufactured entirely of stainless steel. The length of the enclosure shall be expandable to allow for site adjustment. The enclosure shall have a mounting lip on one end and a locking mechanism on the other end. The handle controlling the locking mechanism shall be concealed within the surface of the enclosure and provide for a padlock.

E. Quick Coupling Valves: Two-piece brass body construction, 150-pound class, with 1-inch female threads opening at base permitting operation with a special connecting device (coupler) designed for this purpose.
1. Coupler threads: Lug type.
2. Hinge cover: Provide with rubber-like locking N/A vinyl cover.

F. Master Valves

1. Valve Type: Spring loaded, packless diaphragm activated, normally closed type with brass body, equipped with flow control and pressure regulation capabilities where noted.
2. Valve Solenoid: 24 volt AC, 4.5 watt maximum, 500 milli-amp maximum surge, corrosion-proof, stainless steel construction, epoxy encapsulated to form a single integral unit unless otherwise noted on plans.
3. Provide bleeder valve to permit operation in the field without power at the controller.

G. Remote Control Valves
1. Valve Type: Spring loaded, packless diaphragm activated, normally closed type with brass body, equipped with flow control and pressure regulation capabilities where noted.
2. Valve Solenoid: 24 volt AC, 4.5 watt maximum, 500 milli-amp maximum surge, corrosion-proof, stainless steel construction, epoxy encapsulated to form a single integral unit unless otherwise noted on plans.
3. Provide bleeder valve to permit operation in the field without power at the controller.

H. Valve Boxes
1. Remote control Valves: 14” x 19” of plastic material with locking cover.
2. Gate valves, ball valves and quick couplers: 10" round of concrete material with locking cover.
3. Valve box extensions shall be by the same manufacturer as the valve box.
4. Emboss, letters on valve boxes to indicate contents of valve box and include valve numbers. (ie. GV = Gate Valve, QC = Quick Coupler, RC = Remote Control Valve, MV = Master Valve, BV = Ball Valve)

I. Station Decorders
1. Shall match manufacturer of controller.
2. Provide minimum one (1) decoder per valve. The station decoder shall be a 2-station decoder and shall be able to operate up to 2-solenoids using unique colored wires for each. Utilizing decorder to support multiple valves is acceptable in accordance with manufacturer's instructions.
3. Include POC decorders for master valve and flow sensor per manufacturer's instructions.
4. Provide grounding rods or plates per manufacturer's instructions.

2.05 CONTROLS

A. Manufacturers:
1. As indicated on drawings.
2. Substitutions: See Division 01, General Provisions.

B. Controller(s): Automatic controller, microprocessor solid state control with visible readout display, temporary override feature to bypass cycle for inclement weather, timer for a 48 station system, programmable for 7 days in quarter hour increments, with automatic start and shutdown.

C. Controller Enclosure: The enclosure shall be of a vandal and weather resistant nature manufactured entirely of 304-grade stainless steel, and the top shall be 12 gauge and the body 14 gauge with lockable hinged door. The main housing shall be louvered upper and lower body to allow for cross flow ventilation.

1. Controller(s) shall be labeled inside and outside, warning that the system is utilizing recycled water. The labels shall also alert the system's maintenance personnel of any important constraints on the operation of the system.

D. Flow Sensor
   1. Shall match manufacturer of controller.
   2. The flow sensor shall be wired back to the irrigation controller using two #14 AWG wires, one red, and one black in 1" PVC conduit to connect to the irrigation controller. The maximum wire run between flow meter and controller shall be 2000 ft. The flow meter shall send low voltage digital pulses back to the controller and therefore all electrical connections must be waterproof and be resistant to any moisture entry.
   3. Housing to be a Sch 80 polyvinyl chloride tee or bronze tee.

2.06 ELECTRICAL (LOW VOLTAGE)

A. Connections between controller and remote control valves shall be made with direct burial AWG-UH, 600-volt wire, insulation thickness 3/64 inch, utilizing low-density high molecular weight polyethylene insulation.

B. Splices, where permitted, shall be waterproofed using Rain Bird, Pen-Tite Connectors or fusible heat shrinking tubing, and housed in a box. Boxes for other irrigation use may be utilized for this purpose.

C. Wire sizing shall be minimum of #14 "UF" 600 volt underground wiring, unless a shielded cable is used in which case #16 wire may be used. Common wires to be #12 and white in color. Each "hot" valve wire shall have a distinct and unique color other than white with no repetition of colors.

D. All electrical connections must be waterproof and moisture-resistant and shall be done with 3M™ Scotchcast™ 3570G Connector Sealing Packs.

2.07 PUMP SYSTEMS

A. Booster Pump 1
   1. Manufacturer: Barrett Engineered Pumps
      a. Contact(s):
         1) Kim Goldstein, G2 Enterprises
         2) kimgoldstein1@gmail.com
         3) Phone: 619-380-1833
   2. System Design Parameters

System Model Number: IBPCO-5-2-2.5/VFD-F	System Design Flow Rate: 75 GPM	System Design Pressure: 80 PSI	System Piping Size: 2 1/2 INCH
Minimum Suction Pressure: 45 PSI	System Electrical Voltage: 208/230/460 VAC	System Electrical Phase and Frequency: 1 or 3	

		PHASE 60 Hz	
Pump Model Number: PACO 1270-9	Pump Capacity (GPM): 75 GPM	Pump Total Head (Feet): 100 FEET	
Pump Horsepower: 5HP	Pump RPM: 3500 RPM	System Full Load Amperage: Undetermined Voltage	

3. Booster Pump Assembly
   a. A simplex water pressure booster system as designed and fabricated by Barrett Engineered Pumps (619) 232-7867. The system shall be a completely prefabricated system with pump, piping, electrical and structural elements. The entire booster pump assembly shall be UL Listed and Approved.
   b. Pump shall be:
      1) (PACO Series) Single stage end suction close coupled centrifugal, cast-iron bronze fitted construction, equipped with mechanical shaft seal, back pullout design. Impeller shall be threaded directly to the end of the shaft. Pump shaft shall be stainless steel with no sleeve. Pump shall be directly coupled to a C-face electric motor.
   c. Electric motor shall be of the squirrel cage induction type suitable for full voltage starting. Motor shall be ODP to aid in cooling. Electric motor shall be rated for continuous service. The motor shall have horsepower ratings such that the motor will carry the maximum possible load to be developed under the designed pumping conditions and not overload the motor beyond the nameplate rating of the motor. Motor shall have a 1.15 service factor. The motor shall conform to the latest NEMA Standards for motor design and construction.
   d. The pump Control Panel shall have a UL Listed Modular NEMA4X plain front non-metallic enclosure with stainless steel lockable latches. This Includes power and control re-settable thermal circuit breakers or Time Delay Fuses, heavy duty magnetic starter with adjustable overload protection, Controls Relays, Control on/off Switch, Hand-Off-Auto switch to select mode of operation, heavy duty numbered terminal strips for power and control wiring lead terminations to land all field wiring, Ground Lugs, Motor wiring whip, VFD to remote panel wiring whip, and wiring schematic.
   e. If 24V control started, a Metal oxide varistor protected pump start relay shall be incorporated in panel to start pump with signal from an irrigation controller.
   f. All system piping shall be Schedule 10S 304 stainless steel. All major fittings shall be 304 stainless steel with flanges to allow for system disassembly or major component removal. All instrumentation fittings shall be 304SS. The system shall incorporate an integral full pipe size bypass line with isolation valve to allow for pump removal and repair without disrupting water supply to system.
   g. Isolation valves shall be all stainless quarter turn ball valves with hard chrome ball on lines 2” and less. Isolation valves shall be lug style butterfly valves with Buna-N elastomeric seats, ductile iron nickel coated disc, and stainless-steel stem with handle and 10 position galvanized memory plate on lines 2½” and greater.
   h. Gauges shall be 2½” diameter face, glycerin filled with stainless casing and brass internals.

i. The flow switch shall be a 316 stainless steel and solid-state thermal sensor designed to measure change in flow velocity and in temperature. The flow switch shall include an integrated bar graph with 10 LED lights and shall be capable of providing an indication of flow (green), closed (orange), and open (red) conditions.

j. The pump system shall be mounted on a structural aluminum skid with mounting flanges on front and back to allow for mounting of skid to concrete pad. Skid equipped with pipe support on suction and discharge piping. All nuts and bolts and washers shall be stainless steel on skid and piping. Skid shall include mounting hardware for integral aluminum enclosure.

k. The system enclosure shall be vandal and weather resistant, marine grade aluminum alloy 5052-H32 construction with rectangular punch-outs for viewing and heat dissipation. The enclosure shall be low profile hinged top design with padlock provision. The cover shall be secured to the concrete pad with stainless steel hardware. The enclosure shall measure 30D" x 42W" x 30H" and concrete pad dimensions shall be 42" x 54". The enclosure shall be manufactured by V.I.T. Products, Inc.

l. Pump Assembly shall include the following option(s):
   1) **(VFD-F)** Where specified by the System Design Parameters, a **Fuji Variable Frequency Drive** system to receive feedback signal from system mounted stainless steel pressure transducer, and in conjunction with internal software driven PID control loop maintain customer adjustable constant system discharge pressure by varying the speed of the pump in response to varying system load.
   2) **(PACT)** Where specified by the System Design Parameters, the following items shall be provided to allow for stand-alone system pressure activation of pumping unit:
      (a) Variable Frequency Drive system to receive feedback signal from system mounted stainless steel pressure transducer, and in conjunction with internal software driven PID control loop to maintain customer adjustable constant system discharge pressure by varying the speed of the pump in response to varying system load. Variable Frequency Drive shall provide for on/off control of pumping unit via system pressure monitoring.
      (b) Bladder Style Pressure Storage Tank, piped to pump discharge, designed to maintain system pressure when pump is off and properly sized by the manufacturer to prevent short cycling of pumping system.
      (c) Spring loaded wafer style disc check valve with cast iron body, bronze disc, and stainless-steel spring to maintain system pressure when pump is off.
   3) The services of a factory representative or trained service professional shall be made available on the job site to check installation and perform the startup and instruct the operating personnel. A startup report containing voltage and amperage readings, suction and discharge pressure readings, estimated flow conditions, and general operating characteristics shall be submitted to the Owner.
   4) One electronic set of operating and maintenance manual shall be provided to the owner after startup and shall include parts manuals for major components, performance curve for pump, general sequence of operation, and electrical schematic for control panel.
   5) The warranty period shall be a non-prorated period of 36 months from date of purchase.

B. Booster P
   1. Manufacturer: Barrett Engineered Pumps
      a. Contact(s):
         1) Kim Goldstein, G2 Enterprises
         2) kimgoldstein1@gmail.com
         3) Phone: 619-380-1833
   2. System Design Parameters

System Model Number: IBSSHM-2-2-1.5/Options	System Design Flow Rate: 30 GPM	System Design Pressure: 45 PSI	System Piping Size: 1 1/2 INCH
Minimum Suction Pressure: 0 PSI (30K Gal Cistern – 10' Lift; 45 PSI Potable)	System Electrical Voltage: 208/230 or 460 VAC	System Electrical Phase and Frequency: 1 or 3 PHASE 60 Hz	
Pump Model Number: SSHM 4 Stage	Pump Capacity (GPM): 30 GPM	Pump Total Head (Feet): 125 FEET	
Pump Horsepower: 2 HP	Pump RPM: 3500 RPM	System Full Load Amperage: Undetermined Voltage	

   3. Booster Pump Assembly
      a. A simplex water pressure booster system as designed and fabricated by Barrett Engineered Pumps (619) 232-7867. The system shall be a completely prefabricated system with pump, piping, electrical and structural elements. The entire booster pump assembly shall be UL Listed and Approved.
      b. Pump shall be:
         1) (SSHM Series) Horizontal Multi-Stage Self Priming Centrifugal. Pump construction shall be cast iron stainless fitted with cast iron casing, stainless steel impellers and bowls. Pump shall be equipped with tungsten carbide mechanical seal. Pump shall be directly coupled to a C-face electric motor.
      c. Electric motor shall be of the squirrel cage induction type suitable for full voltage starting. Motor shall be ODP to aid in cooling. Electric motor shall be rated for continuous service. The motor shall have horsepower ratings such that the motor will carry the maximum possible load to be developed under the designed pumping conditions and not overload the motor beyond the nameplate rating of the motor. Motor shall have a 1.15 service factor. The motor shall conform to the latest NEMA Standards for motor design and construction.
         1) Pump Control Panel shall have a NEMA4 plain front non-metallic enclosure with padlock latches. This Includes power and control re-settable thermal circuit breakers, heavy duty magnetic starter with adjustable overload protection, Hand-Off-Auto switch to select mode of operation, and heavy duty numbered terminal strips for power and control wiring lead terminations.

d. **24V control started**; a Metal oxide varistor protected pump start relay shall be incorporated in panel to start pump with signal from an irrigation controller.
e. All system piping shall be Schedule 10S 304 stainless steel. All major fittings shall be 304 stainless steel with flanges to allow for system disassembly or major component removal. All instrumentation fittings shall be 304SS.
f. Isolation valves shall be all stainless quarter turn ball valves with hard chrome ball on lines 2" and less. Isolation valves shall be lug style butterfly valves with Buna-N elastomeric seats, ductile iron nickel coated disc, and stainless-steel stem with handle and 10 position galvanized memory plate on lines 2½" and greater.
g. Gauges shall be 2½" diameter face, glycerin filled with stainless casing and brass internals.
h. The flow switch shall be a 316 stainless steel and solid-state thermal sensor designed to measure change in flow velocity and in temperature. The flow switch shall include an integrated bar graph with 10 LED lights and shall be capable of providing an indication of flow (green), closed (orange), and open (red) conditions.
i. The pump system shall be mounted on a structural aluminum skid with mounting flanges on front and back to allow for mounting of skid to concrete pad. Skid equipped with pipe support on suction and discharge piping. All nuts and bolts and washers shall be stainless steel on skid and piping. Skid shall include mounting hardware for integral aluminum enclosure.
j. The system enclosure shall be vandal and weather resistant, marine grade aluminum alloy 5052-H32 construction with rectangular punch-outs for viewing and heat dissipation. The enclosure shall be low profile hinged top design with padlock provision. The cover shall be secured to the concrete pad with stainless steel hardware. The enclosure shall measure 30D" x 42W" x 30H". The enclosure shall be manufactured by V.I.T. Products, Inc.
k. Pump Assembly shall include the following option(s):
    1) **(VFD-Y)** Where specified by the System Design Parameters, a **Yaskawa Variable Frequency Drive** system to receive feedback signal from system mounted stainless steel pressure transducer, and in conjunction with internal software driven PID control loop maintain customer adjustable constant system discharge pressure by varying the speed of the pump in response to varying system load. **The pump shall be designated as 24V. pump start from irrigation controller.**
    2) **(LSEN)** Supply tank Domestic Water activation float with adjustable differential to provide activation of system provided 24VAC solenoid actuated 3-way supply valve to provide supply water to booster system suction when supply tank reaches preset low water level. **The Level Sensing Floats and 75' of cable shall be provided separately for contractor installation at points of connection as noted on plans. Contractor shall wire from Level Float location to pump control panel.**
    3) **(ATLF15)** Where specified by the System Design Parameters, a **1 1/2"Manual Style Disk Filter** rated 0-22 GPM unit with 100 Micron filtration screen cartridge. The filter unit shall be constructed of reinforced plastic with male connections on inlet and outlet. The cartridge shall be plastic grooved discs. **The Manual Disk Filter shall be pre-plumbed into booster pump assembly piping. The installing contractor shall be responsible for connecting the discharge of filter to location as provided on irrigation design drawing.**

4) (**FILL2-AG-ENCL)** Where specified in the System Design Parameters, a **Normally Closed Model 3100 2" Brass Fill Valve and 4" Air Gap and Enclosure Assembly** shall be provided for field mounting above and into the in-ground fiberglass cistern tank. The fill valve shall be 24 VAC activated and wired to control panel from tank level sensor in the event of low tank level. **The installing contractor shall be responsible for installing fill valve on 2" PVC line from potable service line and installing 2 – 14 ga. irrigation control wires from Fill Valve to Pump Control Panel. Consult with Civil Engineer or Architect on requirement for location of Fill Valve and Air Gap manifold to below grade cistern tank as designed to avoid cross connection between potable service line and below grade cistern tank. In addition, the installing contractor shall mount a provided 16 W" x 28" H x 22" L aluminum enclosure to house Fill Valve and Air Gap. (FV) Where specified in the System Design Parameters, a 2" cast iron bronze fitted wafer style stainless steel spring-loaded disc check Foot Valve with cast iron body and bronze check disc. The installing contractor shall be responsible for installing foot valve in cistern tank suction line connection.**

l. The services of a factory representative or trained service professional shall be made available on the job site to check installation and perform the startup and instruct the operating personnel. A startup report containing voltage and amperage readings, suction and discharge pressure readings, estimated flow conditions, and general operating characteristics shall be submitted to the Owner.

m. One electronic set of operating and maintenance manual shall be provided to the owner after startup and shall include parts manuals for major components, performance curve for pump, general sequence of operation, and electrical schematic for control panel.

n. The warranty period shall be a non-prorated period of 36 months from date of purchase.

2.08 ACCESSORIES

A. Do Not Drink Signage
   1. Aluminum 8"x8" sign shall read "RECYCLED WATER IN USE DO NOT DRINK. WASH HANDS AFTER CONTACTING. NO TOME EL AGUA LAVESE LAS MANOS DESPUÉS DE HACER CONTACTO CON EL AGUA"
   2. Quantity five (5) signs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify location of existing utilities.

B. Verify that required utilities are available, in proper location, and ready for use.

3.02 PREPARATION

A. Drawings are generally diagrammatic and indicative of the work to be installed. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan accordingly, furnishing such fittings, etc., as may be required.

B. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Architect or Designated Representative's approval prior to proceeding with work under this section.

C. Coordinate installation of irrigation system, including pipe, so there will be NO interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers. The Contractor shall carefully check all grades to satisfy him/her that he may safely proceed before starting work on the irrigation system.

D. All piping or equipment shown diagrammatically on drawings outside planting areas shall be installed inside planting areas whenever possible.

E. Layout and stake locations of system components.

F. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

3.03 TRENCHING

A. Trench and backfill in accordance with Section 31 2316 and Section 31 2323.

B. Excavate trenches to required depths. Follow approved layout for each system.

C. Trench bottom shall be flat to ensure piping is supported continuously on an even grade.

D. Where lines occur under paved areas, consider dimension to be below the subgrade.

E. Trench Size:
   1. As indicated on the drawings.

F. Trench to accommodate grade changes and slope to drains.

G. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.04 INSTALLATION

A. Assemblies:
   1. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.
   2. Line Clearance: All lines shall have a minimum clearance of 6 inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.
   3. Connect to utilities.

4. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specification pertaining to specific items required to complete work, perform such work in accordance with best standard practice, with prior approval from Architect or Designated Representative.
5. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.
6. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape or approved equal shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded.
7. Quick Coupling Valves: Unless otherwise indicated, locate valves within 12 inches of hardscape.
8. Set outlets and box covers 1 inch above finish grade in turf areas and 2 inches above finish grade in shrub planters.
9. Provide for thermal movement of components in system.
10. Use threaded nipples for risers to each outlet.

B. Mechanical Joints:
   1. Use for pipe sizes 4" and larger.

C. Thrust Blocks:
   1. For 4" pipe and larger install thrust blocks at fittings per plans.

D. Electrical Supply:
   1. Low voltage wiring shall be placed in the same ditch and taped on bottom side of main lines unless otherwise approved.
   2. Wire is to be taped a maximum 12 feet on center.
   3. Provide a minimum 12-inch expansion loop at each connection and directional change.
   4. Use a continuous wire between controller and remote control valves. Except as otherwise approved, do not splice wire at any point. All approved splices shall be enclosed in an acceptable box.
   5. Each controller shall be provided with separate 2-wire path.

E. Automatic Controller:
   1. Install as per manufacturer’s instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings.
   2. Controller shall be mounted inside lockable electrical cabinet.
   3. Controller shall be programmed to read flows from valve stations.
   4. Manufacturer's representative shall be on site for initial programming and startup of controller.
   5. Contractor shall coordinate controller communication service plan, connectivity and startup with manufacturer and Owner.

F. Flow Sensor:
   1. Flow sensor tee assembly shall be installed with minimum required length of unobstructed straight pipe run per manufacturer's instructions.

2. Install flow sensor wiring from flow sensor to controller. Connect wiring to flow sensor terminal at controller.

G. Pump Assembly:
   1. Prepare concrete forms for concrete base of pump.
   2. Plumb required inlet and outlet pipes through formwork.
   3. Place concrete pad per Section 32 1313.
   4. Make piping connections.
   5. Make appropriate electrical hookup connections per Division 16 - Electrical.
   6. Coordinate with manufacturer 21 days in advance for start up. Manufacturer's representative shall be on-site for first start up. Additional fees apply from manufacturer if start up date is changed. Start-up must be performed by a certified employee of the pump manufacturer to maintain warranty.

H. Mark valves with neoprene valve markers containing locking device. Set valve markers in pipe risers extending from top of valve to finish grade.

I. System Flush: After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

J. Sprinkler Heads:
   1. Install the sprinkler heads as designated on the drawings and in accordance with their respective detail.
   2. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.

K. Valve Boxes:
   1. All buried valves and equipment shall be installed with a proper box as specified in part 2 - products.
   2. Fill area under box with a minimum of 1 cubic feet of pea gravel before box is installed.
      a. Identification tags shall be attached to each remote control valve, showing number that corresponds with controller sequence. Tags shall be manufactured of polyurethane Behr Desopaid, yellow in color with black letters 2-3/4 inches by 2-1/4 inches.
      b. All boxes shall be permanently marked on top, designating type of equipment installed as noted in drawing.

3.05 FIELD QUALITY CONTROL

A. Prior to backfilling, test system for leakage at main piping to maintain 100 psi pressure for two hours.

B. System is acceptable if no leakage or loss of pressure occurs and system self drains during test period.

C. Testing of pressure main lines shall occur prior to installation of electrical control valves, quick couplers or any other equipment that might prevent a proper test from being performed.

D. All piping under paved areas shall be tested under hydrostatic pressure of 150 pounds per square inch, and proved watertight, prior to paving.

E. If leaks develop, replace joints and repeat test until entire system is proven watertight.

F. All hydrostatic tests shall be made only in the presence of the Architect or Designated Representative of the Owner. No pipe shall be completely backfilled until it has been inspected, tested and approved in writing.

G. Furnish necessary force pump and all other test equipment.

H. Upon completion of each phase of work, entire system shall be tested and adjusted to meet site requirements.

I. Low voltage wire under paving shall be tested for continuity, prior to paving.

3.06 BACKFILLING

A. Backfill trench and compact to specified subgrade elevation. Protect piping from displacement.

B. Buried pipe in trenches shall be center loaded only until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

C. A fine granular material backfill will be initially placed on all lines. No foreign matter larger than 1/2 inch in size will be permitted in the initial backfill.

D. Flooding of trenches will be permitted only with approval of the Architect or Designated Representative.

E. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

3.07 TEMPORARY REPAIRS

A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the warranty as herein specified.

3.08 SYSTEM STARTUP

A. Prepare and start system in accordance with manufacturer's instructions.

B. Adjust control system to achieve time cycles required.

C. Pump Start-up
   1. The initial pump start-up shall be performed in the presence of a representative from the pump manufacturer. Prior to startup, the manufacturer's representative shall provide an inspection of the installation to insure the pump is properly installed and will function per the manufacturer's specifications. Failure to provide the initial start up of the pump in the presence of the manufacturer's representative means the contractor will be held liable should damage or failure occur.
   2. Pump shall be in good working order before setting it to an automatic schedule.
   3. Contractor shall familiarize the Owner maintenance personnel with operation and maintenance procedures of the pump system prior to handing over of project site back to owner. Familiarity of pump systems should occur while manufacturer's representative is on-site.

3.09 MAINTENANCE

A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days prior to any planting.

B. The Architect or Designated Representative reserves the right to waive or shorten the operation period.

3.10 CLEANUP

A. Cleanup shall be performed as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage sustained to the work of others shall be repaired and work returned to its original condition.

3.11 OPERATING INSTRUCTIONS

A. The Contractor shall be required to train Owner’s maintenance personnel in proper operation of all major equipment. Provide written evidence of the person or persons so trained to the Architect or Designated Representative.

3.12 CLOSEOUT ACTIVITIES

A. Instruct Owner's personnel in operation and maintenance of system. Use operation and maintenance material as basis for demonstration.

B. Irrigation Schedule: See Submittal Requirements above.

C. Irrigation Audit: Shall be performed by a third party representative hired by the Owner. Contractor shall coordinate keys to controllers and valve boxes for use by the auditor.

3.13 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 32 8423

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Section 32 9219
Seeding

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizer.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 2323 - Fill: Topsoil material.

B. Section 32 0190 - Operation and Maintenance of Planting: Post-occupancy maintenance.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for additional unit price requirements.

1.04 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 SUBMITTALS

A. See Section 01 3300 - Administrative Requirements, for submittal procedures.

B. Seed Mixture

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

2.02 SEED MIXTURE

A. Seed Mixture:
   1. Native Fescue Mix
      a. S&S Seeds or approved equal.
         1) https://www.ssseeds.com/
         2) [endif]Mix shall include:
         3)

SPECIES	COMMON NAME	BULK #'S/ACRE	MIN % PLS*
Festuca rubra Molate	Molate Fescue	32.00	85
Festuca idahoensis	Idaho Fescue	32.00	80
Festuca ovina var. ingrate Mokelumne	Mokelumne Fescue	16.00	80
		80	

2.03 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Mulching Material: Wood cellulose fiber, dust form, free of growth or germination inhibiting ingredients.
   1. Manufacturers:
      a. Profile Products; ProGanics Biotic Soil Media: www.profileevs.com/#sle.

C. Fertilizer: Recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil, as indicated by analysis.
   1. Manufacturers:
      a. Profile Products; BioPrime: www.profileevs.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of supplier's recommendation for 80 lbs per acre evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 PROTECTION

A. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.06 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

C. Provide maintenance of seeded areas for three months from Date of Substantial Completion.

D. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

E. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

F. Neatly trim edges and hand clip where necessary.

G. Immediately remove clippings after mowing and trimming.

H. Water to prevent grass and soil from drying out.

I. Roll surface to remove minor depressions or irregularities.

J. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

K. Immediately reseed areas that show bare spots.

L. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 32 9219

Section 32 9223
Sodding

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Fertilizing.

D. Sod installation.

E. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

B. Section 31 2323 - Fill: Topsoil material.

1.03 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 REFERENCE STANDARDS

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Certificate: Certify grass species and location of sod source.

C. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer .

D. Herbicides: Submit manufacturer's analysis. Schedule for application of herbicides must be approved by the Inspector.

E. Test Reports: Provide the following soils tests and submit the results to the Inspector: Test reports shall be performed by a certified soils laboratory.
   1. Existing Site Soil: Test for agricultural suitability, fertility, particle size analysis; including recommendations for soil amendment, and fertilization during the maintenance period.
   2. Import Soil: Submit test reports of representative sample(s) for approval prior to delivery and for every 100 yards delivered to the site. Test for agricultural suitability, fertility, particle size analysis; including recommendations for soil amendment, and fertilization during the maintenance period.
   3. Organic Amendments, Fir Bark: Test for partial organic amendment evaluation.
   4. All Other Fertilizers and Amendments: For standard products, submit manufacturer's analysis. For all other products, submit analysis by testing laboratory.

F. All submittals for soil amendments and fertilizers must be accompanied by a letter on contractor's company stationary listing exact quantities in gallons, lbs, tons, cubic yards or cubic feet. These quantities will be checked for accuracy before construction and with delivery tickets during construction.

G. Maintenance Contract.

1.06 QUALITY ASSURANCE

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of California.

B. Installer Qualifications: Company approved by the sod producer.

C. Testing Laboratory: Recognized laboratory for soil and plant disease analysis for ornamental horticulture, approved by the Inspector. Testing laboratory is to perform all work in accordance with the current methods of the Association of Official Agricultural Chemists.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Sod:
   1. Deliver sod on pallets. Protect exposed roots from dehydration.
   2. Do not deliver more sod than can be laid within 24 hours.
   3. Notify Owner's Representative of delivery schedule in advance so material can be inspected upon arrival at project site. Immediately remove unacceptable material from project site.

B. Fertilizer:
   1. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark and conformance to state law, bearing name and warranty of producer.

1.08 PROJECT/SITE CONDITIONS

A. General: Do not perform work when climate and existing site conditions will not provide satisfactory results.

B. Vehicular accessibility on site shall be as directed by Owner authorized representative. Repair damage to prepared ground and surfaces caused by vehicular movement during work under this section to original condition at no additional cost to the Owner.

C. Perform soil preparation just prior to planting operations and in accordance with final planting schedule. Coordinate with irrigation system installation to avoid damage to work of one by the other.

D. Utilities: Determine location of underground utilities (irrigation lines included) and perform work in a manner which will avoid damage, Hand excavate, as required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sod:
1. TPI, Field Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

B. Topsoil:
1. General: Sandy Loam Soil with 70-75% sand, silt 12.5-20%, clay 8%-15%
2. All soils to be used in areas to be planted on the project shall be free of rocks over one inch in diameter, and free of foreign debris. Soil shall be free from sub-soil, refuse, plants or roots, clods, weeds, viable weed seeds, sticks, solvents, petroleum products, concrete, base rock, or other deleterious or extraneous material. Soil shall be free of soil-borne diseases, and capable of sustaining healthy plant life.
    a. Imported Topsoil:
        1) Make all arrangements for obtaining and testing imported topsoil. Submit test results of a representative sample of the proposed supply for approval by the Inspector well in advance of its scheduled delivery to the site. The approved sample will establish the standards to which all imported topsoil used on the job must conform.
        2) Do all work necessary to bring imported topsoil to standards specified above.
        3) Transport imported topsoil directly from source to final position. If stockpiling is required, locations and amounts of stockpiles will be designated by the Inspector.
        4) The Inspector reserves the right to take additional samples of imported topsoil at the site. If subsequent testing proves material to be at variance with the approved sample, remove rejected soil from the site and replace immediately at no additional cost to the City of Modesto.
        5) All topsoil shall be tested as outlined above. No turfgrass sod shall be placed on soil which has been treated with soil sterilants or herbicides until sufficient time has elapsed to permit the dissipation of toxic materials. The landscape contractor shall assume full responsibility for any loss or damage to turfgrass sod arising from improper use of sterilants or due to his or her failure to allow sufficient

time to permit dissipation of toxic materials, whether or not such sterilants are specified herein.

C. Organic Composted Soil Amendment
   1. General: Soil tests shall be made to determine requirements for organic soil amendments.
   2. Basic Requirements: Basic requirements are intended for bidding purposes only. Actual organic soil amendment requirements shall be determined by results of soils test.
      a. Compost must have the following characteristics:
         1) pH of less than 8.5
         2) Screened to 1/2" minus
         3) Organic content above 30% (dry sample)
         4) Shall be free of glass, metal and visible plastics
         5) Odor shall be soil-like (musty or moldy) not sour, ammonia-like or putrid
         6) Can have no ntirogenized wood product in it, or redwood, or cedar
         7) Quantities:
            (a) All turf areas: 3.1 cubic yards/1,000 sq. ft.

D. Fertilizers:
   1. General: Soil tests shall be made to determine requirements for lime, and fertilizer. All fertilizers shall be uniform in composition and free- flowing.
   2. Basic Requirements: Basic requirements are intended for bidding purposes only. Actual fertilizer requirements shall be determined by results of soils test.
      a. Pre- Plant Fertilizer:
         1) Acid/Calcium based control release liquid phosphorus
            (a) pH less than 1
            (b) Nutrient analysis: 5.5-10-0-2.4Ca
            (c) Approved product -THI PHOS 10 (no known equal)
            (d) Quantity: 2 gallons/1000 sq. ft.
         2) Concentrated Organic Growth Medium
            (a) pH less than 8.5
            (b) 25%+ organic content
            (c) Salts EC less than 3
            (d) Calcium (Ca) 10%+
            (e) Magnesium (Mg) 2%+
            (f) Iron (Fe) 2.5%+
            (g) Approved product: THI Concentrated Organic Growth Medium #604 (no known equal).
            (h) Quantity: 3.41 tons/acre
         3) Concentrated Granule Gypsum with the following analysis:
            (a) Ca: 23%,
            (b) Quantity: 1.1136 tons/acre
         4) Granular 11-52-0 Phosphorus Fertilizer
            (a) Quantity: 2.5 lbs/1,000 sq. ft.
         5) Granular 0-0-50 Potassium Fertilizer
            (a) Quantity: 1.88 lbs/1,000 sq. ft.
      b. Post-Plant Fertilizer
         1) Liquid Organic Fertilizer
            (a) From soybean extract
            (b) 10-4-4 nitrogen product or as otherwise approved.

3. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

2.02 ACCESSORIES

A. Herbicide: As approved. Herbicide shall not inhibit or damage grass development.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

B. Verity the soils analysis reports are adequate.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

3.03 FERTILIZING

A. Apply soil amendments in accordance with soils analysis results and manufacturer's instructions.

B. Apply fertilizer in accordance with soils analysis results and manufacturer's instructions.

C. Verify adequate time has elapsed to allow herbicides to deplete enough from soils to avoid damage to sod.

D. Apply after smooth raking of topsoil and prior to installation of sod.

E. Apply fertilizer no more than 48 hours before laying sod.

F. Mix thoroughly into upper 2 inches of topsoil.

G. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately after delivery to site to prevent deterioration.

C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

D. Where new sod adjoins existing grass areas, align top surfaces.

E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.

F. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

G. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

3.05 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide maintenance of sodded areas for 4 months from Date of Substantial Completion.

D. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

E. Neatly trim edges and hand clip where necessary.

F. Immediately remove clippings after mowing and trimming.

G. Water to prevent grass and soil from drying out.

H. Roll surface to remove irregularities.

I. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

J. Immediately replace sod to areas that show deterioration or bare spots.

K. Protect sodded areas with warning signs during maintenance period.

END OF SECTION 32 9223

Section 32 9300
Plants

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil and topsoil.

B. Topsoil bedding.

C. Bioswale Soil Mix

D. New trees, plants, and ground cover.

E. Mulch and Fertilizer.

F. Plants in pots/containers

G. Warranty Replacement

H. Tree Pruning.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Gr adin: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

B. Section 32 8200 - Irrigation

C. Section 32 0190 - Operation and Maintenance of Planting: Post-occupancy maintenance.

1.03 DEFINITIONS

A. Weeds: Any plant life not specified or scheduled.

B. Plants: Living trees, plants, and ground cover specified in this Section , and described in ANSI Z60.1.

1.04 REFERENCE STANDARDS

A. ANSI/AHIA Z60.1 - American National Standard for Nursery Stock; 2014.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Submit list of plant life sources.

C. Submit purchase invoices from nurseries for review.

D. Samples: Submit the following to the Owner for acceptance:
   1. Soil Separator: One square foot minimum, accompanied by product data.
   2. Drain Rock: One-half cubic foot.
   3. Wood Bark Mulch: One-half cubic foot.
   4. Root Control Barrier: One square foot sample panel, accompanied by product data.

E. Product Data: Submit the following product information to the Owner for acceptance:
   1. Tree Staking Materials: Manufacturer's literature.
   2. Herbicides: Schedule for application of herbicides must be approved by the Owner.

F. Test Reports: Soil tests shall be performed by a certified soils analyst by the state of California. Provide the following tests and submit the results to the Owner:
   1. Existing Site Soil: Provide two separate tests at distinctly separate on-site locations, for agricultural suitability, fertility, particle size analysis; including recommendations for soil amendment, and fertilization during the maintenance period.
   2. Import Soil: Submit test reports of representative sample(s) for approval prior to delivery and for every 100 yards delivered to the site. Test for agricultural suitability, fertility, particle size analysis; including recommendations for soil amendment, and fertilization during the maintenance period.
   3. Organic Amendments, Fir Bark: Test for partial organic amendment evaluation.
   4. All Other Fertilizers and Amendments: For standard products, submit manufacturer's analysis. For all other products, submit analysis by testing laboratory.

G. Soil Mix - Planters: Submit cut-sheets of each accepted planter soil mix component and one-ounce samples of the fertilizers to the Inspector.

H. Soil Mix - Bioswales: Submit cut-sheets of bioswale soil mix indicating type and breakdown in percentages of sand, silt, and compost materials.

1.06 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience.

B. Installer Qualifications: Company specializing in installing and planting the plants with five years experience.

C. Testing Laboratory: Recognized laboratory for soil and plant disease analysis for ornamental horticulture, approved by the Inspector. Testing laboratory is to perform all work in accordance with the current methods of the Association of Official Agricultural Chemists.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer. Store fertilizers and amendments, bark mulch, soil mixes, and other materials

which could stain concrete and similar surfaces in such a manner that staining does not occur.

B. Plants: Maintain all plant material in a healthy growing condition prior to and during planting operations. Protect plants at all times from sun and drying winds. Plants that cannot be planted immediately upon delivery shall be kept in the shade, well protected and watered. Plant material delivered to the site must be planted within 3 days of site delivery. Plants that cannot be installed on this work schedule shall be returned to the grower until installation requirements can be met.

1.08 SUBSTITUTIONS, ADDITIONS, DELETIONS

A. General: Submit proposals for substitutions in accordance with the requirements of Division 1 Specification Sections. Acceptance by the Inspector is required prior to proceeding with the work under this Section.

B. The Architect reserves the right to substitute plant material of sizes equal to material specified, as the work progresses, at no additional cost to the Owner.

C. When requesting substitutions for plant material, the Contractor shall provide the Architect with the following:
   1. Contact information for nurseries Contractor was unable to obtain plant material. Minimum of three are required.
   2. Three (3) alternate plant suggestions as part of the initial request. Provide foliage/flower color, growth habit, and sunset zone of each.
   3. Substitution requests which do not include the above requirements will be denied until requirements have been met.

1.09 FIELD CONDITIONS

A. General: Become familiar with the anticipated growing conditions prior to commencement of work. Notify the Inspector immediately in writing of any conditions, which will prevent the proper execution of the warranty responsibilities specified. Failure to so notify the Inspector constitutes acceptance of the growing conditions. Any removal, repair or replacement of plant material required by unsuitable conditions found after work has begun shall be done at no additional cost to the Owner.

B. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

C. Do not install plant life when wind velocity exceeds 30 mph.

1.10 WARRANTY

A. Plant Material: Warrant that all trees under this Contract will be vigorous, healthy, free of dead or dying branches and branch tips, bearing foliage of normal density and color, and will otherwise comply with the requirements of this Section, for a period of one year from date of Final Acceptance. Any delay in completion of planting operations which extends the planting into more than one growing season shall extend the warranty period correspondingly.

B. Replacements: Without cost to the Owner, in a timely manner and as directed by the Inspector, replace all plants not meeting the requirements above throughout the course of the warranty period. Replacements shall closely match adjacent specimens of the same species in size and shall comply with all requirements of this specification.

C. Species: Replace all plant material determined by the Owner within two years following the final acceptance of the project, to be untrue to the species, clone and/or variety specified, to the equal condition of adjacent plants at the time of replacement, at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 PLANTS

A. Trees, Plants, and Ground Cover: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work.
   1. Size:
      a. Plants shall conform to measurements specified. Measure plants when branches are in their normal position. Height and spread dimensions specified refer to the main body of plant and not branch tip to tip. Take caliper measurements at a point on the trunk 6 inches above natural ground line for trees up to 4 inches in caliper, and at a point 12 inches above the natural ground line for trees over 4 inches in caliper.
      b. The measurements specified are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height, spread, and caliper, shall be rejected.
      c. Plants larger than specified may be used if approved by the Owner, and if provided at no additional cost to the Owner. If larger plants are approved, the root ball shall be increased in proportion to the size of the plant; irrigation system shall also be adjusted as required to accommodate larger plants.

B. Acclimatization: The General Contractor is responsible for supplying plant material that has been properly acclimated and conditioned, in accordance with good horticultural practices, for the exposure, wind and humidity levels, soil conditions, etc., encountered at the project site and in the proposed plant location.

C. Coordination: The Contractor shall coordinate his acclimatization schedule with the Owner as to allow an adequate conditioning period for the plant material prior to the approved date of planting commencement. Notify the Owner in writing prior to proceeding with any acclimatization work if approved work schedule allows insufficient time to acclimate the material.

D. Quality: Plants shall be superior in form, compactness and symmetry; sound, healthy and vigorous, well branched and densely foliated when in leaf; free of disease, insect pests, eggs or larvae, and free from physical damage or adverse conditions that would prevent thriving growth.

E. Species: Tag one of each plant prior to delivery to the site; label with genus, species and variety. Any plants not so identified will be subject to rejection by the Owner. Plants may be cross referenced with nurseries invoice at the discretion of the Architect.

F. Root Ball:
   1. Do not supply any bare root or ball and burlapped stock unless approved by the Owner.
   2. Sizes: As specified on the plans. Where no root ball dimensions have been specified, supply material in container sizes specified.
   3. Material: Root ball shall consist of a soil or soil mix that is compatible with the soil or soil mix into which the plant will be planted, and that provides for thorough drainage, aeration, and adequate moisture and nutrient retention. Having sufficient density and firmness that when planted, the plant will stand upright and stable without need for additional support.
   4. Containers: All plant material shall have been grown in the containers in which delivered for at least six months, but not over two years. Stock appearing to not have been in their containers for this term shall be rejected.
   5. Root Pruning: Where root pruning is required to provide material of the specified size, or for planting in the sloped containers, the pruning is to be done under the direction of a Certified Arborist. No root pruning is to be done within one year of installation unless approved by the Owner.

G. Trunks and Branches: Do not prune plants before delivery. All trunks are to be straight and of uniform taper, larger at the bottom unless otherwise specified. Plants with damaged or crooked leaders, or multiple leaders, unless specified, will be rejected. Plants with abrasions of the bark, sun scalds, disfiguring knots, or fresh cuts of limbs over 3/4 inch, which have not completely callused, will be rejected. Any plant unable to stand upright without support will be rejected.

2.02 SOIL MATERIALS

A. General: All soils to be used in areas to be planted on the project shall be free of rocks over one inch in diameter, and free of foreign debris. Soil shall be free from sub-base/aggregate, refuse, plants or roots, clods, weeds, viable weed seeds, sticks, solvents, petroleum products, concrete, base rock, or other deleterious or extraneous material. Soil shall be free of soil-borne diseases, and capable of sustaining healthy plant life.

B. Imported Topsoil:
   1. Topsoil shall be fertile, friable soil of loamy character, containing an amount of organic matter normal to the region. All imported topsoil used on the job shall be from the same source.
      a. Make all arrangements for obtaining and testing imported topsoil. Submit test reports of a representative sample of the proposed supply for approval by the Owner well in advance of its scheduled delivery to the site. The approved sample will establish the standards to which all imported topsoil used on the job must conform.
      b. Transport imported topsoil directly from source to final position. If stockpiling is required, locations and amounts of stockpiles will be designated by the Owner.
      c. The Owner reserves the right to take additional samples of imported topsoil at the site. If subsequent testing proves material to be at variance with the approved sample, remove rejected soil from the site and replace immediately at no additional cost to the Owner.

C. Bioswale Soil Mix:
   1. Imported Mix comprising of the following unless required otherwise by the local jurisdiction:

a. Soil mix shall be made up of 65% sand meeting ASTM-C33 for fine aggregate, 20% sandy loam, and 15% high quality compost meeting the requirements listed below.
   1) Compost for Bioretention soils shall be analyzed by an accredited lab using #200, 1/4 inch, 1/2 inch, and 1 inch sieves ASTM D 422 or as approved by the local municipality. Sieve analysis shall meet the requirements listed below:

Sieve Size Percent Passing (By Weight)	Min.	Max.
SAND:		
3/8"	100	100
No. 4	90	100
No. 8	70	100
No. 16	40	95
No. 30	15	70
No. 40	5	55
No. 100	0	15
No. 200	0	5
COMPOST		
1"	99	100
1/2"	90	100
1/4"	40	90
No. 200	2	10

b. Materials shall be mechanically blended using a high-speed shredder apparatus and stored on a clean asphalt pad or approved equal. The material shall be tested to prove infiltration rates greater than 5 inches per hour.

D. Imported Planter Pot Soil Mix: For use in planters and planter pots. The following ingredients, thoroughly blended into a homogeneous mix:

Amount	Ingredient
0.5 cubic yards	1/8 inch Fine Fir Bark as Specified
0.5 cubic yards	Fine Sand as Specified
3 pounds	Single Superphosphate 0-20-0
1 pound	Calcium Nitrate 15.5-0-0
1 pound	Iron Sulfate
8 pounds	Kaiser 65 Dolomite Lime

E. Existing On-Site Soils: Existing site soils shall be amended per the recommendations of the approved soils testing laboratory. The following soil amendments and fertilizers are to be used FOR BIDDING PURPOSES ONLY.
   1. Site Soil: Top 6 inches of site soil shall be amended with following blend of amendments per 1000 square feet.

Amount	Ingredient
6 cubic yards	Nitrogen Stabilized 0” - 1/4” Fir Bark
15 lbs	12-12-12 Commercial Fertilizer as approved
15 lbs	Soil Sulfur

100 lbs	Agricultural Gypsum

2. Backfill Mix (on-grade locations): Amend site soil as follows per cubic yard.

Amount	Ingredient
3/5 cubic yard	Surface Soil
2/5 cubic yard	Nitrogen Stabilized 0” to 1/4” Fir Bark
1 lb	12-12-12 Commercial Fertilizer as Specified
2 lbs	Iron Sulfate as Specified
10 lbs	Agricultural Gypsum

3. Additional Amendments: Soil amendment recommendations will vary for planting areas if imported topsoil is required to establish finish grade. Provide all additional amendments as may be required by subsequent soil testing of approved imported topsoil and as directed by the Inspector.

2.03 SOIL AMENDMENT MATERIALS

A. Nitrogen Stabilized Fir Bark On-Grade: Meeting the following specifications:
1. Particle Size (dry weight basis):

Sieve Size	Percent Passing
6.35 mm (1/4 inch)	95 - 100
2.38 mm (No. 8, 8 mesh)	50 - 80
500 micron (No. 35, 32 mesh)	0 - 25

2. Organic Content: Determined by ash analysis. Minimum 92% based on dry weight.
3. Nitrogen: Minimum 0.8% nitrogen based on dry weight.
4. Salinity: Maximum saturation extract conductivity 3.5 millimhos per cm at 25 degrees centigrade.
5. Iron: Minimum 0.08% dilute acid soluble Fe based dry weight, if iron treated.
6. Bulk Density: 400 pounds per cubic yard.

B. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.
1. Fertilizers shall be approved by the Organic Materials Review Institute (OMRI).
2. Contractor shall obtain Owner's written approval of proposed fertilizer(s) prior to use.

C. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.

D. Pre-Emergent Herbicide: For all on-grade ground cover and shrub areas, provide "Surflan A.S." as manufactured by Elanco Products Co., Indianapolis, IN, with no acceptable substitutions. Apply per manufacturer's instructions.

2.04 MULCH MATERIALS

A. Non Bioswale Planter Mulching Material: Cedar species wood shavings, free of growth or germination inhibiting ingredients. Mulch shall have been baked to remove unwanted seed growth.

B. Bioswale Planter Mulching Material: Topdress bioswale planter areas with compost per 2.02C listed above.

2.05 ACCESSORIES

A. Drain Rock: 3/4" diameter river rock or approved equal.

B. Soil Separator: Soil Separator: "Mirafi 140N", as manufactured by Mirafi, Charlotte, NC, "Trevira Spunbond 1120", as manufactured by Hoechst Fibers Industries, Spartanburg, SC, or approved equal.

C. Stakes: Softwood lumber, pointed end.
   1. Lodgepole stakes. Length as required to meet dimensions required per plans.

D. Root Control Barrier: "Deep Root Control Barrier", stock number UB24-2 as manufactured by Deep Root Corp., 15040 Golden West Circle, Westminister, CA 92683 (714) 898-0563, or approved equal.

2.06 SOURCE QUALITY CONTROL

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter; pH value and any deficincies.

B. Submit minimum 10 oz sample of topsoil proposed. Forward sample to testing laboratory in sealed containers to prevent contamination.

C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 ORDERING, REVIEW AND ACCEPTANCE OF PLANT MATERIAL

A. Ordering:
   1. Within 30 days after award of contract, submit written certification to the Owner of the quantity and species of plant material ordered, and the nursery(s) supplying the material.
   2. The Contractor is responsible for providing all plant material in the quantities and sizes specified on the drawings, and for making all arrangements in advance that may be required to obtain these materials. If any material specified will be unavailable at the time of planting, submit written verification to the Owner along with the bid.

B. Review of Plant Material: Before planting operations begin, all plant materials shall be reviewed for conformance to the design intent of the Contract Documents by the Owner. Submit written request for review of plant material at least 10 days prior to commencement of planting operations. Review by the Owner does not waive the right of rejection during planting or any time thereafter.

C. Rejection of Material: The Owner reserves the right to review and reject plant material at any time, and at the place of growth, for nonconformance to the Specifications. Do not install plant material, which has not been reviewed at the project site by the Owner.

3.02 EXAMINATION

A. Verify that prepared subsoil and planters are ready to receive work.

B. Saturate soil with water to test drainage.

C. Verify that required underground utilities are available, in proper location, and ready for use.

3.03 GRADING

A. General: All areas to be planted on the project shall be free of rocks over one inch in diameter to a depth of 8" minimum below finish grade, and free of foreign debris, subsoil, refuse, plants or roots, clods, weeds, sticks, solvents, petroleum products, concrete, base rock, or other deleterious or extraneous material. Areas to be planted shall be free of soil-borne diseases and capable of sustaining healthy plant life. Do all work necessary to bring site soil, import soil and planter backfill to compliance with these requirements. Remove from the project site and dispose of in a legal manner any soils and material not meeting these requirements. Subject to acceptance of the Owner, all soil and material not meeting these requirements shall be the property of the Contractor.
   1. Surface Drainage: Contractor is responsible for proper surface drainage of planted areas. Report in writing to the Owner any discrepancies in the Contract Documents, obstructions on the site, or any other conditions, which the Contractor feels prevent establishing proper drainage, and obtain the Inspector's instructions prior to proceeding with the work affected.
   2. Final Contouring:
      a. Handle and place the soil to depths required. Remove all rocks and clods over one inch in diameter. Provide for surface drainage and cut all necessary drain swales.
      b. Work soil sufficiently so that after rolling and after full settlement has occurred, the site will be graded to within ±0.10 of a foot from the lines, grades and elevations shown, and as may be directed by the Inspector. Finished surface shall be smooth and uniform and shall be free of depressions that retain standing water or any surface irregularities that would impede proper drainage. Unless otherwise noted, all soil finish grades shall be 1-1/2 inches below finish grade of adjacent walks, pavements and curbs, and top of wall elevations.
   3. Erosion Repair: Repair all erosion damage that occurs until Final Acceptance. Take all measures necessary to prevent erosion occurring during work under this Section. Provide and amend replacement soil in accordance with this Section.

3.04 PREPARATION OF SUBSOIL

A. Amend subsoil as indicated in analysis.

B. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

C. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

D. Scarify subsoil to a depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

E. Dig plant pits and beds twice the size of the rootball as directed per the drawings.

3.05 PLACING TOPSOIL - NON BIOSWALE PLANTERS

A. Spread topsoil to a minimum depth of 6 inches over area to be planted. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches.

F. Place topsoil mix to the depths specified to obtain finish grades shown on the drawings. Soil mix shall be handled in a manner so as to prevent segregation of ingredients. Thoroughly water planter backfill mix after placement to compact and settle mix.

3.06 PLACING TOPSOIL - BIOSWALE PLANTERS

A. Spread bioswale soil mix over permeable rock subbase to depths indicated within limits shown per plans. 18" depth of bioswale mix shall be utilized if no detail is provided.

B. Verify permeability of soil media meets a minimum of 5 ft/second by running flood test through media.

C. Remove vegetable matter and foreign debris from topsoil

D. Grade topsoil to match grades provided on plans.

3.07 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.08 EXCAVATION OF PLANTING PITS ON-GRADE

A. General: Excavate plant pits by hand or with a backhoe; use of augers will not be permitted. Prior to planting and backfill, scarify the sides and bottom of the pit as required to eliminate any glazed surfaces. Excavate container-grown tree, shrub, and vine holes to the following dimensions:
   1. 1, 5, and 15 gallon containers: Two times the size of the root ball in width and depth.
   2. 24-inch boxes and larger: Large enough to allow one foot of space around the ball in all directions.
   3. Holes on mounds: Dig plant holes on mounds deeper than normal.
   4. Excess Soil: Transport and dispose of off-site in a legal manner any excess excavated soil.
   5. Obstructions: If rocks, underground construction work, tree roots or other unknown obstructions are encountered in the excavation of plant holes, alternate locations may be selected by Owner. Report all such conditions in writing to the Owner. If a change in the location of the planting pit is unacceptable to the Owner, the original planting pit shall be over-excavated to remove the obstructions to a minimum dimension of 12" beyond the sides and bottom of the tree pit as typically specified. Obtain the Owner's instructions prior to proceeding with the work affected.

3.09 DETRIMENTAL SOILS AND DRAINAGE

A. General: Prior to planting, test drain all planting areas as follows:
   1. On-Grade Plant Pits: Fill with 12 inches of water. Water should drain completely in 48 hours.
   2. Plant Beds: Irrigate until soil is saturated. Saturated condition should not remain after 24 hours.

B. Drainage Chimneys:
   1. General: For plant pits failing the initial drainage test, provide drainage chimneys as shown on the drawings and as directed by the Owner.
   2. Neatly auger drainage chimneys to a depth directed by the Owner. Remove loose soil from hole and plant pit. Locate chimneys at perimeter of plant pit. Repeat test for proper drainage.
   3. Once required drainage test has been passed, backfill chimneys with drain rock, flush with bottom of pit. Cover chimneys with soil separator.

C. Failure of Drainage Test: report in writing to the Owner all areas not passing these tests and all soil conditions that the Contractor considers detrimental to growth of plant material. State condition and proposal and cost estimate for correcting the condition. Obtain the Owner's instructions prior to proceeding with the work affected. Repeat drainage testing and correction of conditions in this manner as necessary until tests are passed. Failure to perform drainage tests and/or to notify the Owner in writing of the conditions specified above renders the Contractor responsible for all plant failure that occurs as a result of inadequate drainage or detrimental soil conditions, as determined by the Owner.

3.10 PLANTING

A. General: Do not plant any material that has not been reviewed by the Inspector upon delivery to the project site or that has been rejected for any reason. Do not plant under unfavorable weather conditions.

B. Place plants for best appearance.

C. Set plants vertical.

D. Remove non-biodegradable root containers. After removing plants from their containers, disentangle any small roots that encircle the container. Do not cut or otherwise disturb the root ball. Inspect all plants for rootbound condition; do not install rootbound plants or plants found to have cracked or broken root balls when taken from the container.

E. Care should be exercised to prevent damage or breakage to limbs, and ropes or other lines should not be allowed to damage bark.
   1. Container Stock:
      a. General: Do not lift or handle container plants by tops, stems, or trunks at any time.
      b. Boxed Stock: Remove bottom of box prior to placement of plant in planting pit. Cut bands and remove box sides just prior to backfilling.
      c. Canned Stock: Remove canned stock carefully after cans have been cut on two sides with acceptable cutter. Do not use spade to cut cans.
      d. Ball and Burlap Stock: Dig ball and burlap (B & B) plants with firm balls of earth of diameter not less than that recommended by the American Standard for Nursery Stock, and of sufficient depth to include the fibrous and feeder roots. Plants moved with ball will not be accepted if the ball is cracked or broken before or during planting operations.

F. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches under each plant. Remove burlap, ropes, and wires, from the root ball.

G. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

H. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

I. Top-dress Fertilizing On-Grade: When plant installation is complete, fertilize all planting areas (excluding lawn areas) with top-dress fertilizer at the rate of 4 lbs. per 100 square feet.

J. Anti-Desiccant: At Contractor's option, spray all evergreen and deciduous plant material in full leaf with anti-desiccant, in accordance with manufacturer's instructions. Apply an adequate film over trunks, branches, twigs and foliage. Take precautions as necessary to prevent damage, particularly from sun scald.

K. Mulching: Mulch all planting areas (excluding lawn areas) with 3 inch layer of wood bark mulch unless otherwise shown. Spread mulch uniformly to form a smooth cover free of bare spots and mounds.

1. Settlement: As shown on the drawings, the crowns of all plants shall be at least 1/2 inch above the surrounding grade after all settlement has occurred.
2. Watering Basins On-Grade: Form a watering basin, an excavated ring around the root ball of the plant for each tree and shrub. Do not form watering basins in lawn areas.

3.11 GROUND COVER PLANTING

A. Pre-emergent herbicide Application On-Grade Only: Apply pre-emergent herbicide, Surflan A.S. at the rate of 5-1/3 pounds per acre applied in 25 gallons of water to all on-grade locations. Apply before wood bark mulch application.

B. Planting: Plant ground cover plants through wood bark mulch at the specified triangular spacings. Make planting hole with a hand mattock avoiding mixing surface applied herbicide into planting hole.
   1. Activation of Herbicide On-Grade Only: After planting, irrigate with at least one inch of water to activate the herbicide. Water areas carefully taking care to avoid erosion. Repair erosion occurring from careless watering immediately. Remove, repair and replace adjacent planting and soil damaged by careless watering and translocation of herbicide.

3.12 LAYOUT OF PLANT MATERIAL

A. General: The Owner will review for conformance to the design intent of the Contract Documents locations of all plants in the field prior to planting. Notify the Owner and schedule layout review sufficiently in advance of planting to allow for review and adjustment without disrupting construction schedule.

B. Adjustments: The Owner reserves the right to make minor adjustments in the layout of all plant material; adjust irrigation system as necessary.

3.13 INSTALLATION OF ACCESSORIES

A. Install trunk protectors on all new trees located in turf areas.

3.14 PLANT SUPPORT

A. General: Complete staking and guying immediately after planting. Perform in accordance with reference standards, unless otherwise shown on the drawings or directed by the Owner. Securely stake or guy all trees planted on the site using staking or guying type shown on the drawings. The Owner reserves the right to make modifications to staking and guying procedures as required to accommodate field conditions at no additional cost to the Owner.
   1. Staking: Stake trees with one as shown on the drawings.

3.15 PRUNING

A. Prune plants only at the direction of the Owner and according to reference standards to preserve the natural character of the plant. Remove all dead wood, suckers and broken or badly bruised branches. Remove sucker basal and lateral growth to prevent resprouting; retain normal side branching. Use only disinfected, sharp tools. Improperly pruned trees will be subject to rejection by the Owner. Apply tree seal to cuts over one inch diameter in accordance with manufacturer's instructions.

B. Prune trees as recommended in ANSI A300 Part 1.

C. Prune newly planted trees as required to remove dead, broken, and split branches.

3.16 FIELD QUALITY CONTROL

A. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

B. Deficient Soils: Remove all soils determined by the Owner to be deficient and provide all additional amendments as directed to modify deficient soils at no additional cost to the Owner.

3.17 MAINTENANCE

A. See Section 32 0190 - Operation and Maintenance of Planting for post-occupancy maintenance.

3.18 CLEANUP

A. Sweep site clean of all excess materials used in these operations. Excess soils shall be swept up and removed off site. Do not wash excess materials into adjacent drainage facilities.

END OF SECTION 32 9300

Section 33 1416
Site Water Utility Distribution Piping

PART 1 - GENERAL

1.01 Summary

A. This Section includes water-distribution piping and related components outside the building for water service and fire service mains.

B. All fire service protection products and infrastructure shall meet the requirements of the Fire Department having jurisdiction.

C. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.02 Definitions

A. LLDPE: Linear, low-density polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.03 Action Submittals

A. Product Data: For each type of product indicated.

1.04 Informational Submittals

A. Field quality-control test reports.

1.05 Closeout Submittals

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.06 Quality Assurance

A. Regulatory Requirements:

1. Comply with requirements of authorities supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

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. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

G. NSF Compliance:

1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.07 delivery, storage, and handling

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping 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.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 Project Conditions

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.09 Coordination

A. Coordinate connection to water main with utility company or authority having jurisdiction.

PART 2 - PRODUCTS

2.01 Pvc Pipe And Fittings

A. PVC, Schedule 40 Pipe: ASTM D 1785.

1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.

B. PVC, Schedule 80 Pipe: ASTM D 1785.

1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.

C. PVC, AWWA Pipe: AWWA C900-07, Class 235, DR-18 and Class 305, DR-14, with bell end with gasket, and with spigot end.
1. Comply with UL 1285 for fire-service mains if indicated.
2. PVC Fabricated Fittings: AWWA C900-07, Class 235 and Class 305, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or grey-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    a. Minimum 350 psi working pressure.
    b. Gaskets: AWWA C111, rubber.
4. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, Ductile- or grey-iron standard pattern or AWWA C153, Ductile-iron compact pattern.
    a. Minimum 350 psi working pressure.

b. Glands, Gaskets, and Bolts: AWWA C111, ductile- or grey-iron glands, rubber gaskets, and steel bolts.

2.02 Corrosion-Protection Piping Encasement

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A 674 or AWWA C105.
2. Form: Sheet or tube.
3. Material: LLDPE film of 0.008-inchminimum thickness, or high-density, cross laminated PE film of 0.004-inchminimum thickness.
4. Color: Natural.

2.03 Gate Valves

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. McWane, Inc.; Clow Valve Co.
b. Mueller Company
c. M. & H.
d. McWane, Inc.; Kennedy Valve Co.
e. Waterous
f. Kennedy

B. UL/FMG, Cast-Iron Gate Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. McWane, Inc.; Clow Valve Co.
b. Mueller Company
c. M. & H.
d. McWane, Inc.; Kennedy Valve Co.
e. Waterous

2.04 Gate Valve Accessories and Specialties

A. Valve Boxes: Comply as indicated on the Drawings.

B. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve. Indicator Posts shall include tamper switch and wiring meeting the requirement of

the Fire Department having jurisdiction. Install tamper switch conduit and wiring as indicated on the Drawings.

2.05 Check Valves

A. AWWA Check Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. McWane, Inc.; Clow Valve Co.
    b. McWane, Inc.; Kennedy Valve Co.
    c. McWane, Inc.; M&H Valve Co.
    d. Mueller Co.; Water Products Div.

2. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.

    a. Standard: AWWA C508.
    b. Pressure Rating: 250 psig. 175 psig.

2.06 Water Meters

A. Water meters shall provided by the contractor as directed by the City Engineer. Prior to installation, water meters shall be approved by the City Engineer.

2.07 Backflow Preventers

A. Reduced-Pressure-Principal Backflow Preventers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following (must be approved by the City Engineer of Porterville):

    a. Wilkins; a Zurn Company
    b. Ames Fire & Waterworks; a division of Watts Regulator Co.
    c. Febco
    d. Watts Water Technologies, Inc.

2. Standard: ASSE 1013 or AWWA C511. All assemblies shall be lead free meeting the requirements of the State of California.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 6 psig maximum, through middle 1/3 of flow range.
5. Size: as indicated on the Drawings.
6. Design Flow Rate: 107 gpm.
7. Pressure Loss at Design Flow Rate: 6 psig maximum.
8. Body: Bronze for NPS 2and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2and larger.

9. End Connections: Threaded for NPS 2and smaller; flanged for NPS 2-1/2and larger.
10. Configuration: Designed for vertical inlet, horizontal center section, and vertical outlet flow.
11. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2and larger.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

B. Double-Check, Detector-Assembly Backflow Preventers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following (must be approved by the City Engineer of Hanford):

    a. Febco
    b. Wilkins; a Zurn Company

2. Standards: ASSE 1048 and UL listed or FMG approved.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Size: As indicated on Drawings.
6. Design Flow Rate: 1,000 gpm
7. Pressure Loss at Design Flow Rate: 5 psig maximum
8. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved.
9. End Connections: Flanged.
10. Configuration: Designed for vertical inlet, horizontal center section, and vertical outlet flow.
11. Accessories:

    a. Valves: UL 262, FMG-approved, OS&Y gate type with flanged ends on inlet and outlet.
    b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

C. Backflow Preventer Test Kits:

1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.08 Protective Enclosures

A. Expanded-Metal Enclosures:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Backflow Prevention Device InnClosures, Inc.
    b. BF Products Inc.
    c. Cross Brothers Inc.

d. Le Meur Welding & Manufacturing Co.

2. Description: Enclosure designed to protect aboveground water piping, equipment, or specialties from damage.

a. Material: ASTM F 1267, expanded metal side and top panels, of weight and with reinforcement of same metal at edges as required for rigidity.
b. Type: Type I, expanded.
c. Class: Class 1, uncoated carbon steel.
d. Finish: Powder Coated; color: Hunter Green as approved by the City Engineer of Porterville.
e. Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
f. Locking device.
g. Lugs or devices for securing enclosure to base.

B. Enclosure Bases:

1. Description: 6-inch-minimum thickness Class 3 concrete pad, of dimensions required to extend at least 3 inches beyond edges of enclosure housings. Include openings for piping.

2.09 Fire Hydrants

A. Wet-Barrel Fire Hydrants:

1. All fire hydrants assemblies shall be approved by City Engineer:

a. Mueller A423
b. Waterous Pacer no. WB-67
c. America Darling
d. Kennedy Guardian
e. Clow Medallion
f. Or City Engineer Approved Equal

2. Description: Freestanding, with one 4-1/2" steamer outlet and two 2-1/2" hose outlets. Verify acceptable brand and model number with the controlling jurisdiction.

a. Standard: AWWA C503.
b. Pressure Rating: 200 psig minimum.
c. Color: Gloss White.

3. Fire hydrants must meet the requirements of the Fire Department having jurisdiction.

4. See City Standard Fire Hydrant Assembly in plans for more information.

2.10 Fire Department Connections

A.

1. Allenco No. 230 Fire Department Connection or a comparable product acceptable to the controlling jurisdiction. Fire Department Connection shall be UL listed an FM approved.
2. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate. Check Valve NPS 4 forged body with spring loaded brass check body. Verify acceptable brand and model number with the controlling jurisdiction

    a. Standard: UL 405.
    b. Connections: Two NPS 2-1/2 inlets.
    c. Inlet Alignment: Incline, horizontal.
    d. Finish Including Sleeve: Polished chrome-plated or Rough chrome-plated or Polished bronze.
    e. Escutcheon Plate Marking: "AUTO SPKR".Fire Department Connections:

3. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-high brass sleeve; and round escutcheon plate.

    a. Standard: UL 405.
    b. Connections: Two NPS 2-1/2inlets and one NPS 4 or NPS 6 outlet as indicated on Drawings.
    c. Inlet Alignment: Inline, horizontal.
    d. Finish Including Sleeve: Polished chrome-plated.
    e. Escutcheon Plate Marking: "AUTO SPKR."

2.11 Alarm Devices

A. Alarm Devices, General: UL 753 and FMG approved, of types and sizes to mate and match piping and equipment.

B. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

PART 3 - EXECUTION

3.01 Earthwork

A. Refer to Section 31 2000 "Earth Moving" for excavating, trenching, and backfilling.

3.02 Piping Applications

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping 3/4" to 3" shall be the following:

1. PVC, Schedule 40 pipe; PVC, Schedule 40 socket fittings; and solvent-cemented joints.

F. Underground water-service piping 4" to 12" shall be the following:

1. PVC, AWWA C900-07, Class 235, DR-18 pipe; fittings shall have a minimum working pressure of 350 psi and shall conform to either AWWA C110 or AWWA C153 with "Ring-Tite" ends or approved equal and push-on joint ends for cast iron, ductile iron or polyvinyl chloride pipe. Fitting shall have a 1/16" minimum cement-mortar lining conforming to AWWA C104; and gasketed joints.

G. Aboveground Water-Service Piping 3/4" to 3" shall be any of the following:

1. Hard copper tube, ASTM B 88, Type K; copper, pressure-seal fittings; and pressure-sealed joints.
2. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.

H. Aboveground water-service piping 4" to 12" shall be the following:

1. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

I. Aboveground Fire-Service-Main Piping 4" to 12" shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.03 State Fire Marshal Requirements

A. Materials, installations, tests, flushing, and all construction required for fire-service-main piping for fire suppression shall comply with State Fire Marshal requirements.

1. Inspections are required: 1) prior to pouring thrust blocks, 2) of thrust blocks and joints 3) hydrostatic testing, and 4) for flush. Schedule all inspections 72 hours in advance. Call the local Deputy State Fire Marshal for inspection scheduling.

2. Installation, inspection, and testing shall conform to 2013 NFPA 13 and 2013 NFPA 24.
3. Private fire hydrants shall be approved type and have not less than a 6 inch diameter connection with the mains. All outlets shall be provided with National Standard Threads (NST).
4. A valve shall be installed in the hydrant connections; all valves shall be installed within 20 feet of the hydrant.
5. Fire hydrants shall be located not less than 40 feet from the buildings to be protected. A keyed gate valve shall be provided for each hydrant in an accessible location. Valves shall not be located in parking stalls.
6. Hydrants shall be protected if subject to mechanical damage. The means of protection shall be arranged in a manner that does not interfere with connection to or operation of hydrants.
7. Piping shall be listed for fire protection service or shall comply with the standards in 2013 NFPA 24 table 10.1.1
8. All buried fittings shall be of an approved type with joints and pressure class ratings compatible with the pipe used.
9. All bolts used for underground connections shall be stainless steel. All corrosion protection shall be in place.
10. All bolted joint accessories shall be cleaned and thoroughly coated with asphalt or other corrosion-retarding material after installation.
11. The depth of cover over water pipes shall be determined by the maximum depth of frost penetration in the locality where the pipe is laid; top of the pipe shall be buried not less than 1ft. below the frost line for the facility.
12. In those locations where frost is not a factor, the depth of cover shall not be less than 2 ½ ft. to prevent mechanical damage. When surface loads are expected, a minimum of 3 ft. cover shall be provided.
13. All tees, plugs, caps bends, reducers, valves and hydrant branches shall be restrained against movement in accordance with 2013 NFPA 24 §10.8.2 or §10.8.3
14. Thrust blocks, or other approved method of thrust restraint, shall be provided wherever pipe changes direction.
15. The trench shall be excavated for thrust blocks and inspected *prior* to pour. Thrust blocks shall be placed between undisturbed earth and the fitting to be restrained and shall be capable of resisting the calculated thrust force.
16. Thrust blocks shall be placed so that the joints are accessible for repair.
17. A hydrostatic test (200 psi for two hours or 50 psi over maximum static pressure, whichever is greater) shall be witnessed by a Deputy State Fire Marshal. The trench shall be back-filled between the joints to prevent movement of the pipe.
18. The system shall be thoroughly flushed before connection is made to overhead piping. Flow shall be through a minimum of a 4" hose or pipe unless otherwise approved by the Deputy State Fire Marshal. A Deputy State Fire Marshal shall witness the flush.
19. Control valves shall be supervised by one of the 4 acceptable methods listed in 2014 NFPA 24 §6.7.2

3.04 Valve Applications

A. General Application: Use mechanical-joint-end valves for NPS 3and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG,

nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Use the following for valves in vaults and aboveground:

a. Check Valves: AWWA C508 or UL/FMG, swing type.

2. Relief Valves: Use for water-service piping in vaults and aboveground.

3.05 Piping Installation

A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

B. Make connections NPS 2and smaller with drilling machine according to the following:

1. Install curb valve in water-service piping with head pointing up and with service box.

C. Bury piping with a minimum depth of cover over top of pipe to the following:

1. Under Traffic Areas: NPS 1 to NPS 4 - 24 inches, NPS 6 to NPS 10 - 36 inches, NPS 12 - 42 inches.
2. Under Non-Traffic Areas: NPS 1 to NPS 4 - 18 inches, NPS 6 to NPS 12 shall comply with the requirements for Traffic Areas above.

D. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

E. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

F. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. It shall be the responsibility of the contractor to review the Drawings and furnish all fittings, etc. necessary to complete the work.

G. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.06 Joint Construction

A. Make pipe joints according to the following:

1. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.

    a. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

    a. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

3.07 Anchorage Installation

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages that may be used include the following:

1. Concrete thrust blocks.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.08 Valve Installation

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve as indicated on Drawings.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.09 Water Meter Installation

A. Install water meters, piping, and specialties according to specifications of authority having jurisdiction.

3.10 Roughing-In For Water Meters

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.11 Backflow Preventer Installation

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2and larger backflow preventers, valves, and piping near floor and on concrete piers or steel supports.

3.12 Protective Enclosure Installation

A. Install concrete base level and with top approximately 2 inches above grade.

B. Install protective enclosure over valves and equipment.

C. Anchor protective enclosure to concrete base.

3.13 Fire Hydrant Installation

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.

C. AWWA Fire Hydrants: Comply with AWWA M17.

D. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.14 Fire Department Connection Installation

A. Install ball drip valves at each check valve for fire department connection to mains.

B. Install protective pipe bollards as indicated on Drawings each fire department connection. Pipe bollards are specified in Section 05 5000 "Metal Fabrications."

3.15 Alarm Device Installation

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

B. Supervisory Switches: Supervise valves in open position.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Locking and Sealing: Secure unsupervised valves as follows:

1. Valves: Install chain and padlock on open OS&Y gate valve.

D. Connect alarm devices to building fire alarm system. Wiring and fire-alarm devices are specified in Section 28 3111 "Digital, Addressable Fire-Alarm System" and Section 28 3112 "Zoned (DC Loop) Fire-Alarm System."

3.16 Connections

A. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

B. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.17 Field Quality Control

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psigincrements and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

D. Additional construction, testing and replacement costs resulting from damaged or improperly installed infrastructure shall be borne by the Contractor.

3.18 Identification

A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 31 2000 "Earth Moving."

B. Tracer Wire: At all non-ferrous pipes, install 10 GA. solid copper wire with 45 mils of high molecular weight polyethylene (HMWPE) insulation, UL listed, rated for direct burial, color blue.

1. Tracer wire access points shall be accessible at all new water valve boxes, water meter boxes, blowoffs, and fire hydrants.
2. Tracer wire shall be laid flat and securely affixed to the pipe with tape at 7 feet intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. At water service saddles, the tracer wire shall not be allowed to be placed between the saddle and the water main.
3. At all water main end caps, a minimum of 6 feet of tracer wire shall be extended beyond the end of the pipe, coiled an secured to the cap for future connections. The end of the tracer wire shall be spliced to the wire of a six pound zinc anode and is to be buried at the same elevations as the water main.
4. Connectors:
    a. All mainline wires must be interconnected at intersections, at mainline tees and mainline crosses as indicated on the drawings.

3.19 Cleaning

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

Section 33 3113
Site Sanitary Sewerage Gravity Piping

PART 1 - GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 Summary

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure and pressure couplings.
3. Cleanouts.
4. Encasement for piping.
5. Manholes.

1.03 Definitions

A. PVC: Polyvinyl Chloride Plastic.

1.04 Action Submittals

A. Product Data: For the following:

1. Piping Material.
2. Fittings.
3. Manholes, including frames and covers.
4. Cleanouts.

1.05 Informational Submittals

A. Field quality-control reports.

1.06 Delivery, Storage, And Handling

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.07 Project Conditions

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager and City of Porterville no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Manager's written permission and approval from the City of Porterville.

PART 2 - PRODUCTS

2.01 Pvc Pipe And Fittings

A. PVC Type PSM Sewer Piping NPS 4 to NPS 15:

1. Pipe: ASTM D 3034, SDR 35 or SDR 26 as indicated on Drawings, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Gravity Sewer Piping NPS 18 to NPS 36:

1. Pipe and Fittings: ASTM F 679, Min. 46 psi Pipe Stiffness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

2.02 Nonpressure-Type Transition Couplings

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc
c. Logan Clay Pipe.

d. Mission Rubber Company; a division of MCP Industries, Inc.
e. NDS.
f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cascade Waterworks Mfg.
b. Dallas Specialty & Mfg. Co.
c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Fernco, Inc.
b. Logan Clay Pipe.
c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.03 Cleanouts

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2.04 Manholes

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with rubber gasket joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Base: Cast-in-place concrete as indicated on drawings.
4. Top Section: Concentric-cone with top of cone of size that matches grade rings.

5. Joint Sealant: ASTM C 990, bitumen or butyl rubber. Joints shall be water-tight.
6. Reinforced-concrete rings, 9 to 18-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 4 to 6-inch riser, with 4-inch minimum-width flange and 25-1/4 to 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.05 Concrete

A. General: Cast-in-place concrete complying with ACI 318, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix for Cast in Place Concrete: Class 3 Concrete, 2500 psi minimum at 28 days, with 0.50 maximum water/cementitious materials ratio unless noted otherwise on the Drawings.

1. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel.

PART 3 - EXECUTION

3.01 Earthwork

A. Excavating, trenching, and backfilling are specified in Section 31 2000 "Earth Moving."

3.02 Piping Installation

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. It shall be the responsibility of the contractor to review the Drawings and furnish all fittings, etc. necessary to complete the work.

C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

F. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

G. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope as indicated on drawings.
2. Install piping with 36-inch minimum cover.
3. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
4. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Hub-and-spigot, cast-iron soil pipe.
2. Hubless cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Expansion joints and deflection fittings.

I. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.03 Pipe Joint Construction

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
2. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
3. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Shielded flexible couplings for pipes of same or slightly different OD.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.04 Manhole Installation

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Install FRP manholes according to manufacturer's written instructions.

D. Form continuous concrete channels and benches between inlets and outlet.

E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.05 Concrete Placement

A. Place cast-in-place concrete according to ACI 318.

3.06 Cleanout Installation

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Pipe branches for cleanouts and riser extensions shall match mainline specifications. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Heavy-Duty, top-loading classification cleanouts in all areas except vehicle-traffic service areas and roads.
2. Use Extra-Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas and roads.

B. Set cleanout frames and covers outside of paved areas as indicated on the Drawings.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.07 Connections

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 22 1316 "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 2500 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 2500 psi.

3. Make branch connections from side into existing piping, NPS 21or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 2500 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Connect to grease, oil, and sand interceptors specified in Section 22 1323 "Sanitary Waste Interceptors."

3.08 Identification

A. Comply with requirements in Section 31200 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.09 Field Quality Control

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

        1) Mandril Tests: Upon completion of backfill and compacting trenches, the contractor, at his own expense shall pull a properly sized mandril through the installed main lines, 8 inches inside diameter and larger, to demonstrate that the maximum pipe deflection does not exceed 5%. If excessive pipe deflection obstructs passage of the mandril, the contractor shall excavate and make suitable repairs.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, and the following:

a. Test plastic gravity sewer piping according to UNI-B-6 or ASTM F 1417.

6. Manholes: Perform exfiltration hydraulic test according to ASTM C 969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

E. Additional construction, testing, and replacement costs resulting from damaged or improperly installed infrastructure shall be paid for by the Contractor.

3.10 Cleaning

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION

Section 33 4211
Storm Water Gravity Piping

PART 1 - GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 Summary

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Cleanouts.
4. Drains.
5. Manholes.
6. Catch basins.
7. Stormwater inlets.
8. Pipe outlets.

1.03 Action Submittals

A. Product Data: For each type of product indicated.

1.04 Informational Submittals

A. Field quality-control reports.

1.05 Delivery, Storage, And Handling

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.06 Project Conditions

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.01 General

A. It shall be the Contractors option to install PVC Pipe and Fittings or Concrete Pipe and Fittings as listed in the following sections unless specific pipe and fitting requirements are noted on the Drawings. All fittings and pipe connections shall be watertight.

2.02 Pvc Pipe And Fittings

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

C. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F 679, Min 46 psi Pipe Stiffness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

D. PVC Pressure Piping:

1. Gaskets: ASTM F 477, elastomeric seals.

2.03 Concrete Pipe And Fittings

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

1. Bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets

B. Appropriate pipe class shall be determined by the depth of cover listed below unless indicated otherwise on the Drawings:

1. Class III, Wall B min. for cover depths from 2 feet to 3 feet
2. Class II, Wall B min. for cover depths greater than 3 feet up to 9 feet.
3. Class III, Wall B min. for cover depths of greater than 9 feet up to 14 feet.
4. Class IV, Wall B min. for cover depths of greater than 14 feet up to 21 feet
5. Class V, Wall B min. for cover depths greater than 21 feet up to 30 feet.

2.04 Nonpressure Transition Couplings

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Unshielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.
c. Logan Clay Pipe.
d. Mission Rubber Company; a division of MCP Industries, Inc
e. NDS.
f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

C. Shielded, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cascade Waterworks Mfg.
b. Dallas Specialty & Mfg. Co.
c. Mission Rubber Company; a division of MCP Industries, Inc

2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Fernco, Inc.
   b. Logan Clay Pipe.
   c. Mission Rubber Company; a division of MCP Industries, Inc

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.05 Cleanouts

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2.06 Manholes

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with rubber gasket joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Base: Cast-in-place concrete as indicated on drawings.
4. Top Section: Concentric-cone with top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber. Joints shall be water-tight.
6. Reinforced-concrete rings, 9 to 18-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 4 to 6-inch riser, with 4-inch minimum-width flange and 25-1/4 to 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.07 Concrete

A. General: Cast-in-place concrete complying with ACI 318, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable

B. Portland Cement Design Mix for Cast in Place Concrete: Class 3 Concrete, 2500 psi minimum at 28 days, with 0.50 maximum water/cementitious materials ratio unless noted otherwise on the Drawings.

1. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel

2.08 Catch Basins

A. Standard Precast Concrete or Cast in Place Catch Basins as indicated on the Drawings.

B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.

1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
2. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Frames and Grates: ASTM A 536, Grade 80-55-06, ductile iron or ASTM A 48, Class 35 gray iron designed for H-20 structural loading. Include flat grate with slotted drain openings.

1. Size: As indicated on drawings.
2. Grate Free Area: Approximately 40 percent unless otherwise indicated.

2.09 Stormwater Inlets

A. Combination Inlets: Made with vertical curb and horizontal gutter openings as indicated on the Drawings

B. Frames and Grates: Heavy duty.

PART 3 - EXECUTION

3.01 Earthwork

A. Excavation, trenching, and backfilling are specified in Section 31 2000 "Earth Moving."

3.02 Piping Installation

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. It shall be the responsibility of the contractor to review the Drawings and furnish all fittings, etc. necessary to complete the work.

D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

F. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

G. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping with 36-inch minimum cover, unless otherwise indicated.
3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
4. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Expansion joints and deflection fittings.

3.03 Pipe Joint Construction

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.

2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
3. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
4. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping according to the following:

1. Join PVC pressure piping according to AWWA M23 for gasketed joints.

3.04 Cleanout Installation

A. Install cleanouts and riser extensions from storm sewer pipes to cleanouts at grade. Pipe branches for cleanouts and riser extensions shall be PVC as indicated on the Drawings. Install piping so cleanouts open in direction of flow in storm sewer pipe.

B. Set cleanout frames and covers with concrete collar as indicated on the Drawings in landscape areas.

C. Set cleanout frames and covers with concrete collar as indicated on the Drawings in concrete pavement and roads with tops flush with pavement surface.

3.05 Drain Installation

A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
2. Use Heavy-Duty, top-loading classification drains in and roads areas.

B. Fasten grates to drains if indicated.

C. Set drain frames and covers with tops flush with pavement surface.

3.06 Manhole Installation

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.07 Catch Basin Installation

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.08 Stormwater Inlet and Outlet Installation

A. Construct riprap of broken stone, as indicated.

B. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

3.09 Concrete Placement

A. Place cast-in-place concrete according to ACI 318.

3.10 Connections

A. Connect non-pressure, gravity-flow drainage piping in building's storm building drains specified in Section 22 1413 "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Section 22 1413 "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Make connections to existing underground manholes.

1. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 2500 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials

2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.11 Identification

A. Materials and their installation are specified in Section 31 2000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 Field Quality Control

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

        1) Mandril Tests: Upon completion of backfill and compacting trenches, the contractor, at his own expense shall pull a properly sized mandril through the installed main lines, 8 inches inside diameter and larger, to demonstrate that the maximum pipe deflection does not exceed 5%. If excessive pipe deflection obstructs passage of the mandril, the contractor shall excavate and make suitable repairs.

    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.

5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, and the following:

    a. Air test plastic piping according to UNI-B-6 or ASTM F 1417.
    b. Test concrete piping for exfiltration according to ASTM C969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 Cleaning

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION

Section 33 4600
Subdrainage

PART 1 GENERAL

1.01 Section Includes

A. Subdrains in trenches and subdrains or prefabricated composite drainage panels at walls or foundations
B. Bioretention and biofiltration areas for storm water treatment

1.02 Related Sections

A. Section 31 2000, Earthmoving
B. Section 33 4100, Storm Utility Drainage Piping

1.03 Related Documents

A. Geotechnical Report: "Geotechnical Investigation Report; Fourth Street Community Center and Park, Southeast Corner of N. 4th St. & E. Henderson Avenue, Porterville, California," prepared by Soils Engineering, Inc., dated January 13, 2023.
B. AASHTO
   1. M288: Standard Specification for Geotextiles Used for Subsurface Drainage Purposes
C. ASTM
   1. C1173: Standard Specification for Flexible Transition Couplings for Underground Piping Systems
   2. D448: Standard Classification for Sizes of Aggregate for Road and Bridge Construction
   3. D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics
   4. D1785: Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
   5. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
   6. D2564: Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
   7. D2729: Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
   8. D3034: Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
   9. D4716: Standard Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
   10. F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
   11. F656: Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
   12. F1336: Standard Specification for Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings
D. Caltrans Standard Specifications, 2015
   1. Section 68-Subsurface Drains
   2. Section 96-Geosynthetics

1.04 Definitions

A. AASHTO: American Association of State Highway and Transportation Officials
B. ASTM: American Society for Testing and Materials
C. PVC: Polyvinyl Chloride

1.05 Submittals

A. Follow submittal procedure in accordance with Section 01 1000, Supplemental General Requirements.
B. Product data for the following:
    1. Perforated pipe and fittings
    2. Solid pipe and fittings
    3. Prefabricated composite drainage panels
    4. Geotextile fabrics
    5. Cleanout plugs or caps
    6. Precast clean out boxes and box covers
    7. Drainage bubblers
    8. Biofiltration soil material
C. Samples:
    1. Drainage Fill

1.06 Delivery, Storage and Handling

A. Do not store plastic structures, pipe, and fittings in direct sunlight.
B. Protect pipe, pipe-fittings, and seals from dirt and damage.
C. Protect permeable material from contamination by other materials.

PART 2 PRODUCTS

2.01 Perforated Wall and Solid Wall Pipe

A. PVC pipe and Fittings Smaller than 4-inch:
    1. Pipe: ASTM D1785, Schedule 40. Solvent cement joints
    2. Solvent Cement: ASTM D2564. Include primer according to ASTM F656.
    3. Perforation Size, Location, and Spacing: ASTM D2729
B. PVC Pipe and Fittings 4-inch through 15-inch:
    1. Pipe: ASTMD3034, SDR 26. Bell and spigot joints
    2. Perforation Size, Location, and Spacing: ASTM D2729
    3. Fittings: ASTM F1336
    4. Joint Gasket: Elastomeric seal, ASTM F477

2.02 Special Pipe Couplings

A. Description: ASTM C1173. Rubber or elastomeric sleeve and stainless steel band assembly fabricated to match outside diameters of pipes to be joined.

2.03 Cleanouts

A. Piping: Same as subdrain pipe without perforations.

B. Top Plug or Cap: Same material as piping if possible. Plug or cap to be secure but removable,threaded or non-threaded.
   1. Size box to provide access and allow easy removal and reinstallation of plug or cap.
   2. Types:
      a. Non-Traffic Areas: Portland cement concrete box and box cover, light duty.
      b. Traffic Areas: Portland cement concrete box and box cover or steel or cast iron cover, heavy duty, both box and cover to be rated for AASHTO H20 loading.

C. Cover Markings: "STORM DRAIN" unless otherwise specified.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
      a. Associated Concrete Products, Inc.,
      b. Brooks Products Inc.,
      c. Christy Concrete Products, Inc., or approved equal

2.04 Prefabricated Composite Drainage Panels

A. Description: Prefabricated composite panels, 36 to 60 inches wide and manufactured with geotextile facing laminated to molded drainage core

B. Drainage Core: Three-dimensional, non-biodegradable, molded Polypropylene or Polystyrene
   1. Minimum Compressive Strength: 10,000-lbf./sq. ft. when tested according to ASTM D1621
   2. Minimum Flow Rate: 2.8 gpm per foot at hydraulic gradient of 0.05 and compressive stress of 25 psig when tested according to ASTM D4716

C. Geotextile: Non-woven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M288
   1. Survivability Class: 1
   2. Apparent Opening Size: No. 70 sieve maximum
   3. Permittivity: 0.5 per second, minimum

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. American Wick Drain Corporation
   2. Tencate Geosynthetics/Mirafi Inc.
   3. Multi-Flow (Prinsburg, MN) (Tel. 800-978-8007)
   4. Phillips Fibers Corporation, or approved equal

2.05 Bioretention Or Biofiltration Treatment Soil

A. Soil specification shall meet requirements of local agency having authority or sustainability requirements for projects achieving environmental goals.
   1. For projects located within the jurisdiction of the Municipal Regional Stormwater Permit (MRP), treatment soil shall conform to requirements in Appendix L of the MRP. Contractor shall provide submittal information verifying conformance to MRP

standard.

2.06 Drainage Fill Material

A. Permeable Material: Conform to Section 68-2.02F(3) of Caltrans Standard Specifications,Class 2.
B. Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate, Sieve No. 57, with 100 percent passing 1-1/2-inch sieve and not more than 5 percent passing No. 8 sieve

2.07 Geosynthetics

A. When required, use filter fabric for encasing permeable material around subdrains.
   1. Caltrans Filter Fabric: Section 96-1.02B of Caltrans Standard Specifications,
   2. Mirafi 140N (by Tencate Geosynthetics/Mirafi Inc.), or approved equal.

PART 3 EXECUTION

3.01 Examination

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
B. Install only after unsatisfactory conditions have been corrected.

3.02 Piping Applications

A. Refer to Plans for location, size, and material designation for individual subdrains.

3.03 Installation of Perforated Portions Of Subdrains

A. Excavation: Section 6 of ASTM D2321 and as indicated.
B. Subdrain Bedding: Place supporting layer of drainage fill over compacted subgrade to compacted depth indicated. If drainage fill requires encasement in filter fabric, lay filter fabric in trench and overlap trench sides before installing drainage fill.
C. Piping Installation: Install pipe in accordance with Section 7 of ASTM D2321. Install piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert. Excavate recesses for bottoms of bell ends of pipe. Lay pipe with bells facing upslope and with spigot end centered fully into adjacent bell. Bed piping with full pipe bearing in drainage fill material. Lay perforated pipe with perforations down. Install gaskets, seals, sleeves, and couplings in accordance with manufacturers written instructions. Use increasers, reducers, and couplings made for different sizes of materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
D. Initial Subdrain Backfill: After installing drainage piping, add drainage fill up to top of pipe to perform tests.
E. Testing Subdrain: After installing drainage fill to top of pipe, test drain piping with water to ensure free flow before backfilling with drainage fill. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.
F. Subsequent Subdrain Backfill: After satisfactory testing, cover piping with drainage fill to width and height indicated. Place drainage fill in layers not exceeding 3 inches in loose depth; compact each layer placed. If filter fabric is required complete the filter fabric encasement

by bringing fabric to top and closing the encasement.

G. Fill to Grade: Place native fill material over compacted drainage fill to thickness indicated. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish elevations.

3.04 Installation of Non-Perforated Portions of Subdrains

A. Conform to Sections 31 2333, Utility Trenching and Backfill and 33 4100, Storm Utility Drainage Pipe.

3.05 Installation of Rain Gardens, Bioretention or Biofiltration Treatment Areas

A. The Contractor shall excavate rain gardens / treatment areas to the elevations and dimensions specified on the plans. Level surface of area of top of treatment soil shown on the plans shall govern actual length and width dimensions if shown on the plans. In-situ soils shall not be further compacted.

B. Direct the use of heavy equipment and construction traffic around rain gardens so as to avoid compaction, to the extent possible.

C. After initial site grading, the Contractor shall provide temporary protection from curb cuts and other potential inflow entrances so that runoff drainage does not enter the rain gardens during construction and installation.
   1. Treatment areas / rain gardens may be used as sediment settling facilities during mass excavation and commensurate construction activities.
   2. Prior to commencing work in rain gardens, the Contractor shall remove and properly dispose of all accumulated sediments.

D. Excavated soils shall be placed with stockpiled fill and properly disposed and stabilized by the Contractor.

E. Subdrain installation:
   1. Subdrain shall be installed as indicated on the plans at an elevation within the drain rock layer shown on the construction details and connected to the overflow or outfall structure at the invert elevation shown on the plans.
   2. For connections of the perforated drain pipes to storm drainage structures, appropriately sized holes shall be cut in the structures at the correct invert elevation specified by the Project Designer or authorized representative. The connections shall be sealed sediment-tight and secured in place with mortar or other approved joint sealant compatible with subdrain pipe materials.
   3. Drain rock layer shall be approved Class II Permeable Material. Crushed rock or aggregate base cannot be used within the treatment area, in, around or under the drain rock layer.
   4. Care shall be exercised to prevent natural or fill soils from intermixing with the drain rock surrounding the underdrain. All contaminated drain rock shall be removed and replaced with uncontaminated Class II permeable material.
   5. Attach subdrain piping to overflow structure.
   6. Install cleanouts at the ends of the subdrains. Install screw-on end caps set flush with the finished top of treatment soil.

F. Overflow drain structure:
   1. Install overflow structure at the elevation and location specified on the plans. Attach subdrain piping to overflow structure. Attach solid pipe from overflow structure outfall storm drain system at elevation and slope indicated on the plans.
   2. Rim elevation of overflow structure must be set above the elevation of the top of treatment soil by the amount indicated on the plans, typically 6 inches. Contractor

shall verify that the rim elevation of the overflow structure is also a minimum of 2 inches below the lowest elevation of the treatment area perimeter so that storm flows will reach the overflow rim before the top of the treatment area perimeter.

3. The overflow structure shall have an open bottom filled with drain rock if indicated on the plans. This should be installed where the overflow structure has a sump condition (subdrains lower than the outfall invert elevation). The overflow structure shall be installed such that the bottom of the structure is set a minimum of 6-inches below the undisturbed bottom of the treatment area. Drain rock in the overflow sump shall be installed up to the invert of the lowest pipe connected to the structure.

G. Filter media soil backfill
   1. Filter soil of the approved specification shall be installed to the elevation indicated on the plans. Care should be taken to ensure that the soil is not compacted and that no equipment is driven on the backfill. Walking on the backfill should be limited to what is absolutely necessary.

H. Planting soil, plantings, and mulch shall be installed per the plans. Non-floating bark / mulch shall be used, if indicated, to prevent removal of material and clogging of the overflow.

I. Testing of the treatment area should be conducted once the filter media is installed and all storm drain piping is connected. The area should allow an infiltration rate well above 5 inches/ hour to ensure that the treatment area will continue to function at 5 inches/ hour over the lifetime of the treatment area.

3.06 Prefabricated Composite Drainage Panels

A. Coordinate placement with other drainage materials.
B. Install prefabricated drainage panels in accordance with manufacturer's instructions.
C. Place perforated drainage pipe at base of footing and attach to composite drainage panels in accordance with the manufacturer's instructions.

3.07 Joining Pipe

A. Join PVC pipe and fittings with elastomeric seals according to ASTM D2321 or solvent cement.
B. Special pipe couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and that fit both pipe materials and dimensions.

3.08 Cleanout Installation

A. Cleanout piping to be the same size as the subdrain piping to which it is attached.
B. Install cleanouts from subdrainage piping to grade. Locate cleanouts at beginning of piping run, at changes in direction, and other locations indicated.
C. Do not allow cleanout box to bear on cleanout riser.

3.09 Cleaning

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

3.10 Retaining Wall Drainage

A. Unless otherwise specified, drain system should consist of a minimum of 12 inches thick free-draining granular materials containing less than five percent fines passing a No. 200 sieve placed adjacent to the wall. Free-draining granular material should be graded to prevent the intrusion of fines or encapsulated in a suitable filter fabric. As an alternative, a prefabricated drainage structure, such as geo-composite, or approved equivalent, may be used as a substitute for the granular backfill adjacent to the wall.

B. Drainage system consisting of either weep holes or perforated drain lines (minimum 4 inch diameter placed near the base of the wall) should be used to intercept and discharge water which would tend to saturate the backfill. Where used, drain lines should be embedded in a uniformly graded filter material and provided with adequate clean-outs for periodic maintenance.

C. An impervious soil should be used in the upper one foot layer of backfill to reduce the potential for water infiltration.

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APPENDICES TO THE SPECIFICATIONS

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APPENDIX I - FAIR EMPLOYMENT PRACTICES PROVISIONS

Under the terms of the contract documents for the above stated project, the Contractor, and all subcontractors, suppliers, and vendors, shall comply with all City, State and Federal laws, ordinances, codes, executive orders, or regulations, including amendments and another requirements regarding equal employment opportunities and fair employment practices, including the following provisions:

1. The Contractor shall not willfully discriminate against any employee or applicant for employment on the basis or race, color, national origin, ancestry, gender, or religion, and will take affirmative action to ensure that applicants are employed and employees are treated during employment without such discrimination. Such affirmative action shall include encouragement and assistance to qualified members of minority groups in all activities involving recruiting, advertising, or soliciting for employment; hiring, placing, training, upgrading, transferring, or demoting; selection for training or apprenticeship; rates of pay or other compensation; and layoff or termination.

2. In all advertisements, offers, requests, or solicitations for labor, personnel, or employment opportunities of any nature, the Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, national origin, ancestry, gender, sexual orientation, or religion.

3. No qualified disabled person shall, on the basis of disability, be excluded from participating in, be denied the benefits of, or otherwise be subject to discrimination under any program or activity that receives or benefits from federal financial assistance.

4. The Contractor shall fulfill the following requirements to the satisfaction of the City:

    a. Provide notice to all sources of employee referrals including the State Department of Human Resources, employment agencies, and each union or other representative of labor with which the Contractor has a collective bargaining agreement, or other contract or understanding, and that copies of said notice have been posted in conspicuous places available to employees and applicants for employment.

    b. Provide notice to all supervisors, foreman, personnel officers, subcontractors, suppliers, and vendors, and that they have been instructed as to their responsibilities hereunder.

    c. Have a plan for affirmative action indicating the measures to be taken to encourage and assist qualified members of minority groups in the areas of

recruitment, employment, training promotion, compensation, and selection for apprenticeship.

d. Provide a written agreement with each union, labor representative, or other source of employees or applicants for employment that sets forth the requirements and responsibilities for non-discrimination and affirmative action under these provisions.

e. Notify the City in writing of any opposition to the requirements of these provisions by any individual, firm, union, labor representative, organization, corporation, or source of employees or applicants for employment.

f. Upon request file with the City a basic compliance report detailing what actions have been taken under these provisions, indicating all sources from which the project work force has been assembled, and identifying all persons responsible for employment decisions in connection with this contract. False statements willfully made in said report will be punishable as provided by law.

5. Nothing in these provisions shall be construed as requiring or permitting the employment of persons restricted from such employment by provisions of state or federal laws.

6. Upon request, the Contractor shall compile records on forms provided by the City indicating ethnic distribution by man hours of work within various crafts and trades for the entire project work force, including subcontractors' forces and shall file said forms with the City by the tenth day of each month.

7. The Contractor shall maintain and disseminate all information as required by City, State, or Federal orders relative to these provisions and shall ensure unlimited access to records of such information for the purpose of ascertaining compliance hereunder.

8. If the Contractor or any subcontractor is in violation of these provisions, the City will serve written notice on the Contractor setting forth the nature of the violation. The Contractor shall meet promptly with the City to determine the manner and time for correcting the violation. If the Contractor fails or refuses to so correct the violation, the City will pursue all remedies which may be required under the law.

9. A finding by any governing body that the Contractor has willfully violated these provisions may be sufficient grounds for cancellation, termination, or suspension of the contract in whole or in part and may require the imposition of penalties, sanctions, and remedies as may be provided for under the law, including revocation of the Contractor's credentials as a responsible bidder and the deduction of monetary damages from any payments due the Contractor.

10. The Contractor shall include these provisions in every first tier subcontract or purchase order and shall require each subcontractor, supplier, or vendor to similarly bind each further subordinate agreement.

11. The Contractor shall take action with respect to any subcontractor, supplier, or vendor as may be directed by the City or any other governing body to ensure enforcement of these provisions.

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APPENDIX 2 – LIST OF UTILITIES

Southern California Gas Company……(559) 739-2337

Southern California Edison……...(626) 484-3789

AT&T……..……...(559) 304-7307

Charter Communications…….....(559) 920-9669

Sewer, Water & Storm Drain,

City of Porterville Field Services Division……...(559) 782-7499

OACYS…….(559) 781-4123

Underground Service Alert……..811

The City of Porterville assumes no responsibility for the accuracy or the completeness of this list. The Contractor is fully responsible for notifying all the correct parties regarding utility coordination.

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APPENDIX 3 – PREVAILING WAGE RATE

See the State website for current rates, http://www.dir.ca.gov/DLSR/PWD

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APPENDIX 5- FUGITIVE DUST CONTROL AT CONSTRUCTION SITES

COMPLIANCE ASSISTANCE BULLETIN
April 2007

Fugitive Dust Control at Construction Sites: New Requirements

Regulation VIII, Fugitive PM10 Prohibitions, of the District's Rules and Regulations apply to many activities that generate fugitive dust, and particularly to construction sites.

Fugitive dust is emitted into the air by activities that disturb the soil, such as earthmoving and vehicular/equipment traffic on unpaved surfaces. Windblown dust is also of concern where soil has been disturbed at construction sites.

The District adopted Regulation VIII in 1993 and its most recent amendments became effective on October 1, 2004. This is a basic summary of the regulation's requirements as they apply to construction sites.

These regulations affect all workers at a regulated construction site, including everyone from the landowner to the subcontractors. Violations of Regulation VIII are subject to enforcement action including fines.

Visible Dust Emissions (VDE) may not exceed 20% opacity during periods when soil is being disturbed by equipment or by wind at any time. Visible Dust Emissions opacity of 20% means dust that would obstruct an observer's view of an object by 20%. District inspectors are state certified to evaluate visible emissions. Dust control may be achieved by applying water before/during earthwork and onto unpaved traffic areas, phasing work to limit dust, and setting up wind fences to limit wind blown dust.

Soil Stabilization is required at regulated construction sites after normal working hours and on weekends and holidays. This requirement also applies to inactive construction areas such as phased projects where disturbed land is left unattended. Applying water to form a visible crust on the soil and restricting vehicle access are often effective for short-term stabilization of disturbed surface areas. Long-term methods including applying dust suppressants and establishing vegetative cover.

Carryout and Trackout occur when materials from emptied or loaded vehicles falls onto a paved surface or shoulder of a public road or when materials adhere to vehicle tires and are deposited onto a paved surface or shoulder of a public road. Should either occur, the material must be cleaned up at least daily, and immediately if it extends more than 50 feet from the exit point onto a paved road. The appropriate clean-up methods require the complete removal and cleanup of mud and dirt from the paved surface and shoulder. Using a blower device or dry sweeping with any mechanical device other than a PM10-efficient street sweeper is a violation. Larger construction sites, or sites with a high amount of traffic on one or more days, must prevent carryout and trackout from occurring by installing gravel pads, grizzlies, wheel washers, paved interior roads, or a combination thereof at each exit point from the site. In many cases, cleaning up trackout with water is also prohibited as it may lead to plugged storm drains. Prevention is the best method.

Unpaved Access and Haul Roads, as well as unpaved vehicle and equipment traffic areas at construction sites must have dust control. Speed limit signs limiting vehicle speed to 15 mph or less at construction sites must be posted every 500 feet on uncontrolled and unpaved roads.

San Joaquin Valley Air Pollution Control District

Northern Region Office
4800 Enterprise Way
Modesto, CA 95356 - 8718
(209)557-6400 ❖ FAX (209) 557-6475

Central Region Office
1990 East Gettysburg Avenue
Fresno, CA 93726 - 0244
(559)230-6000 ❖ FAX (559)230-6062

Southern Region Office
34946 Flyover Court
Bakersfield, CA 93308
(661)392-5500❖FAX (661)392-5585

Storage Piles and Bulk Materials have handling, storage, and transportation requirements that include applying water when handling materials, wetting or covering stored materials, and installing wind barriers to limit VDE. Also, limiting vehicle speeds, loading haul trucks with a freeboard of six inches or greater along with applying water to the top of the load, and covering the cargo compartments are effective measures for reducing VDE and carryout from vehicles transporting bulk materials.

Demolition activities require the application of water to the exterior of the buildings and to unpaved surfaces where materials may fall. A Dust Control Plan will be required for large demolition projects. Consider all structures slated for demolition as possibly being regulated due to potential asbestos, per District Rule 4002 - *National Emission Standards for Hazardous Air Pollutants*. Contact the District well before starting because a 10 working-day notice will likely be required before a demolition can begin.

Dust Control Plans identify the dust sources and describe the dust control measures that will be implemented before, during, and after any dust generating activity for the duration of the project. Owners or operators are required to submit plans to the District at least 30 days prior to commencing the work for the following:

- Residential developments of ten or more acres of disturbed surface area.
- Non-residential developments of five or more acres of disturbed surface area.
- The relocation of more than 2,500 cubic yards per day of materials on at least three days.

Operations may not commence until the District has approved the Dust Control Plan. A copy of the plan must be on site and available to workers and District employees. **All work on the site is subject to the requirements of the approved dust control plan. A failure to abide by the plan by anyone on site may be subject to enforcement action.**

Owners or operators of construction projects that are at least one acre in size and where a Dust Control Plan is not required, must provide written notification to the District at least 48 hours in advance of any earthmoving activity.

Record Keeping is required to document compliance with the rules and must be kept for each day any dust control measure is used. The District has developed record forms for water application, street sweeping, and "permanent" controls such as applying long term dust palliatives, vegetation, ground cover materials, paving, or other durable materials. Records must be kept for one year after the end of dust generating activities (Title V sources must keep records for five years).

Exemptions exist for several activities. Those occurring above 3,000 feet in elevation are exempt from all Regulation VIII requirements. Further, Rule 8021 – *Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities* exempts the following construction and earthmoving activities:

- Blasting activities permitted by California Division of Industrial Safety.
- Maintenance or remodeling of existing buildings provided the addition is less than 50% of the size of the existing building or less than 10,000 square feet (due to asbestos concerns, contact the District at least two weeks ahead of time).
- Additions to single family dwellings.
- The disking of weeds and vegetation for fire prevention on sites smaller than ½ acre.
- Spreading of daily landfill cover to preserve public health and safety and to comply with California Integrated Waste Management Board requirements.

Nuisances are prohibited at all times because District Rule 4102 – *Nuisance* applies to all construction sources of fugitive dust, whether or not they are exempt from Regulation VIII. It is important to monitor dust-generating activities and implement appropriate dust control measures to limit the public's exposure to fugitive dust.

For more information please contact the Compliance Division of the District office nearest to you. Information on Regulation VIII, where you may obtain copies of record keeping forms, the Dust Control Plan template, and the Construction Notification form, is available on the District's website at:

www.valleyair.org, under Compliance Assistance/Dust Control.

WARRANTY BOND

BOND NO.: _____

KNOW ALL MEN BY THESE PRESENTS:
THAT we,_____, as Principal, and _____, a corporation organized and doing business under and by virtue of the laws of the State of_____and duly licensed to conduct surety business in the state of California, as Surety, are held and firmly bound unto CITY OF PORTERVILLE as Obligee, in the sum of_____ _____($_____) dollars, for which payment, well and truly to be made, we bind ourselves, or heirs, executors and successors, jointly and severally firmly by these presents.

THE CONDITION OF THE OBLIGATION IS SUCH THAT:

WHEREAS, the above named Principal entered into an agreement or agreements with said Obligee to CONSTRUCT THAT PROJECT ENTITLED
_____

WHEREAS, said agreement provided that Principal shall guarantee replacement and repair of asphalt concrete as described therein for a period of three years following the acceptance of the contract.

NOW, THEREFORE, if the above Principal shall indemnify the Obligee for all loss that Obligee may sustain by reason of any defective materials or workmanship which become apparent during the period of three years from and after acceptance of the said asphalt concrete by Obligee, then this obligation shall be void; otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above mentioned parties have executed this instrument under their seals this_____day of_____, 20____, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

(Seal)

_____
Principal

_____
Signature for Principal, Title

(Seal)

_____
Surety

_____
Surety Address & Telephone No.

_____
Signature for Surety, Title

(Attach notarization form for each required signature)

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APPENDIX 6 – ASPHALT GRINDINGS VICINITY MAP

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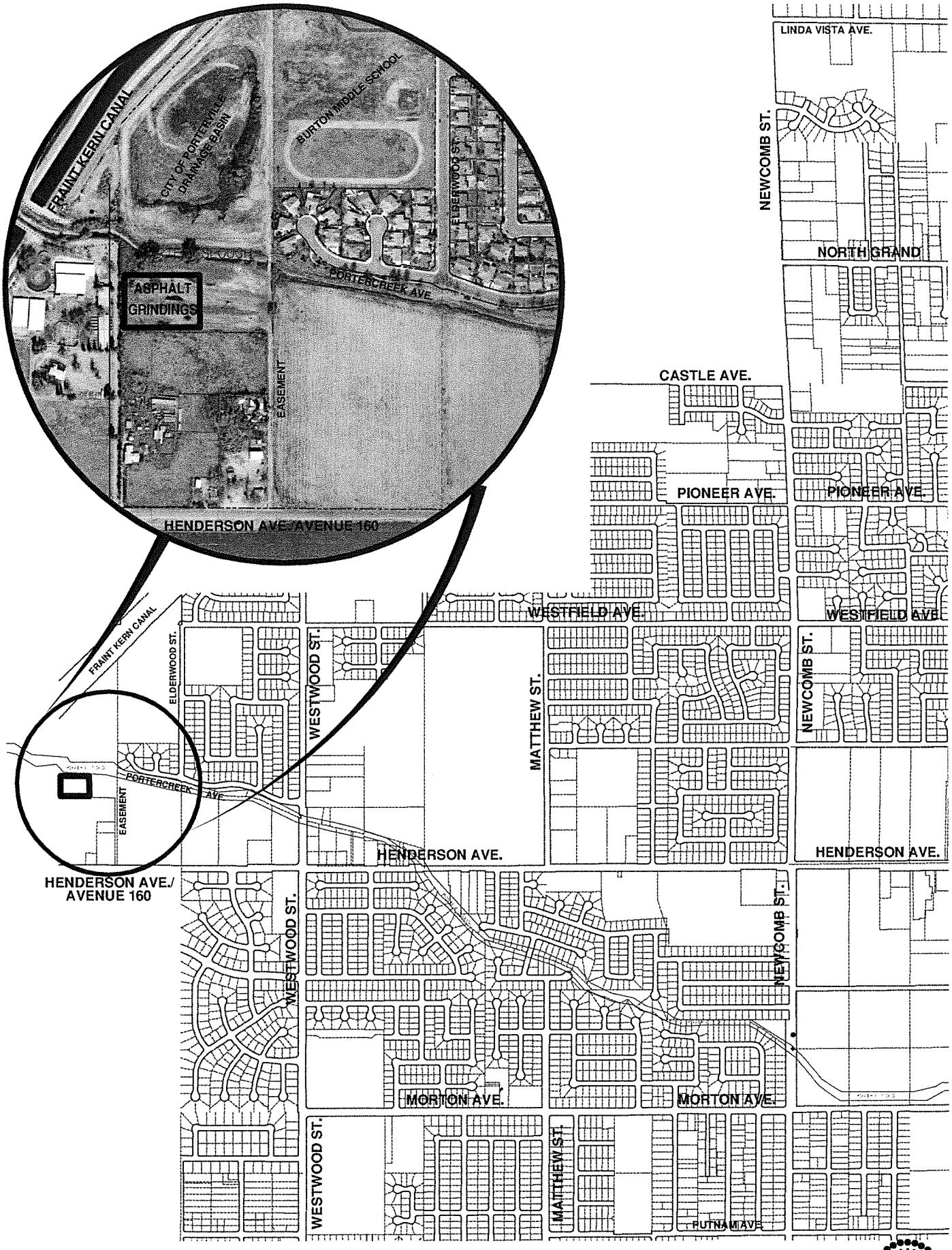

CITY OF PORTERVILLE
ASPHALT GRINDING LOCATION

NORTH

SCALE : N.T.S.

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Nonresidential Building Commissioning

CERTIFICATE OF COMPLIANCE	NRCC-CXR-E

This document is used to demonstrate compliance with mandatory commissioning requirements in 120.8 for nonresidential buildings and hotel/motel or mixed-use buildings with nonresidential spaces. This document does not demonstrate compliance with commissioning requirements within Title 24, Part 11, which need to be documented separately if they apply.

Project Name:	PORTERVILLE FOURTH STREET COMMUNITY CENTER	**Report Page:**	**(Page 1 of 7)**
Project Address:	NORTH FOURTH STREET, PORTERVILLE, CA 93257	**Date Prepared:**	2023-10-19T19:30:28-04:00

A. GENERAL INFORMATION

01	Project Location (city)	PORTERVILLE	04	Building Size (ft^2)	18546
02	Occupancy Type	Nonresidential	05		10,000 - 49,999 ft^2
03	Project Type	Newly constructed	06		Unitary or packaged equipment each serving one zone
			07	Climate Zone	13

B. PROJECT SCOPE

Based on project information provided in Table A, Table B indicates which commissioning related requirements apply per 120.8. Table B is not editable by the user.

Commissioning Requirements per 120.8

01	Table F: Design Review Kickoff	120.8(d)1 and 120.8(d)2	The design review kickoff meeting establishes who will play the role of the design reviewer, the project schedule and identify owner's requirements. This meeting should be conducted during schematic design.
02	Table G: Owner's Project Requirements (OPR)	120.8(b)	The owner's project requirements establish the owner's goals, requirements and expectations for everything related to energy consumption and operation. This should be completed during schematic design.
03	Table H: Basis of Design (BOD)	120.8(c)	The basis of design documents the design elements such as calculations and product selections that meet the owner's project requirements and applicable regulatory requirements. This should be completed during schematic design.
04	Table I: Design Review	120.8(d) and 120.8(e)	The design reviewer(s) reviews the construction documents for clarity, completeness, and adherence to the owner's goals. Commissioning measures must be included in the construction documents to facilitate the design review and commissioning process. For projects with >= 10,000 ft^2 of nonresidential conditioned floor area, the design review is for adherence with the Owner's Project Requirements (OPR) and Basis of Design (BOD). This should be conducted during design.
05	Table J: Commissioning Plan	120.8(f)	The commissioning plan is developed by the commissioning provider with input from the designer and defines the scope of commissioning the project. This should be drafted during design and completed during early construction.
06	Table K: Functional Performance Testing	120.8(g)	Functional performance testing is conducted on building systems to demonstrate correct installation and operation.
07	Table L: Documentation and Training	120.8(h)	Documentation of the operational aspects of the building shall be completed within the Systems Manual and delivered to the building owner or representative and facilities operator.

CERTIFICATE OF COMPLIANCE		**NRCC-CXR-E**
Project Name: PORTERVILLE FOURTH STREET COMMUNITY CENTER	**Report Page:**	**(Page 2 of 7)**
	Date Prepared:	2023-10-19T19:30:28-04:00

B. PROJECT SCOPE

08	Table M: Commissioning Report	120.8(i)	A complete report of commissioning process activities undertaken through the design, construction and reporting recommendations for post-construction phases of the building project shall be completed and provided to the owner or representative.

C. COMPLIANCE RESULTS

Table C will indicate if the project data input into the compliance document is compliant with commissioning requirements per 120.8. This table is not editable by the user. If any cell on this table says "DOES NOT COMPLY" or "COMPLIES with Exceptional Conditions" refer to Table D. for guidance.

01	02	03	04	05	06	07	08	09
Design Kickoff Review	Owner's Project Requirements	Basis of Design	Design Review	Commissioning Plan	Functional Performance Testing	Documentation and Training	Commissioning Report	
Table F	Table G	Table H	Table I	Table J	Table K	Table L	Table M	
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	COMPLIES
10				DANNY MCBRIDE				COMPLIES

D. EXCEPTIONAL CONDITIONS

This table is auto-filled with uneditable comments because of selections made or data entered in tables throughout the form.

Table G. indicates that the Owner's Project Requirements (OPR) document is attached to the permit application.
Table H. indicates that a Basis of Design (BOD) document is attached to the permit application.
Table I. indicates that a Design Review document is attached to the permit application.
Table J. indicates that a draft commissioning plan is attached to the permit application.

E. ADDITIONAL REMARKS

This table includes remarks made by the permit applicant to the Authority Having Jurisdiction.

CERTIFICATE OF COMPLIANCE		**NRCC-CXR-E**
Project Name: PORTERVILLE FOURTH STREET COMMUNITY CENTER	**Report Page:**	**(Page 3 of 7)**
	Date Prepared:	2023-10-19T19:30:28-04:00

F. DESIGN REVIEW KICKOFF MEETING

This table indicates that the design reviewer meets the qualification requirements per Title 24, Part 1 Section 10-103(a)1 and demonstrates compliance with design review kickoff requirements per 120.8(d)2. This meeting should occur during the Schematic Design phase of the project.

Design Review Kickoff Meeting Details

01	Date of Design Review Kickoff Meeting			2023-08-31	
02	Meeting Attendees: (one person may play multiple roles)				
☒	Owner/Facility Manager:	SARAH WEAVER	☐	Design Reviewer(s)	
☐	Project Manager:		☒	Design Architect/ Engineer(s):	MICHAEL SCOTT, DENVER STANGER
☐	Contractor:		☐	Certified Acceptance Test Tech(s):	
☒	Commissioning Provider:	DANNY MCBRIDE	☒	Energy/ T24 Part 6 Consultant:	BEN SWANSON

Design Reviewer Qualifications per Title 24 Part 1 Section 10-103(a)1

	The design reviewer(s) must be licensed professional engineers or licensed architects, or licensed contractors representing services performed by or under the direct supervision of a licensed engineer or architect, as specified in the provisions of Division 3 of the Business and Professions Code.	Do the Design Reviewer(s) meet these qualifications?	
		Yes	No
03	In addition, for buildings with >= 10,000 ft^2 but < 50,000^2, the design reviewer(s) shall be a qualified in-house engineer or architect with no other project involvement or a third party engineer, architect, or contractor	●	○
04	The design reviewer(s) for this project will be:	DANNY MCBRIDE	

Preliminary Construction Schedule

		Start Date	Completion Date
05	Schematic Design	2023-04-28	2023-06-29
06	Design Development	2023-07-05	2023-08-31
07	Construction Documents	2023-09-04	2023-12-06
08	Construction	2024-05-10	2025-06-30
09	Building Turnover	2025-07-01	2025-08-01

CERTIFICATE OF COMPLIANCE		NRCC-CXR-E
Project Name: PORTERVILLE FOURTH STREET COMMUNITY CENTER	**Report Page:**	**(Page 4 of 7)**
	Date Prepared:	2023-10-19T19:30:28-04:00

G. OWNER'S PROJECT REQUIREMENTS (OPR)

This table is only completed if an OPR document is not attached to permit application to demonstrate compliance with 120.8(b). If a specific field is not applicable to the project scope, "NA" is indicated in the table. Per 120.8(b), the OPR is to be completed before design begins. This may be done at the Design Review Kickoff Meeting (see Table F)

		YES	NO
01	Attaching Completed Owner's Project Requirements Document?	●	○
02	Owner's Project Requirements Document Authors and Roles	Danny McBride CBCP, BCxP - Author	

H. BASIS OF DESIGN (BOD)

This table is only completed if a BOD document is not attached to the permit application to demonstrate compliance with 120.8(c). If a specific field is not applicable to the project scope, "NA" is indicated in the table. Per 120.8(c), the BOD should be completed and updated during the design phase.

		YES	NO
01	Attaching Completed Basis of Design Document?	●	○
02	Basis of Design Document Authors and Roles	Danny McBride CBCP, BCxP - Author	

I. CONSTRUCTION DOCUMENT DESIGN REVIEW CHECKLIST

This table is only completed if a design review document is not attached to permit application to demonstrate compliance with 120.8(b) and 120.8(e). For buildings with >= 10,000 ft^2 conditioned floor area, the design review will ensure the construction documents meet the Owner's Project Requirements (Table G.) and the Basis of Design Documents (Table H.). For buildings with < 10,000 ft^2 conditioned floor area, the design review will ensure the construction documents meet the goals documented in Table F. during the Design Review Kickoff.

		YES	NO
01	Attaching Completed Design Review Documentation?	●	○

J. COMMISSIONING PLAN

This table is only completed if a Commissioning Plan document is not attached to permit application to demonstrate compliance with 120.8(f). Per 120.8(f), the Commissioning Plan is to be started during the design phase and a completed draft must be submitted with permit application

		YES	NO
01	Attaching Completed Commissioning Plan?	●	○
02	Commissioning Plan Authors and Roles	Danny McBride CBCP, BCxP - Author	

CERTIFICATE OF COMPLIANCE		NRCC-CXR-E
Project Name: PORTERVILLE FOURTH STREET COMMUNITY CENTER	**Report Page:**	**(Page 5 of 7)**
	Date Prepared:	2023-10-19T19:30:28-04:00

K. FUNCTIONAL PERFORMANCE TESTING

The table below is completed to demonstrate compliance with functional performance testing requirements per 120.8(g).

By checking this box, the responsible party[1] certifies that functional performance testing will be executed to demonstrate the correct installation and operation of each component, system and system-to-system interface in accordance with the acceptance test requirements in 120.5, 130.4 and 140.9. The functional performance testing reports shall contain information addressing each of the building components tested, the testing methods utilized, and include any readings and adjustments made.	01
	☒

The following acceptance tests have been identified as applicable to the project scope:[2]

02	03	04	05
System/ Equipment to be Tested	Brief description of functional performance test	Applicable Reference Appendix	Certified Acceptance Test Technician Required?
TEST AND BALANCE	TAB TESTING	NA7.5.3 Air Distribution	Yes

The acceptance tests required by Title 24, Part 6 outline the minimum functional performance testing scope to be conducted for compliance. However, the commissioning scope may include additional functional performance tests on systems or equipment not having acceptance tests required by Title 24 Part 6.

The following additional functional performance tests have been requested by the owner or owner's representative:

06	07
System/ Equipment to be Tested	Brief description of functional performance test
All HVAC COMPONENTS, ALL ELECTRICAL, LANDSCAPING, WATER AND HOT WATER SYSTEMS, ENVELOPE	RUN ALL SYSTEMS THROUGH ALL PHASES OF EXPECTED PERFORMANCE AND SEQUENCES OF OPERATION.

[1]FOOTNOTE: See the signature block on the last page of this compliance document for the responsible party.

[2]Required acceptance tests can be determined by reviewing the "Certificates of Acceptance" table on each Certificate of Compliance submitted for permit application.

L. DOCUMENTATION AND TRAINING

The table below is completed to demonstrate compliance with documentation and training requirements per 120.8(h)

By checking this box, the responsible party[1] certifies that a systems manual will be provided to the building owner or representative per 120.8(h)1.	01
	☒
By checking this box, the responsible party[1] certifies that a training of the appropriate maintenance staff for each equipment and system will be completed and documented in the commissioning report per 120.8(h)2. Training requirements should be included in the contract document in the specifications.	02
	☒

CERTIFICATE OF COMPLIANCE		NRCC-CXR-E
Project Name: PORTERVILLE FOURTH STREET COMMUNITY CENTER	**Report Page:**	**(Page 6 of 7)**
	Date Prepared:	2023-10-19T19:30:28-04:00

L. DOCUMENTATION AND TRAINING

[1] FOOTNOTE: See the signature block on the last page of this compliance document for the responsible party.

M. COMMISSIONING REPORT

The table below is completed to demonstrate compliance with commissioning report requirements per 120.8(i)

By checking this box, the responsible party[1] certifies that a complete report of commissioning process' activities undertaken through the design, construction and reporting recommendations for post-construction phases of the building project shall be completed and provided to the owner or owner's representative.	01 ☒

[1] FOOTNOTES: See the signature block on the last page of this compliance document for the responsible party.

N. DECLARATION OF REQUIRED CERTIFICATES OF INSTALLATION

There are no forms required for this project.

O. DECLARATION OF REQUIRED CERTIFICATES OF ACCEPTANCE

There are no forms required for this project.

CERTIFICATE OF COMPLIANCE		**NRCC-CXR-E**
Project Name: PORTERVILLE FOURTH STREET COMMUNITY CENTER	**Report Page:**	**(Page 7 of 7)**
Project Address:	**Date Prepared:**	2023-10-19T19:30:28-04:00

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Danny McBride	Documentation Author Signature:
Company: 3C Engineering Inc.	Signature Date: 10/20/2023
Address: 1500 PALM STREET	CEA/ HERS Certification Identification (if applicable):
City/State/Zip: SAN LUIS OBISPO, CA, 93401	Phone: 805.540.3363

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer)
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name:	Responsible Designer Signature:
Company: 3C Engineering Inc.	Date Signed: 10/20/2023
Address: 1500 PALM STREET	License: M34066
City/State/Zip: SAN LUIS OBISPO, CA, 93401	Phone: 805.540.3363

Owner Project Requirements

Porterville Fourth Street Community Center

3C | ENGINEERING

I. General Project Information

Project Name	**Porterville Fourth Street Community Center**
Project Address	N 4th Street, Porterville, Ca, 93257
Building Type / Occupancy Type	VB / A-3 & B
Building Description	One Story Community Center approximately 18,546 SF.
Owner Agency	City of Porterville
Schedule Completion Date	6/2025

II. Building Description and Intended Use

A. The Fourth Street Community Center in Town, CA is a community center to serve the community at N 4th St. The 18,546 SF facility is comprised of a mixture of spaces including a racquetball court that can serve as a community room, staff office space, interior restrooms as well as exterior accessible restrooms. The building will be a Type VB Construction and will provide space for Occupancy Groups A-3 & B. The Maximum occupancy for the space is 713 people.

III. Environmental and Sustainability Goals

A. The Porterville Fourth Street Community Center shall meet the 2022 California Green Building Standards and Energy Codes.

IV. Energy Efficiency Goals

A. The project shall meet the 2022 California Green Building Standards Code requirements.

B. Project to exceed Title 24 building efficiency standards to the level possible within the project budget and schedule.

1. Overall energy efficiency to meet or exceed Title 24.
2. Lighting system efficiency to meet or exceed Title 24.

C. HVAC equipment efficiency & characteristics

1. To meet code and as desired by owner.

2. Provide the most reliable and efficient products that fit within the owners budget and time constraints.

D. Cost-effective efficiency measures desired by owner consist of:

1. Orientate building to offer best use of available space.
2. Daylighting
    a. Provide efficient lighting, daylighting controls, master scheduling, and occupancy controls.
3. Building envelope construction for efficiency
    a. Exterior to consist of reliable materials.
    b. Utilize a cool roof where possible.
4. Ventilation
    i. Facility will utilize outside air economizers and power exhaust systems for energy efficiency and CO2 control.
    ii. Efficient mechanical units
    iii. Commissioning and scheduled maintenance
5. To consider on-site renewable power generation.
6. Utilize durable low water landscaping and shading where possible by the building.

V. Project Program

A. Facility will be occupied up to seven days a week beyond normal hours as demands/events arise.

B. Special events may require after-hours operation.

C. 18,546 square foot single story building.

D. Occupancy Type: A-3 & B

E. Construction Type: VB

F. No future expandability requirements currently.

G. Project must fit within the owner's budget.

VI. Indoor Environmental Quality Requirements

A. Indoor lighting requirements:

1. Lighting shall be adequate to perform specific tasks
2. Use high efficacy LED lighting

B. Occupant lighting control requirements:
   1. Occupancy sensors shall be used as required by code.
   2. Dimming controls, plus occupancy sensors dimming to 50% or less shall be used as required by code.
   3. Daylighting sensors and automatic dimming controls shall be used as required by code.
   4. Dimming controls shall be used as required by code, in all applicable areas.
   5. A lighting control panel will control the overall lighting schedule for all areas.
   6. The lighting control panel with a photocell and time clock shall control the exterior lighting.
   7. Demand-responsive controls will be implemented as required by code.

C. Thermal comfort requirements:
   1. No humidification control.
   2. Occupied Setpoints
      a. Heating setpoint of 68F
      b. Cooling dry bulb setpoint of 74F
   3. Un-occupied Setpoints
      a. Cooling setpoint of 85F
      b. Heating setpoint of 55F

D. Ventilation and filtration requirements:
   1. Standard to meet Title 24 standards
   2. Restrooms require one air change every five minutes, minimum

E. Occupancy HVAC control requirements:
   1. Programmable thermostats for temperature control
   2. Scheduling and setback functionality to comply with Title 24

F. Acoustic environment requirements:
   1. Interior noise level shall be less than 50 dB equivalent sound level to comply with Cal Green Code

VII. Equipment and System Expectations

A. Special HVAC equipment requirements:
   1. Provide the most reliable and efficient units that fit within the Owner's budget.

B. Special lighting equipment requirements:

1. Lighting shall meet code and align with the Owner's budget.

C. Landscaping system requirements

1. Landscaping irrigation is to be zoned and controlled to minimize water usage.

D. Building Management System

1. To be considered.

E. Building Security

1. Security options to be discussed.

VIII. Building Occupant

A. Day-to-day HVAC operation by:

1. Occupants through thermostats.

B. Periodic HVAC maintenance performed by:

1. At Owner's discretion

C. Lighting system maintenance will be performed by:

1. At Owner's discretion

D. Training required for building occupants:

1. The owner shall be provided with a training manual on HVAC and lighting operation procedures and recommended maintenance practices.

IX. Other Owner Requirements

A. None currently

X. Owner Approval

Signature _____ Date _____

Name _____

Basis of Design

Porterville Fourth Street Community Center

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Basis of Design

I. General Project Information

Project Name	**Porterville Fourth Street Community Center**
Project Address	N 4th Street, Porterville, Ca, 93257
Building Type	VB / A-3 & B
Building Description	One Story Community Center approximately 18,546 SF.
Owner Agency	City of Porterville
Schedule Completion Date	6/2025

II. Intent

A. Provide a written explanation of how the design of the building systems meets the OPR. The design team develops the BOD to describe how the building systems design meets the OPR, and why the systems were selected.

III. HVAC Systems and Controls

A. Narrative Description of System

1. Space conditioning for the community center is provided by Trane/Mitsubishi units with Heat Pump heating and cooling. Roof Top Units also have economizers and CO2 sensors for demand control ventilation and are controlled by Trane thermostats.

   a. Bathrooms will be conditioned by one 6-ton RTU with an EER of 15.5 providing 2,400 CFM to the area.

   b. The Teen Study Room will be conditioned by one 3-ton RTU with an EER of 12.1 providing 1,200 CFM to the area.

   c. The Teen Game Room will be conditioned by one 8.5-ton RTU with an EER of 11 providing 3,400 CFM to the area.

   d. The gym will be conditioned by two 25-ton RTU with an EER of 16.1 providing 10,000 CFM to the area.

e. Offices will be conditioned by one 3.5-ton Heat Pump Fan Coil Unit with an EER of 10.1 providing 1,485 CFM to the area with 200 CFM of Outside air.

f. The Racquetball Court will be conditioned by one 4.5-ton Heat Pump Fan Coil Unit with an EER of 11.3 providing 1,485 CFM to the area with 200 CFM of Outside air.

g. The Storage Room will be conditioned by one 3-ton Ductless Split Heat Pump Unit with 36,000 BTU Cooling providing 920 CFM to the area.

2. The Restrooms and Gym will also be serviced by Greenheck exhaust fans.

3. This system provides positive environmental benefits through high efficiency and reliability.

B. Reasons for System Selection

1. The HVAC systems described above were determined to meet the following criteria:

a. Owner's requirements and objectives for reduced energy consumption within the budget and schedule constraints.

2. Right sized for expected occupancy.

3. Ease of operation and maintenance.

C. Load Calculations

1. The load calculation method/software was completed by EnergyPro.

2. Summer outdoor design conditions (DBT, WBT):

a. 106°F DBT, 71°F WBT, ASHRAE 1.0% frequency

3. Winter outdoor design conditions (DBT):

a. 25°F DBT, ASHRAE 99.0% frequency

4. Indoor design conditions:

a. Comfort-conditioned spaces:

1. 74°F DBT cooling

2. 68°F DBT heating

5. Applicable Code

a. The 2022 CA Mechanical and Green Building Codes were used.

D. Sequence of Operations: Comfort-cooled Spaces

1. Occupied Period

a. Operating schedules for conditioned spaces shall be defined by the owner.

b. Power exhaust and economizers will provide code-required ventilation air.

c. Unit shall cycle to maintain space set point temperatures of 74°F (adjustable) cooling and 68°F (adjustable) heating.

d. Detection of smoke by duct smoke detector shall shut down the fan operation.

2. Occupied Cooling:

a. First stage cooling shall be 100% outside air economizer. The economizer shall be de-energized when outside air temperature is greater than return air temperature. Mechanical cooling shall be enabled when the outside air temperature is 68°F (adjustable) or greater. Power exhaust shall modulate to maintain a space pressure of 0.05" w.c. maximum.

3. Demand Control Ventilation (DCV):

a. CO2 sensor shall monitor CO2 levels in breathing zone of space. When CO2 levels exceed the code required amount the economizer shall be enabled to allow the outside air damper to open beyond minimum position, allowing additional outside ventilation air until the CO2 levels drop to acceptable levels, and all operations shall return to normal.

4. Heating:

a. On a call for heating, the heat pump shall be enabled.

5. Unoccupied Cooling:

a. System shall cycle to maintain a space set point temperature of 85°F (adjustable). Outside air damper shall be 100% closed.

6. Unoccupied Heating:

a. System shall cycle to maintain a space set point temperature of 55°F (adjustable). Outside air damper shall be 100% closed.

7. This system meets the OPR through the use of utilizing efficient and reliable units. Combining the power exhaust and economizers will help efficiency as well as handling the demand control ventilation.

IV. Indoor Lighting System

A. Narrative Description of System

1. Fixture types.
    a. LED
2. Control type
    a. Occupancy sensors in all required areas.
    b. Dimming controls for all spaces required by code.
    c. Dimming controls, plus occupancy sensors shall dim to 0-10 VDC in all required areas.
    d. Lighting control system to have demand responsive controls and reduce lighting power by a minimum of 15% below the total installed lighting power.
    e. Daylighting sensors and dimming controls are used in all applicable areas.
    f. The N-Light lighting control panel will control the entire building. Interior lights will automatically shut off during closed hours with a low voltage override.
    g. The lighting control panel with a photocell and time clock shall control the exterior lighting and turn it off during daylight hours.

B. Describe how the system meets special requirements in the OPR.
    1. The use of LED and fixtures combined with occupancy sensors, dimming controls, and network lighting controls throughout the facility enable satisfactory lighting while meeting the energy requirements.

C. Reasons for System Selection
    1. The selected fixtures and layout provide visual comfort performance, efficiency, reliability, flexibility, reasonable cost, and ease of maintenance.

D. Lighting Design Criteria
    1. Comply with 2022 California Green Building Standards and Energy Codes.

V. Water Heating Systems and Controls

A. Narrative Description of System
    1. The static water pressure for the building is 53.0 psi. Water demand is calculated at 96 WSFU and 66.3 GPM.
    2. Two Quantumflo booster pumps will be utilized to aid in low incoming water pressure.
    3. The DHW system is comprised of the following:

a. One 50-gallon Heat Pump Electric Storage Water Heater will be used to supply the building.

B. Reasons for System Selection

1. The system is well suited to the number of hot water fixtures and the frequency of use in the building and provides a good balance between cost and reliability.

C. Design Assumptions

1. Hot water supply temperature: 120°F
2. Calculated hot water demand (ASPE design standards): 16 GPM.
3. Water pressure (static): 53 PSI.
4. Public water supply
5. Applicable code: 2022 California Plumbing Code.

D. This system meets the OPR through the use of quality efficient materials that are properly sized to suit the demand of the facility. The heat Pump Water Heater provides additional efficiency.

VI. Landscape Irrigation Systems

A. Narrative Description of System

1. Irrigation system is all low water use irrigation. The valves are automatically controlled via schedule as well as rain sensor.
2. No special irrigation requirements listed in OPR beyond complying with applicable code.

B. Reasons for System Selection

1. Systems were designed for performance, efficiency, reliability, and ease of maintenance.

C. System Calculations

1. System sizing and design was based upon city standards, solar access, site layout, soil type and slope, water conservation, and ease of use.

VII. Envelope Design Considerations

A. This envelope consists of board formed concrete walls, metal panels, stucco, and Hardie panel.

VIII. Other Owner Requirements

A. None currently

IX. Owner Approval

Signature

Date

Name

CD Design Review

Porterville Fourth Street Community Center

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Construction Document Cx Design Review

I. General Project Information

Project Name	**Porterville Fourth Street Community Center**
Project Address	N 4th Street, Porterville, Ca, 93257
Building Type	VB / A-3 & B
Building Description	One Story Community Center approximately 18,546 SF.
Owner Agency	City of Porterville
Schedule Completion Date	6/2025

II. Overview

One of the responsibilities under 3C Engineering's commissioning process is to complete a review of the project design drawings and specifications, which also includes the owner's project requirements (OPR), basis of design (BOD), and the design documents.

The design review is to occur prior to the mid-construction document phase and is to focus on the following issues: Ensuring clarity, completeness, and adequacy of the OPR. Verifying that all issues discussed in the OPR are addressed adequately in the BOD, reviewing design documents for achieving the OPR, BOD and coordination of commissioned systems.

III. HVAC Systems Design and Controls Design

A. Describe how system meets special requirements in the OPR/BOD

1. This system meets the OPR & BOD through the use of high efficiency units that provide reliability and ease of maintenance while most importantly meeting the Owner's budget and time scheduling constraints.

IV. Indoor Lighting System and Controls Design

A. Describe how system meets special requirements in the OPR/BOD

1. The use of LED fixtures combined with occupancy sensors and dimming controls throughout the facility enable satisfactory lighting while meeting the energy requirements. Utilizing a lighting control panel will allow additional efficiency as well as ease of operation and maintenance.

V. Outdoor Lighting System and Controls Design

A. Describe how system meets special requirements in the OPR/BOD

1. The use of LED fixtures combined with astrological clocks will allow for satisfactory lighting while meeting energy requirements.

VI. Water Heating Systems and Controls Design

A. Describe how system meets special requirements in the OPR/BOD

1. The system is well suited to the number of hot water fixtures and the frequency of use in the building and provides a good balance between cost and reliability. The heat pump style water heater will provide additional savings and efficiency over utilizing point of use electric heaters.

VII. Landscape Irrigation Systems

A. Describe how system meets special requirements in the OPR/BOD

1. Systems meet the OPR/BOD by being designed for performance, efficiency, reliability, and ease of maintenance.
2. Durable, low water use plants will also aid in reducing water consumption.

VIII. Envelope

A. Describe how system meets special requirements in the OPR/BOD

1. Envelope systems meet the OPR/BOD by providing durable components necessary for a public place.
2. Cool roof utilized where available.

VIIII. Reviewer Signature

Danny McBride, BcxP, CBCP

3C Engineering Inc.

Preliminary Commissioning Plan

Porterville Fourth Street Community Center

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Commissioning Plan

I. General Project Information
II. Commissioning Overview
III. Systems to be Commissioned
IV. Commissioning Team Information
V. Role and Responsibilities
VI. Commissioning Process
VII. Schedule

Commissioning Plan

I. General Project Information

Project Name	**Porterville Fourth Street Community Center**
Project Address	N 4th Street, Porterville, Ca, 93257
Building Type	VB / A-3 & B
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Common Abbreviations

A/E	Architect and design engineers	FPT	Functional performance tests
CP	Commissioning provider	GC	General Contractor
CC	Controls Contractor	MC	Mechanical Contractor
CX	Commissioning	PF	Pre-Functional checklist
EM	Energy Manager	PM	Project Manager
CX Plan	Commissioning Plan Documents	SUBS	Subcontractor to General
EC	Electrical contractor	TAB	Test and balance contractor
MM	Maintenance Manager	STAFF	Maintenance Staff

II. Commissioning Overview

A. Purpose of Commissioning Plan

1. The purpose of the commissioning plan is to provide direction for the commissioning process during constructions, providing resolution for issues such as scheduling, roles and responsibilities, lines of communication and reporting, approvals, and coordination.

B. Commissioning Goals and Objectives

1. Commissioning is a systematic process of ensuring that the building systems perform according to the design intent and the owner's operational requirements. All equipment and systems should be installed according to manufacturer's recommendations and the best practices and standards of the industry. Commissioning will include document the design intent, followed by activities in the construction, acceptance, and warranty phases of the project. The participation of the contractors in the commissioning activities will follow the requirements defined in the specifications.
2. The three main goals of the commissioning process are:
    a. Facilitate the final acceptance of the projects at the earliest possible date.
    b. Facilitate the transfer of the project to the owner's maintenance staff.
    c. Ensure that the comfort systems meet the requirements of the occupants.

III. Systems to be Commissioned

The following marked systems will be commissioned in this project. All general references to equipment in this document refer only to equipment that is to be commissioned.

Equipment	Included in Scope
Package Heat Pump Units	X
Fan Coil Units	X
Heat Pump Condensing Units	X
Ductless Split Systems	X
Variable Frequency Drives	X
Mechanical Piping System	X
Ductwork	X
Economizers	X
Power Exhaust	X
Exhaust Fans	X
HVAC Control System	X
LIGHTING / ELECTRICAL	
Power Distribution	X
Sensors	X
Switches & Dimming Controls	X
Panels	X
Lighting	X
Lighting controls	X
DOMESTIC WATER	
Water Distribution / Piping	X
Drain/Waste/Vent Piping	X
Hot Water Systems	X
Heat Pump Water Heaters	X
Fixtures	X
IRRIGATION	
Irrigation Controls	X

Equipment	Included in Scope
Distribution	X
BUILDING ENVELOPE	
Roofing	X
Fenestration	X

IV. Commissioning Team Information

Function	Company	Name	Contact Info
Owner	City of Porterville	Sarah Weaver	sweaver@ci.porterville.ca.us
Project Manager	RRM Design Group	Michael Scott	mlscott@rrmdesign.com
Commissioning Agent	3C Engineering Inc.	Danny McBride	dmcrbride@3ceng.com
Architect	RRM Design Group	Michael Scott	mlscott@rrmdesign.com
Mechanical Engineer	3C Engineering Inc.	Brian Starrett	bstarrett@3ceng.com
Electrical Engineer	Rose Sing Eastham & Associates	Steve Eastham	seastham@rse-eng.com
Landscape Architect	RRM Design Group	Lance Wierschem	ldwierschem@rrmdesign.com

V. Role and Responsibilities

A. 4.1 General Management Plan

1. In general, the CXA coordinates the commissioning activities and reports to the owner's construction representative. The CXA's responsibilities, along with all other contractors' commissioning responsibilities, are detailed in the specifications. The Specifications will take precedence over this Commissioning Plan. All members work together to fulfill contracted responsibilities and meet the objectives of the Contract Documents.

B. 4.2 General Descriptions and Roles

Role	Description
CXA	Coordinates the CX process, writes and/or reviews testing plans, directs and documents performance testing.
PM	Facilitates and supports the CX process and gives final approval of the CX work.
MM	Coordinates maintenance staff participation in commissioning activities.
GC	Facilitates the CX process, ensures that Subs perform their responsibilities and integrates CX into the construction process and schedule.
SUBS	Demonstrate correct system performance.
STAFF	Participate in commissioning tasks and performance testing, review O&M documentation, attend training.
A/E	Perform construction observation, approve O&M manuals and assist in resolving problems.
MRF	Equipment manufacturers and vendors provide documentation to facilitate the commissioning work and perform contracted startup.

C. 4.3 General Management Plan and Protocols

1. The following protocols will be used on this project:

Issue	Protocol
For requests for information (RFI) of formal documentation requests:	The CXA goes first through the PM.
For minor or verbal information and clarifications:	The CXA goes direct to the informed party
For notifying contractors of deficiencies:	The CXA documents deficiencies through the PM, but may discuss issues directly with contractors before notifying the PM.
For scheduling functional tests or training:	The CXA provides input and coordination of testing and training. Scheduling is done through the PM.
For scheduling commissioning meetings:	The CXA selects the date and schedules through the PM.
For making a request for significant changes:	The CXA has no authority to issue change orders
For making minor changes in spec'd sequences of operations:	Any required changes in sequence of operations required to correct operational deficiencies must be approved and documented by the PM and A/E team. The CXA may recommend to the PM changes in sequences of operation to improve efficiency or control.
Subcontractors disagreeing with request or interpretations by the CXA shall:	Resolve the issues at the lowest level possible. First with the CXA, then with the GC and PM. Some issues may require input from the A/E team.

VI. Commissioning Process

The section sequentially details the CALGreen fundamental commissioning process by commissioning task or activity.

A. OWNER'S PROJECT REQUIREMENTS

1. The Owner's Project Requirements (OPR) is a step required for compliance with Section 5.410.2 Commissioning of the California Green Building Standards Code. The PM should lead the development of the OPR document. This document should be completed as early as possible during the project so that the design team can use it to develop their BOD document. The CXA will review the OPR document prior to the final accepted version and refer to this document throughout the design and construction process. The OPR should document:

   a. Owner and User Requirements

   b. Environmental and Sustainability Goals

   c. Energy Efficiency Goals

   d. Indoor Environmental Quality Requirements

   e. Equipment and Systems Expectations

   f. Building Occupant and O&M Personnel Expectation

B. Basis of Design

1. The PM shall develop the Basis of Design (BOD) with cooperation from the A/E to describe how the design of the building systems meets the OPR document. The BOD document should be developed during the project's design phase as early as possible and updated as necessary throughout the design process. The CXA will refer to this document throughout the project's design and construction commissioning process. The BOD should provide narrative descriptions, primary design assumptions, standards utilized for design, and document:

   a. Heating, Ventilation, Air Conditioning (HVAC) Systems (mechanical and passive) and Controls

   b. Indoor Lighting Systems & Controls

   c. Water Heating Systems

   d. Renewable Energy Systems (Solar, Wind, etc.)

   e. Landscape Irrigation Systems

   f. Water Reuse Systems

C. Pre-Commissioning Documentation Review & Initial Commissioning Plan

1. The CXA shall review the OPR and BOD for clarity and completeness. After the CXA has completed the pre-commissioning review process, the CXA shall draft an initial Commissioning Plan (CP) based upon the OPR and BOD. The CP describes the commissioning process that will be employed for this project.

D. Commissioning Scoping Meeting

1. The scoping meeting brings together all members of the design, construction, and operations team that will be involved in the commissioning process. Each building system to be commissioned is addressed, including commissioning requirements, and completion and start-up schedules. During the scoping meeting, all parties agree on the scope of work, tasks, schedules, deliverables, and responsibilities for implementation of the CP.

E. Final Commissioning Plan (Construction Phase)

1. The CXA finalizes the draft CP using the information gathered from the scoping meeting. The initial commissioning schedule is also developed along with a detailed timeline. The timeline is fine-tuned as construction progresses.

F. Submittals

1. The general contractor will provide the CXA with a set of equipment and system submittals. This equipment data includes installation and start-up procedures, O&M data, performance data and temperature control drawings. The subcontractors, general contractor or A/E notify the CXA of any new design intent or operating parameter changes, added control strategies and sequences of operation, or other change orders that may affect commissioned systems.

G. Site Observation

1. The CXA makes periodic site visits to witness equipment and system installations. Each site visit will have a specific agenda and will be coordinated with the GC site supervisor. The CXA attends selected planning and job-site meetings in order to remain informed on construction progress and to update parties involved in commissioning. The GC provides the CXA with information regarding substitutions or change orders that may affect commissioned equipment or the commissioning schedule.

H. Pre-functional Checklists and Startup Procedures

1. A Pre-Functional Inspection Checklist (PF) is developed and completed for all mechanical, plumbing and lighting equipment being commissioned. The PF captures equipment nameplate and characteristics data and confirms the as-built status of the equipment or system. The PF ensures that the systems are complete and operational and document the installation of components and completion of systems.

2. The PF is prepared by the CXA from manufacturer's data, drawings and specifications to include the required installation, checkout, and start up procedures. The installing SUBS date and initial the checklists as the construction and start-up is completed. The start-up procedures are developed by the SUBS and consist of the representative PF as well as the manufacturer's installation, start-up, and checkout procedures.

3. The CXA reviews and verifies the completed PF before scheduling the functional performance testing. The CXA observes a sampling of the pre-functional and start-up procedures.

I. Development of Functional Test and Verification Procedures

1. Functional performance testing (FPT) verifies the intended operation of individual components and system interactions under various conditions and modes of operation. The systems are run through all the sequences of operation and the response of components is verified. Testing proceeds from components to subsystems to systems, and finally to interlocks and connections between systems.

2. The CXA prepares FPT plans so that the complete sequence of operations is included. The CXA obtains all documentation, including an updated points list, control sequences, and set points. If necessary, the CXA may request clarifications from contractors and the A/E regarding sequences and operation. FPT plans will be based on requirements in the project's commissioning specifications (as applicable) as well as representative test procedure formats from other industry sources. Not all pieces of identical equipment receive in-depth testing, subject to Specification requirements and CXA judgment to minimize redundancy. Prior to execution, the CXA provides a copy of the primary equipment tests to the installing SUBS and GC who can review the tests for feasibility, safety, warranty, and equipment protection.

J. Execution of Functional Testing Procedures

1. The CXA schedules functional tests through the GC and SUBS. Under the supervision of the CXA, the installing subcontractor performs the hardware and/or software manipulations required for the testing. STAFF may also be present in order to assist in system observations. The CXA witnesses and records the results of FPT.

2. Any deficiencies found from FPT will be documented in a Deficiency Report. The report will include all details of the components or systems found to be non-compliant with the parameters of the FPT plans and design documents. The deficiency report will become part of the punch list. The report will detail the adjustments or alterations required to correct the system operation and identify the responsible party. The deficiency report will be continuously updated. The CXA schedules any required retesting through the GC. Decisions regarding deficiencies and corrections are made at as low a level as possible, preferably between CXA, SUBS and GC.

K. Operation and Maintenance Manuals

1. The operation and maintenance manuals prepared by the contractors for the STAFF are reviewed for completeness. The contractors are encouraged to submit O&M manuals at the earliest possible date. Materials may be added, or requested from the contractors, to stress and enhance the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. A database of preventative maintenance information may also be created from the materials in the O&M manuals.

L. Training and Orientation of Owner Personnel and Occupants

1. Effective maintenance personnel training is critical to the long-term performance of the new building. The CXA will assist the owner and GC in organizing the training sessions by identifying the appropriate STAFF for each session and creating an overall training plan. For each training session, the contractors provide a detailed agenda for each piece of equipment or system for which training is required. The agenda describes the training scope, duration, and methods, along with the name and qualifications of the trainers. The CXA develops a plan for including in the training session contractors / trainers from different disciplines, when appropriate. The trainer documents each training session (duration, general subjects covered, and attendees). The CXA may witness any of the training sessions.

M. Warranty Period

1. Seasonal variation in operations or control strategies may require additional testing during peak cooling and heating seasons to verify system performance. During the warranty period, seasonal testing and other deferred testing is completed as required to fully test all sequences of operation. The CXA coordinates this activity. Tests are executed and deficiencies corrected by the appropriate subcontractors, witnessed by STAFF and the CXA. Any final adjustments to the O&M manuals and as-builts due to the testing are made.
2. The CXA will request input from the STAFF and occupants about the performance of the building systems. The CXA also supports the GC's troubleshooting process during the warranty period. The GC's warranty team will first try and resolve the issues before requesting assistance from the CXA.

N. Commissioning Report

1. A final Commissioning Report will be compiled which summarizes all of the tasks, findings, and documentation of the commissioning process. The report will address the actual performance of the building systems in reference to the design documents. All test reports by various sub-contractors, manufacturers and controlling authorities will be incorporated into the final report. The commissioning report includes:
   a. An evaluation of the operating condition of the systems at the time of functional test completion,
   b. Deficiencies that were discovered and the measures taken to correct them,
   c. Functional test procedures and results,
   d. Reports that document all commissioning field activities as they progressed, and
   e. A description and estimated schedule of required deferred testing.

VII. Schedule

A. General Issues: The following sequential priorities are followed:

1. Equipment is not "temporarily" started (for heating or cooling), until pre-start checklist items and all manufacturer's pre-start procedures are completed and moisture, dust and other environmental and building integrity issues have been addressed.

2. Functional performance testing does not begin until pre-functional, start-up and TAB is completed for a given system.

3. The controls system and equipment it controls are not functionally tested until all points have been calibrated and pre-functional checklists are completed.

B. Project Schedule

Preliminary Commissioning Schedule

Commissioning Activity	*Duration*	*Estimated Start Date*	*Estimated Finish Date*
Document and design intent and BOD	9 Weeks	4/28/2023	6/29/2023
Commissioning Plan	3 Weeks	7/1/2023	7/21/2023
Scoping Meeting	1 Day	4/28/2023	4/28/2023
Design Review	2 Weeks	8/4/2023	8/14/2023
100% CD Submittal	1 Day	12/6/2023	12/6/2023

SOILS ENGINEERING, INC.

GEOTECHNICAL INVESTIGATION

FOR THE

FOURTH STREET COMMUNITY CENTER AND PARK

SOUTHEAST CORNER OF N. 4TH ST. & E. HENDERSON AVE.

PORTERVILLE, TULARE COUNTY, CA

Prepared for:

RRM Design Group
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By:

SOILS ENGINEERING, INC.
SEI File 22-18633
January 13, 2023

On Man Lau, P.E., G.E.
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GEOTECHNICAL INVESTIGATION

FOR THE

FOURTH STREET COMMUNITY CENTER AND PARK

SOUTHEAST CORNER OF N. 4TH ST. & E. HENDERSON AVE.

PORTERVILLE, TULARE COUNTY, CA

SOILS ENGINEERING, INC.
File 22-18633
January 13, 2023

INTRODUCTION

At your request, Soils Engineering, Inc. has prepared this Geotechnical Investigation for the subject site. This report includes recommendations for the site preparation and grading and for foundation design.

Appendix A, "Guide Specifications for Earthwork," is provide as supplement to Section I, "Earthwork," in the recommendations of the report.

Appendix B, "Field Investigation," contains a boring location map, Figure 1, and Logs of Test Borings, Figures 2 through 11.

Appendix C, "Soils Test Data," contains tabulations of laboratory test data.

Appendix D, "Seismic Investigation," contains information provided by EQFAULT, and the USGS.

We hope this provides the information you require. If you have any questions regarding the contents of our report, or if we can be of further assistance, please contact us.

Respectfully submitted,
SOILS ENGINEERING, INC.

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SITE INFORMATION

A. SITE LOCATION AND CONDITIONS

The Fourth Street Community Center and Park (2883-01-RC22) Project is located on the Southeast Corner of North 4th St & E. Henderson Ave. in Porterville, Tulare County, California. The project will include the new community center, along with a playground, picnic shelter, walkway, and various other park features. Other improvements are anticipated to include utilities, light poles, landscaping, hardscaping, and pavement for the new parking lot. Currently the site is mostly vacant land with the Rails to Trails Parkway trail snaking through the site trending north-south with landscaping and trees directly adjacent to it. There are also utilities on the northwest corner of the site and above ground pipes that go underground on the northwest portion of the site along the western border. Adjacent improvements include residential properties to the west, commercial properties & a storage yard border the property to the east, E Henderson Ave borders the site to the north, and the continuation of the Rails to Trails Parkway along with vacant land borders the site to the south.

Overall, the site appears to be relatively flat consisting mostly of a dirt ground surface and a paved surface on the existing trail.

B. GEOLOGIC SETTING

According to the 2010 Geologic Map of California the zone of influence for the proposed construction is located wholly within Pleistocene marine and nonmarine sedimentary rock deposits (Qoa) within the eastern portion of the southern San Joaquin Valley. Although the site is not located in an Alquist-Priolo (earthquake fault) Special Study Zone, there are various earthquake faults in the vicinity. Nearby faults, with distances from the site, are tabulated below.

Kern Front	15.3	miles/	24.7	kilometers
Great Valley 14	52.9	miles/	85.2	Kilometers
Whtie Wolf	56.0	miles/	90.1	Kilometers

The largest estimated maximum site acceleration, based on deterministic methods, is 0.1596g from a 6.3 magnitude earthquake on the Kern Front Fault approximately 24.7 kilometers away. The information above is from the program EQFault (vers.3.0) and a complete listing of faults within 100-miles is presented in Appendix D.

C. SUBSURFACE CONDITIONS

Surface soils encountered in our field investigation consisted predominately of a light yellowish brown to brown, loose to medium dense, dry, and fine Silty Sand and alternating layers of a light brown to brown, dry, low plasticity, and stiff Sandy Silt/Silt. These soil layers are underlain by a red brown, dry to damp, low to high plasticity, and very stiff to hard Clay in most of the borings. These soils are classified as SM, ML and CL respectively, in the Unified Soil Classification System (USCS).

Testing performed in our laboratory showed Expansion Indexes (EI) between 0 and 47; which indicates a low to medium expansion potential. Expansive soils are defined in the 2019 California Building Code (CBC), Section 1803A.5.3. Soils are considered to be expansive when the EI result is greater than 20, per ASTM D4829, Expansion Index of Soils. Design of foundations for structures shall be designed in accordance with the 2019 CBC, Sections 1808A.6.1, & 1808A.6.2.

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The majority of the near surface soils should provide adequate support for the proposed structures provided that a portion of the surface soils are excavated and compacted as outlined in the earthwork recommendations of this report. Detailed descriptions of the various soils encountered during our field investigation are shown on Figures 2 through 11 in Appendix B, "Field Investigation." A "Key to Symbols" legend describing the symbols in the boring logs is also attached.

D. GROUNDWATER

Groundwater was not encountered in any of the boring (B-1 to B-10) during the field investigation to a depth of 21.5 feet bgs. According to maps prepared by the State of California, and presented on the SGMA Data Viewer, the depth to water was 137' in the Spring of 2022 and 42' in the Spring of 2012 near the site. Accordingly, groundwater should have no effect on site preparation, grading, or foundation design.

E. SEISMIC DESIGN VALUES

The seismic design values presented in the table below are based on the 2022 CBC. The Site Class for the proposed project is a Site Class "D" in accordance with the 2022 CBC §1613.2.2, soil boring data and local knowledge. The site is not located within an Alquist-Priolo (earthquake fault) Special Study Zone.

SEISMIC DESIGN CRITERIA		VALUE	SOURCE
Risk Category		**II**	2022 CBC Table 1604.5 or 1604A.5
Site Class		**D**	2022 CBC §1613.2.2 or 1613A.2.2; ASCE 7-16 Table. 20.3-1; Site Specific Soils Report, and local knowledge.
Mapped MCER Spectral Response Acceleration, short period	**S_S**	**0.574g**	SEAOC-OSHPD software; 2022 CBC Figure 1613.2.1(1)
Mapped MCER Spectral Response Acceleration, at 1-sec. Period	**S_1**	**0.223g**	SEAOC-OSHPD software; 2022 CBC Figure 1613.2.1(2)
Site Coefficient	**F_a**	**1.341**	SEAOC- OSHPD software; 2022 CBC Table 1613.2.3(1) or 1613A.2.3(1)
Site Coefficient	**F_v***	**2.154***	2022 CBC Table 1613.2.3(2) or 1613A.2.3(2)
Adjusted MCER Spectral Response Acceleration, short period, F_a * S_s	**S_{MS}**	**0.769g**	SEAOC- OSHPD software; 2022 CBC §1613.2.3 or 1613A.2.3
Adjusted MCER Spectral Response Acceleration, 1-sec. period, F_v * S_1	**S_{M1}***	**0.480g***	2022 CBC §1613.2.3 or 1613A.2.3
Design Spectral Response Acceleration, short period, 2/3 * S_{MS}	**S_{DS}**	**0.513g**	SEAOC- OSHPD software; 2022 CBC §1613.2.4 or 1613A.2.4
Design Spectral Response Acceleration, 1-sec. period, 2/3 * S_{MI}	**S_{D1}***	**0.320g***	2022 CBC §1613.2.4 or 1613A.2.4
Peak Ground Acceleration for Max. Considered Earthquake (MCEG)	**PGA**	**0.248g**	SEAOC- OSHPD software; ASCE 7-16 Fig 22-9
Site Coefficient, F_{PGA} = 1.352 F_{PGA}* PGA	**PGA_M**	**0.335g**	SEAOC- OSHPD software; ASCE 7-16 §11.8.3.2
Mapped Risk Coefficient at 0.2 second Spectral Response Period	**C_{RS}**	**0.928**	SEAOC- OSHPD software; ASCE 7-16 Figure 22-18A
Mapped Risk Coefficient at 1 second Spectral Response Period	**C_{R1}**	**0.94**	SEAOC- OSHPD software; ASCE 7-16 Figure 22-19A

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SEISMIC DESIGN CRITERIA		VALUE	SOURCE
Seismic Design Category, short period		**D**	2022 CBC §1613.2.5
Seismic Design Category, 1second period *		**D***	2022 CBC §1613.2.5
MCER = Maximum Considered Earthquake (risk targeted) MCEG = Maximum Considered Earthquake (geometric mean)			
** The project designer shall confirm that a ground motion hazard analysis is not required in accordance with ASCE 7-16 §11.4.8-Exception 2. The values tabulated above for S_{M1}, S_{D1}, and the Seismic Design Category/1-second period are based on the site coefficient, F_v, interpolated from 2022 CBC Table 1613.2.3(2) or 1613A.2.3(2). The use of that table is predicated on the above referenced Exception 2 being applicable for the site and the structure(s). Where the above referenced Exception 2 does not apply, the values for F_v, S_{M1}, S_{D1}, and for the Seismic Design Category/1-second period may not be applicable for the site and structure(s).*			

EARTHWORK RECOMMENDATIONS

"Earthwork Specifications," in Appendix A are provided for general guidance in preparing site grading plans. In addition, the following specific recommendations are provided and supersede the latter wherever discrepancies may exist:

A. COMPACTION AND OPTIMUM MOISTURE

Unless otherwise specified herein, the terms "compaction" or "compacted", wherever used or implied in this report, should be interpreted as compaction to ninety percent (90%), or greater, of the laboratory maximum density (as determined in accordance with ASTM Test Method D1557). The term, “Optimum Moisture,” wherever use or implied within this report, should be interpreted as that obtained by the above-described test method.

B. STRIPPING

Prior to soil compaction, existing ground surfaces should be stripped of surface vegetation. A stripping depth of one in should be adequate. In no instance should material which has been stripped be used as engineered fill or blended with and compacted in original ground.

C. GROUND SURFACE PREPARATION

Proposed Structure Areas:

Ground surfaces in the proposed structure/building areas shall be compacted in accordance with the following procedures:

1. Excavate earth material to a minimum depth of four (4) feet below existing grade in the proposed structure/building area or one (1) foot below bottom of proposed foundations, whichever is deeper.

2. The bottom of the excavation shall be reviewed by the soil engineer or his or her representative prior to any backfill operations. The top eight (8) inches of materials exposed at the bottom of the excavation shall be scarified and compacted to a minimum of 90 percent of ASTM D1557.

3. Moisten excavated and imported soils to near optimum moisture consistent with effective compaction and soil stability. Compact moistened soils to a minimum of 90 percent of the maximum density obtained by ASTM Test Method D1557.

4. Work to lines at least five (5) feet beyond the outside edges of exterior footings.

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5. The upper two (2) feet of the finish subgrade should be non-expansive soil. The on-site soil with Expansion Index greater than 20 must be placed two (2) feet below finish subgrade.

Proposed Exterior Concrete Flatwork Areas:

Ground surfaces in the proposed exterior concrete flatwork areas shall be compacted in accordance with the following procedures:

1. Excavate earth material to a minimum depth of 12 inches below existing grade in the proposed concrete flatwork areas or one (1) foot below bottom of proposed concrete, whichever is deeper.

2. The bottom of the excavation shall be reviewed by the soil engineer or his or her representative prior to any backfill operations. The top eight (8) inches of materials exposed at the bottom of the excavation shall be scarified and compacted to a minimum of 90 percent of ASTM D1557.

   Moisten excavated and imported soils to near optimum moisture consistent with effective compaction and soil stability. Compact moistened soils to a minimum of 90 percent of the maximum density obtained by ASTM Test Method D1557.

4. Work to lines at least two (2) feet beyond concrete edges.

5. The upper one (1) foot of the finish subgrade should be non-expansive soil. The on-site soil with Expansion Index greater than 20 must be placed two (2) feet below finish subgrade.

Review of Excavation Bottoms:

Prior to placement of backfill, excavation bottoms shall be reviewed for indications of loose-fill, discoloration, or loose, compressible, native materials. Where these are encountered, they should be excavated and removed, or excavated and compacted as directed by the geotechnical engineer.

Excavation of native soils shall continue in vertical increments of one foot until relative compaction tests taken at the bottom of the working surface (excavation bottom) equal or exceed 80% relative compaction.

Fill placement in excavations shall not proceed until the geotechnical engineer or his or her representative on the site has reviewed, tested as described above and accepted materials exposed at the bottom of the excavation.

Pavement Areas:

Ground surfaces to receive concrete driveways or bituminous pavements should be scarified and compacted to a minimum depth of 12 inches below the grading plane in cut areas or to 12 inches in areas to receive fill. Engineered fill placed in proposed pavement areas should conform to the requirements of Section 5.4, "Placing, Spreading and Compacting Fill Materials," of Appendix A. Compaction in proposed pavement areas should be a minimum of 90 percent of the maximum density as obtained by ASTM Test Method D1557 and should extend to a minimum of two feet beyond the outside edges of pavements. The top eight (8) inches of subgrade below the grading plane shall be compacted to a minimum of 95%.

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Utility Lines:

Backfill for utility lines traversing areas proposed for facilities, pavements, concrete slabs-on-grade, or areas to receive engineered fill for future construction should be compacted in accordance with the same requirements for adjacent and/or overlying fill materials. Compaction should include haunch area, spring line, and from top of pipe to finished subgrade. The haunch area up to one foot above the top of the pipe should be backfilled with "cohesionless" material.

Cohesionless native materials may be used for trench and pipe or conduit backfill. The term "cohesionless," as used herein, is defined as material which when dry, will flow readily in the haunch areas of the pipe trench. Pipe backfill materials should not contain rocks larger than two inches in maximum dimension. Where adjacent native materials exposed on the trench bottoms contain protruding rock fragments larger than two inches in maximum dimension, conduits and pipelines should be laid on bedding consisting of clean, cohesionless sand (SP), in the Unified Soils Classification System.

Compaction Requirements - where not otherwise specified in our plans or in these recommendations, the following compaction requirements are applicable to all electrical, gas or water conduits:

TABLE A
COMPACTION DEPTH

Area	Haunch to 1 ft. Above Top of Pipe	1 ft. Above Top of Pipe to 2'6" Below Finished Grade	2'6" Below Finished Grade to Finished Subgrade
Structures	90%	90%	90%
Pavements	90%	90%	90%
Non-Structural	90%	90%	90%

D. ENGINEERED FILL

Earth materials obtained on-site are acceptable for use as engineered fill provided that all grasses, weeds and other deleterious debris are first removed. Engineered fill materials should be placed in thin layers (less than ten inches uncompacted thickness), brought to near the optimum moisture content or to a moisture content commensurate with effective compaction and soil stability, and compacted to a minimum of 90 percent of the maximum density obtainable by ASTM Test Method D1557, "Placing, Spreading and Compacting Fill Materials," in Appendix A.

E. IMPORTED FILL

The table shown below provides general guidelines for acceptance of import engineered fill. Materials of equal or better quality than on-site material could be reviewed by the Geotechnical Engineer of Record (GEOR) on a case-by-case basis. No soil materials shall be imported onto the project site without prior approval by the GEOR. Any deviation from the specifications given below shall be approved by the GEOR prior to import operations.

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Maximum Percent Passing #200 Sieve 40
Maximum Percent Retained 3" Sieve..... 0
Maximum Percent Retained 1½" Sieve for Building Footing Zones..... 15
Maximum Percent Retained ¾" Sieve for Landscape Areas 5
Maximum Percent Retained ½" Sieve for Play Fields..... 0
Maximum Liquid Limit 40
Maximum Plasticity Index..... 14
Minimum R-Value for Pavement Areas..... 50
Maximum Expansion Index (per 2019 CBC)..... 20

Furthermore, the soils proposed for import shall be generally homogenous and shall not contain cemented or clayey and/or silty lumps larger than one inch. When such lumps are present, they shall not represent more than ten percent (10%) of the material by dry weight. Where a proposed import source contains obviously variable soils, such as clay and/or silt layers, the soils which do not meet the above requirements shall be segregated and not used for this project or the various layers shall be thoroughly mixed prior to acceptance testing by the Geotechnical Engineer.

The contractor shall provide sufficient advance notice, prior to import operations, to allow testing and evaluation of the proposed import materials. Because of the time needed to perform the above tests, the contractor shall provide a means by which the Geotechnical Engineer or others can verify that the soil(s) which was sampled and tested is the same soil(s) which is being imported to the project.

F. DRAINAGE

Finished ground grades adjacent to the proposed buildings should be sloped to provide positive free drainage away from the foundations. No areas should be constructed that would allow drainage generated on the site, or water impinging upon the site from outside sources to pond near footings and slabs or behind curbs. Where ground surfaces adjacent to subsurface walls are to be landscaped, walls should be waterproofed. Installation of gravel-filled drains to route subsurface drainage away from walls will reduce the thickness of damp-proofing resulting in a considerable savings.

FOUNDATION RECOMMENDATIONS

Spread Footings – The proposed foundation could be supported on continuous spread footings in accordance with the following Table B:

TABLE B
FOUNDATION DESIGN CRITERIA

Footing Type	Minimum Width (ft.)	Minimum Depth Below Lowest Adjacent Subgrade (ft.)	Maximum Allowable Soil Bearing Pressure (lbs./sq.ft.)
Continuous	1	1	2500
Isolated	1	1	2500

Bearing pressures given are for the minimum widths and depths shown above.

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Bearing pressures given above are for dead and sustained (loads acting most of the time) live loads; they may be increased by one-third for wind and/or seismic loading conditions.

The proposed foundations shall be reinforced in accordance with the structural engineer's recommendations.

Settlement:
Provided maximum allowable soil bearing pressures given above are not exceeded, total settlement should not exceed one inch. A major portion two-thirds to one-half of total settlement should occur before the end of construction. Differential settlements should occur before the end of construction. Differential settlements should, accordingly, be less than one-half of an inch for a horizontal span of twenty feet.

Cast-In-Drilled (CIDH) Piles – As general guidance structures may be supported on straight-shafted drilled piers combined with grade beams. Casing may be needed to stabilize the shaft for the proposed piers. Pier design criteria are given below:

1. Lateral Bearing Pressure: We recommend lateral bearing pressure of 150 psf/ft. The lateral bearing pressure can be increased for each additional foot of depth to a maximum of 15 times of the value with maximum lateral bearing pressure of 2,250 psf. In addition, per Section 1806A.3 of the **2022 CBC**, the allowable bearing pressure can be doubled if the proposed caisson/pile is not affected by 0.5-inch motion at the ground surface due to short-term lateral loads. These values should be reduced if downward sloping ground conditions exist. Also, these values may be increased by 1/3 for short-term duration such as seismic loads.

2. Friction Values: We recommend allowable friction value (down) or skin friction (fs) of 300 psf. This value is for dead load plus live loads and can be increased by 1/3 for the total of all loads, including wind or seismic forces. We recommend allowable friction value (Up) Uplift value of 220 psf.

   The top one foot (1.0') of the below-grade portion of the pier shall be excluded when determining the pier frictional resistance. In the event that steel casing is required to drill the piers and the casing is to remain in place, the friction values above shall be reduced by one third.

3. Minimum Penetration: The piers should extend a minimum of six (6) feet below adjacent subgrade or per the structural engineer's recommendations. Minor deviations from the recommended caisson depths may be necessary upon field review of the drilled caissons.
4. Minimum Diameter: The recommended minimum diameter for friction piers is 18 inches.

5. Concrete Placement: All concrete should be placed in one continuous operation. Vibration to consolidate concrete should be provided. When a casing is used to stabilize the shaft, an adequate height of concrete should be maintained above the bottom of the casing while it is gradually withdrawn. Concrete should be placed as quickly as possible following review, by the Geotechnical Engineer or his representative, of the completed excavation and cleaning.

   Uncased excavations should not be permitted to remain open overnight. Adequate devices should be used to guide the fall of concrete in the pier and prevent it from striking the shaft walls, entraining soil or promoting sloughing during placement.

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6. Construction Review and Observations: The Geotechnical Engineer should provide continuous review of pier drilling and concrete placement. The Geotechnical Engineering should also retain the option of reviewing individual piers and requesting minor depth variations when warranted by changes in soil conditions from those assumed during the preparation of this Geotechnical Investigation Report.

MODULUS OF SUBGRADE REACTION

Modulus of subgrade reaction for use in design of foundations is based on ranges of values for different soil types provided by Foundation Analysis and Design by Joseph E Bowles.[1] Equation 1 should be used for footings on sandy soils. Foundations on clay soils should employ Equation 2. Equation 3 is for rectangular footings having dimensions w= **b** (width) and l = **mb** (length) the variable "m" being the ratio of the length to the width of the foundation**.** $\mathbf{K_{s1}}$ is the modulus of subgrade reaction from the source referenced above based on a 1-foot x 1-foot square plate. For general guidance $\mathbf{K_{s1}}$ of 150 kcf may be used for the subsurface sandy soils.

Equation (1) $$k_{sf} = K_{s1} \times \left(\frac{B+1}{2B}\right)^2$$

Equation (2) $$k_{sf} = K_{s1} \times B$$

Equation (3) $$k_{sf} = K_{s1} \times \frac{m+.5}{1.5 \times m}$$

Values given above should be used for guidance. Local values may be higher or lower and should be based on results of in-situ plate bearing tests performed in accordance with ASTM Test Method D1194.

LATERAL EARTH PRESSURES

Lateral earth pressures and friction coefficients for determining the passive lateral resistance of foundations against lateral movement and the active lateral forces against retaining walls and subsurface walls, expressed as equivalent fluid pressures, are given below in Table C. Lateral earth pressures were computed assuming that backfill materials are essentially free draining and level; and that no surcharge loads, or sloping backfills are present within a distance from the wall equal to or less than the height (H)* of the wall.

(H)* = the height of backfill above the lowest adjacent ground surface.

TABLE C
LATERAL EARTH PRESSURE

Case	Lateral Earth Pressures
Active	40 P.C.F
Passive	390 P.C.F.
At-Rest	50 P.C.F.

Active Case: Active lateral earth pressures should be used when computing forces against free standing retaining walls, unrestrained at the tops. Active pressures should not be used where tilting outward of the walls is greater than .002H would not be desirable.

[1] Bowles, Joseph E; FOUNDATION ANALYSIS AND DESIGN; McGraw-Hill Book Company (1977); Table 9-1 pg. 269

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Passive Case: Passive lateral earth pressures should be used when computing the lateral resistance provided by undisturbed or compacted native soils against the movement of footing. When computing passive resistance, the upper one foot of embedment depth should be discounted.

At-Rest Case: At-rest pressures should be used for subsurface walls restrained at their tops by floor diaphragms or tiebacks and for retaining walls where tilting outward greater than .002 H would not be desirable.

Frictional Resistance: A friction coefficient of **0.4** may be used when computing the frictional resistance to sliding of footings, grade beams, and slabs-on-grade. Frictional resistance and passive lateral soil resistance may be combined without reduction.

SLABS-ON-GROUND

Slabs-on-ground may be supported on earth materials prepared in accordance with the recommendations of this Geotechnical Investigation.

Moisture protection between the soil and the interior slabs-on-ground is recommended. For exceptions to slab moisture protection, refer to the 2022 California Building Code, §1907.1. The project designer should provide specific details regarding construction of the concrete slab-on-ground, including the moisture barrier or vapor retarder/barrier, capillary break (if included), and blotter material (if included). The American Concrete Institute recommends a minimum moisture vapor retarder of 10 mil thick polyethylene. The vapor retarder should be protected from damage. Punctures and tears should be repaired prior to concrete placement. It is our opinion that existing soil and groundwater conditions do not warrant the inclusion of a capillary break.

It has been common local practice to use a sandy material as a blotter layer between the moisture barrier and the concrete to absorb some of the bleed water and to potentially reduce slab curling. However, a blotter layer may act as a moisture reservoir. If that occurs, all apparent advantages of its use are negated. A blotter layer should not be incorporated into the section design for moisture-sensitive slabs if it cannot be kept dry prior to concrete placement or if water may migrate into the layer after slab construction (e.g., wet curing, rainfall). If the slab-on-ground section is to include a blotter layer between the moisture barrier and the concrete, it is our recommendation that the blotter material consist of crusher fines (rock dust) or sand with angular, interlocking grains. The material should be easily compacted and should be screened so that 100% of the material is finer than ¼". Do not use blotter material which may be potentially reactive with the alkalis in the concrete, or which has high sulfate content. At the time of concrete placement, the blotter material should be dry to damp, compact, and smooth. For slabs which are to be water-cured, a blotter layer should not be used. For further consideration, refer to the American Concrete Institute *Manual of Concrete Practice 302.1R and 360.*

Slab thicknesses, reinforcing, and the concrete characteristics should be in accordance with the project designer's recommendations. The 2019 California Building Code, §1907.1 requires that the slab thickness be not less than 3½".

Pressurized water lines should not be installed beneath slabs-on-ground. Where pressurized water lines must be routed beneath the slab, they should be routed entirely inside continuous sleeves with both ends open to the atmosphere above the slab surface. Gravity flow sewer lines may underlie slabs-on-ground, but they should be routed to the exterior point of connection by the shortest feasible path.

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SOIL CORROSIVITY

Soluble Sulfates (SO_4)

The highest Sulfate (SO_4) concentration measured was 35 ppm.

Based on Table 19.3.1.1 "Exposure categories and classes" of ACI 318-14 "Building Code Requirements for Structural Concrete" the soil exposure is classified as S0. Per Table 19.3.2.1 "Requirement for Concrete by Exposure Class" of the same reference, no restriction applies to the cement type or mix design.

Chlorides (Cl)

The highest Chloride (Cl) concentration measured was 29 ppm. Generally, chloride concentrations greater than 500 ppm are considered to be corrosive to foundation elements. (Ref: Caltrans Corrosion Guidelines / Version 1.0)

pH

The soil pH results measured between 8.07 and 8.22. Generally, a pH level less than 5.5 are considered to be corrosive to foundation elements. (Ref: Caltrans Corrosion Guidelines / Version 1.0)

Although preliminary test results indicate that soil corrosivity at the locations and depths tested is low to negligible, if the site grading operations will result in a blend of native and/or imported materials at finished subgrade elevations, additional tests should be performed after rough grading has been completed and prior to concrete and/or mechanical design.

PAVEMENT SECTION RECOMMENDATIONS

Two (2) borings were drilled to a maximum depth of five (5) feet below existing grade. Bore locations are shown on the attached Boring Location Map, Figure 1.

Asphalt Concrete Pavement:
Hot Mix Asphalt (HMA) pavement shall be designed based on the (R) Value test result of 25. The laboratory test report is provided as Figure D-1.

Based on an R-value of 25 the following pavement sections corresponding to the following Traffic Index are as follows:

Traffic Index of 5:	3.0 inches of HMA and 6.0 inches of Class II Aggregate Base
Traffic Index of 6:	3.5 inches of HMA and 9.0 inches of Class II Aggregate Base
Traffic Index of 7:	4.0 inches of HMA and 12.0 inches of Class II Aggregate Base

HMA design should meet the requirements of the 2010 or newer, State of California, Standard Specifications Manual (SSM), Section 39. Aggregate Base should also meet the Class 2 requirements of the SSM, Section 26.

These recommendations are valid only if the pavement is properly drained and shoulder areas are graded to prevent water ponding at pavement edges. All construction should be subject to adequate tests and observations to verify conformance with these recommendations.

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LIMITATIONS, OBSERVATION, AND TESTING

Conclusions and recommendations in this report are given for Fourth Street Community Center and Park (2883-01-RC22) located at the Southeast Corner of N. 4th St. & E. Henderson Ave, Tulare County, California and are based on the following:

a. The information retrieved from ten (10) exploratory borings drilled at the subject site to a maximum depth of 21.5 feet below the existing ground surface.

b. Our laboratory testing program results.

c. Our engineering analysis based on the information defined in this report.

d. Our experience in the Tulare County area.

Variations in soil type, strength and consistency may exist between specific boring locations. These variations may not become evident until after the start of construction. If such variations appear, a re-evaluation of the soils test data and recommendations may be necessary. Unless a Geotechnical Engineer of this firm is afforded the opportunity to review plans and specifications, we accept no responsibility for compliance with design concepts or interpretations made by others about foundation support, fill selection, fill placement or other recommendations presented in this report.

Changes in conditions of the subject property can occur with time because of natural processes or the works of man on the subject site or on adjacent properties. Changes in applicable engineering and construction standards can also occur as the result of legislation or from the broadening of knowledge. Accordingly, the finding of this report may be invalidated, wholly or in part, by changes beyond our control. Therefore, this report is subject to review and should not be relied upon without review after a period of two years or after any modifications to the site.

REVIEW OF EARTHWORK OPERATIONS

Review of earthwork operations relating to site clearing, ground stabilization, placement and compaction of fill materials, and finished grading is critical to the structural integrity of building foundation and floor systems. While the preliminary Geotechnical investigation and report provide guidelines, which are used by the design team, i.e., architects, grading engineers, structural engineers, landscape engineers, etc., in completing their respective tasks, review of plans and site review and testing during earthwork operations are vital adjuncts to the completion of the Geotechnical engineer's tasks.
The most prevalent cause of failure of a structure foundation system is lack of adequate review and testing during the earthwork phase of the project. Projects rarely reach completion without some alteration being required such as may result from a change in subsurface conditions, an amendment in the size and scope of the project, a revision of the grading plans or a variation in structural details.

Occasionally, even minor changes can significantly affect the performance of foundations. The most prevalent secondary cause for foundation failure is inadequate implementation of Geotechnical recommendations during the formulation of foundation designs and grading plans. The error in a foundation design or an omission of a key element from a grading plan occurs most often as a result of inadequate communication between the various project consultants and -- when a change in consultants occurs -- improper transfer of authority and responsibility.

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It is imperative, therefore, that any revisions to the project scope, any change in structural detail, or change in consultant, be brought to the attention of Soils Engineering, Inc. to allow for timely review and revision of recommendations and for an orderly transfer of responsibility and approval.

It is the responsibility of the owner's representative to ensure that a representative of our firm is present at all times during earthwork operations relating to site preparation and grading, so that relative compaction tests can be performed, earthwork operations can be observed and compliance with the recommendations provided herein can be established.

This engineering report has been prepared within the limits prescribed to us by the client or his or her representative, in accordance with the generally accepted principles and practices of Geotechnical engineering. No other warranty, expressed or implied, is included or intended in this report.

Respectfully submitted,
SOILS ENGINEERING, INC.

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APPENDIX A

GENERAL GUIDE SPECIFICATIONS FOR EARTHWORK

1. GENERAL

1.1 Scope

These specifications and plans include all earthwork pertaining to site rough grading including, but not limited to, furnishing all labor and equipment necessary for clearing and grubbing; stripping; preparation of ground surfaces to receive fill; excavation; placement and compaction of structural and non-structural fill; disposal of excess materials and products of clearing, grubbing, and stripping; and any other work necessary to bring ground elevations to the lines and grades shown on the project plans. Wherever discrepancies between these guide-specifications and the earthwork recommendations in Section I of the above geotechnical report, the most stringent recommendations shall supersede.

1.2 Performance:

It shall be the responsibility of the contractor to complete all earthwork in accordance with project plans and specifications. No variance from plans and specifications shall be permitted without written approval of the Engineer-of-Record, hereinafter referred to as the “Engineer” or his or her designated representative, hereinafter referred to as the “Soils Engineer.” Earthwork shall not be considered complete until the “engineer” has issued a written statement confirming substantial compliance of earthwork operations to these specifications and to the project plans. The contractor shall assume sole responsibility for job site conditions during earthwork operations on the project, including safety of all persons and preservation of all property. This requirement shall apply continuously and not be limited to normal working hours. The contractor shall defend, indemnify, and hold harmless the owners, engineer, and soils engineer from all liability and claims, real or alleged, arising out of performance of earthwork on this project, except from liability incurred through sole negligence of the owner, engineers, or soils engineers.

2. DEFINITIONS

2.1 Excavations:

Excavation shall be defined within the content of these specifications as earth material excavated for constructing fill embankment; grading the site to elevations shown on project plans; or placing underground pipelines, conduits, or other subsurface utilities or minor structures. Excavations shall be made true to the lines shown on project plans and to within plus or minus one-tenth (0.1) of a foot, of grades shown on the accepted site grading plans.

2.2 Engineered Fill:

Engineered fill shall be construed within the body of these specifications as earth materials conforming to specifications provided in the soils or geotechnical report placed to raise the grade of the site, to backfill excavations, or to construct asphaltic concrete or Portland cement concrete pavement; and upon which the soils engineer has performed sufficient tests and has made

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sufficient observation during placement and compaction to enable him to issue a written statement confirming substantial conformance of the work to project earthwork specifications.

2.3 On-Site Material:

On-site material is earth material obtained in excavation made on the project site.

2.4 Imported Material:

Imported materials are earth materials obtained off the site, hauled in, and placed as fill.

2.5 "Compaction" or "Compacted:"

Wherever expressed or implied within the context of these specifications shall be interpreted as compaction to ninety (90) percent of the maximum density obtainable by ASTM Test Method D1557.

2.6 Grading Plane:

The grading Plane is the surface of the basement material upon which the lowest layer of subbase, base, asphaltic or Portland cement concrete, surfacing, or another specified layer is placed.

3. SITE CONDITIONS

The contractor shall visit the site, prior to bid submittal, to explore existing subsurface conditions; to survey site topographic, and to define the nature of materials that may be encountered while performing its work under this contract. Moreover, the contractor shall make his or her own interpretation of the contents of the Geotechnical Report, as they pertain to said conditions. The contractor shall assume all liability under the contract for any loss sustained because of variations which may exist between specific soil boring locations or changed conditions resulting from natural or man-made circumstances occurring after the date of the Preliminary Field Investigations.

4. CLEARING AND GRUBBING

4.1 Clearing and Grubbing

Clearing and grubbing shall consist of removing all debris such as metal, broken concrete, trash, vegetation growth and other biodegradable substances, from all areas to be graded. Existing obstructions below shall be removed in accordance with the following procedures:

4.1.1 Slabs and Pavements - Shall be completely removed. Asphaltic or Portland Cement, concrete fragments may be used in engineered fills provided they are broken down to a maximum dimension of six (6.0) inches and thoroughly dispersed within a friable soil matrix. Engineered fill containing said fragments should not be placed above the elevation of the bottom of the lowest structure footing.

4.1.2 Foundations - Existing at the time of grading shall be removed to a depth not less than two (2.0) feet below the bottom of the lowest structure footing.

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4.1.3 Basements, Septic Tanks – Buried concrete containers of similar construction located within areas destined to receive pavements, structures, or engineered fills should be completely removed and disposed of off the site. Basements, septic tanks, etc., situated outside structures, or structural fill areas shall be disposed of by breaking an opening in bottoms to permit drainage, and by breaking walls down to not less than two (2.0) feet below finished subgrade.

4.1.4 Buried Utilities – Such as sewer, water and gas lines or electrical conduits to remain in service shall be re-routed to pass no closer than four (4.0) feet to the outside edge of proposed exterior footings of structures. Lines to be abandoned shall be completely removed to a minimum depth of two (2.0) feet below finished building pad grade. Concrete lines deeper than two (2.0) feet below finished building pad grade and having diameters less than six (6.0) inches can be crushed in place.

4.1.5 Root Systems – Shall be completely removed to a minimum depth of two (2.0) feet below the bottom of the lowest proposed structure footing or to two (2.0) feet below finished subgrade, whichever depth is lower. Root systems deeper than the elevation indicated above shall be excavated to allow no roots larger than two (2.0) inches in diameter.

4.1.6 Cavities – Resulting from clearing and grubbing or cavities existing on the site because of man-made or natural activity shall be backfilled with earth materials placed and compacted in accordance with Sections 5.3 and 5.4 of these specifications.

4.1.7 Preservation or Monuments, Construction Stakes, Property Corner Stakes, or other temporary or permanent horizontal or vertical control reference points shall be the responsibility of the contractor. Where these markers are disturbed, they shall be replaced at the contractor's expense.

5. SITE GRADING

Site grading shall consist of excavation and placement of fills to lines and grades shown on the project plans and in accordance with project specifications and recommendations of the Preliminary Soils Report, whichever is more stringent. The following are recommendations issued in this report:

5.1 Areas to Receive Fill:

5.1.1 Surfaces to receive fill shall be scarified to a depth of at least six (6.0) inches, or as recommended in this report, whichever is greater, until the surface is free from ruts, hummocks or other uneven features which would tend to prevent uniform compaction by the equipment to be used.

5.1.2 After the area to receive fill has been cleared and scarified, it shall be moistened and compacted to a depth of at least six (6.0) inches in accordance with specifications for compacting fill material in paragraph 5.4, below.

5.2 Excavation:

5.2.1 Excavations shall be cut to elevations plus or minus 0.1 foot of the grades shown on the accepted plans.

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5.2.2 When excavated materials are to be used in engineered fill, the excavation shall be made in a manner to produce as much mixing of the excavated materials as practicable.

5.2.3 When excavations are to be backfilled, and where surfaces exposed by excavation are to support structures or concrete floor slabs, the exposed surfaces shall be scarified, moistened and compacted, as stated above, for areas to receive fill. Over excavation below specified depths will not eliminate the requirement for exposed surface compaction.

5.3 Fill Materials:

5.3.1 Materials obtained from on-site excavations will be considered satisfactory for construction of on-site engineered fills, unless otherwise stated in the Soils Report or Foundation Investigation. If unexpected pockets of poor or weak materials are encountered in excavations, and they cannot be upgraded by mixing with other materials or by other means, they may be rejected by the soils engineer for use in engineered fill. Rocks larger than 12 inches in size in any dimension shall not be allowed in the proposed building area. If a large number of rocks greater than 12 inches in size in any dimension is encountered, a rock disposal area shall be located on the grading plan. Rocks shall be mixed with well-graded soils to assure that the voids in these areas will fill properly.

5.3.2 When imported fill materials are necessary to bring the site up to planned grades, no material shall be imported prior to its approval and acceptance by the soils engineer.

5.3.3 The soils engineer shall be given notice of the proposed source of imported materials with adequate time allowance for his or her testing of the proposed materials. The time required for testing will vary with different types of materials, job conditions, and ultimate function of filled areas. Under best conditions the time requirement will not be less than 48 hours.

5.4 Placing, Spreading, and Compacting Fill Material:

5.4.1 The fill materials shall be placed in layers which, when compacted, shall not exceed six (6.0) inches in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to insure uniformity of material in each layer. Increased thickness of layers may be approved by the soils engineer when conditions warrant.

5.4.2 All fills shall be placed in level layers; layers shall be continuous over the area of any structural unit, and all portions of the fill shall be brought up simultaneously within the area of any structural unit. When imported material is used, it must be placed so that its thickness is as uniform as possible within the area of any structural unit.

5.4.3 When materials are to be excavated and replaced in a compacted condition, segmented, or leapfrogging of cut-fill operations within the area of any structural unit will not be permitted unless the method is specifically described by the soils engineer.

5.4.4 When the moisture content of fill material is below the lower limit specified by the Soils Engineer, water shall be added until the moisture content is as specified; and when

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it is above the upper limit specified, the material shall be aerated by blading or other satisfactory methods until the moisture content is as specified.

5.4.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to not less than ninety (90) percent of maximum density in accordance with ASTM Density Test Method D1557. Compaction shall be by equipment of such design that it will be able to compact the fill to specified density. When the soils engineer specifies a specific type of compaction equipment to be used, such equipment shall be used as specified.

5.4.6 Compaction of each layer shall be continuous over its entire area and the equipment shall make sufficient trips to ensure that the desired density has been obtained.

5.4.7 Field density tests shall be made by the soils engineer. The compaction of each layer of fill shall be subject to testing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in the compacted material below the disturbed surface. When tests indicate the density of any layer of fill or portion thereof is below the required ninety (90) percent density, the layer or portion shall be re-worked until the required density has been obtained.

5.4.8 When the soils engineer specifies compaction to other standards or to percentages other than ninety (90) percent, such specification, with respect to the items, shall supersede these specifications.

5.4.9 The fill operation shall be continued in six (6) inch compacted layers, as specified above, until the fill has been brought to within 0.1 foot, plus or minus, of the finished slopes and grades, as shown on the accepted plans. The finished surface of fill areas shall be graded or bladed to a smooth and uniform surface and no loose material shall be left on the surface.

5.4.10 No fill materials shall be placed, spread, or compacted while it is frozen or thawing or during unfavorable weather conditions. When work is interrupted by weather conditions, fill operations shall not be resumed until the soils engineer indicates that moisture content and density of previously placed fill are satisfactory.

5.5 Observations and Testing:

The soils engineer shall be provided with a 48-hour notice, in order that he may be present at the site during all earthwork activities related to excavation, tree root removal, stripping, backfill, and compaction and filling of the site and to perform periodic compaction tests so that substantial conformance to these recommendations can be established.

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APPENDIX B

FIELD INVESTIGATION

Ten (10) test borings were drilled at the subject site and terminated at a maximum depth of 21.5 feet below the existing ground surface. Borings were advanced using an eight (8.0) inch hollow-stem auger. Test data and descriptions from these holes form the basis of the conclusions and recommendations contained in this report.

Undisturbed samples and disturbed bulk samples were obtained. Undisturbed samples were taken using either a 2-3/8” (inside diameter) split-barrel sampler or a 1-3/8” (inside diameter), 2” (outside diameter) Standard Penetration Sampler (SPT). Penetration resistance of undisturbed soils was obtained by driving the above-described sampler using a one-hundred-forty-pound hammer falling thirty inches (30"). Blow counts for each six inch (6") driven increment was recorded and are reported on the Test Borings Logs. In addition, bulk soil samples, selected as most representative of near surface soils encountered, were taken for laboratory testing.

As drilling progressed, earth materials encountered were logged and classified in accordance with the Unified Soils Classification System and presented graphically on Logs of Test Borings, Figures 2 through 11, along with the Legend. Approximate locations of test borings are shown on the Boring Location Map, Figure 1.

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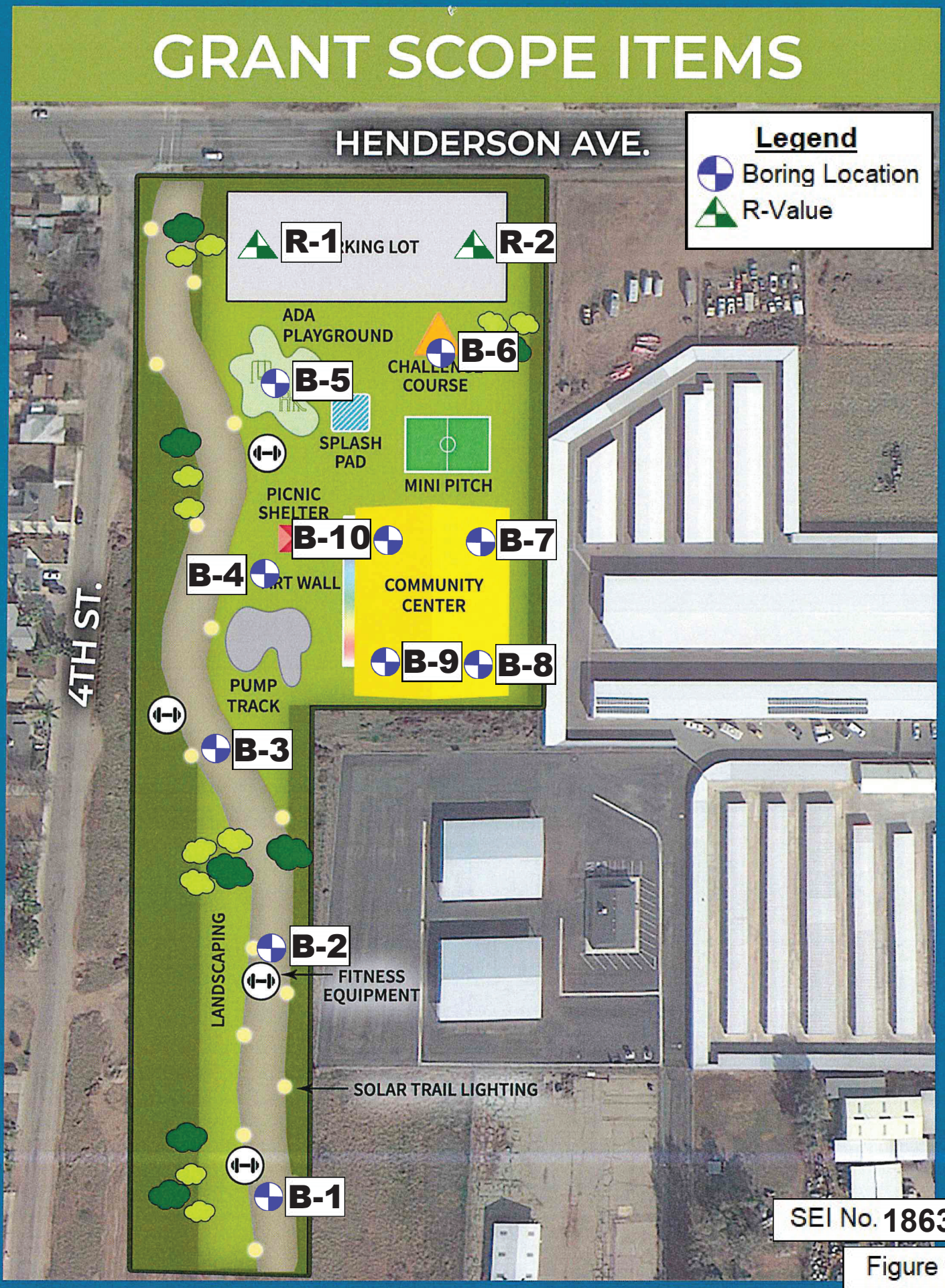
Boring Location Map



LOG OF TEST BORING
BORING B-1

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
FILE NO: *18633*
BORING DATE: *11/21/22*
ELEV.: *Approx. 449'*
BORING LOCATION: *See Boring Location Map, Figure 1*
START: *11/21/22*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
FINISH: *11/21/22*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▽ : *N/A* **CAVING - ▶ :** *N/A*
LOGGER: *M. WATTS*

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		ML	SANDY SILT; brown, dry, fine.			
3.5			BOTTOM.			
7						
10.5						
14						
17.5						
21						
24.5						

Figure Number 2

LOG OF TEST BORING
BORING B-2

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
BORING DATE: *11/21/22*
BORING LOCATION: *See Boring Location Map, Figure 1*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ⬟ :** *N/A*

FILE NO: *18633*
ELEV.: *Approx. 449'*
START: *11/21/22*
FINISH: *11/21/22*
LOGGER: *M. WATTS*

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		SM	SILTY SAND; light yellowish brown, dry, fine.			
3.5			BOTTOM.			
7						
10.5						
14						
17.5						
21						
24.5						

Figure Number 3

LOG OF TEST BORING
BORING B-3

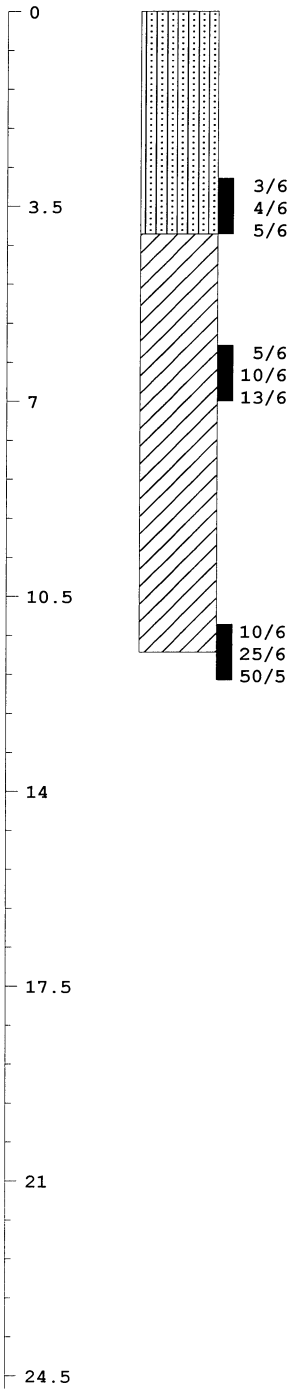
PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
FILE NO: *18633*
BORING DATE: *11/21/22*
ELEV.: *Approx. 449'*
BORING LOCATION: *See Boring Location Map, Figure 1*
START: *11/21/22*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
FINISH: *11/21/22*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ⬢ :** *N/A* **LOGGER:** *M. WATTS*

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		SM	SILTY SAND; light yellowish brown, dry, fine.			
3.5			BOTTOM.			
7						
10.5						
14						
17.5						
21						
24.5						

Figure Number 4

LOG OF TEST BORING
BORING B-4

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
FILE NO: *18633*
BORING DATE: *11/21/22*
ELEV.: *Approx. 449'*
BORING LOCATION: *See Boring Location Map, Figure 1*
START: *11/21/22*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
FINISH: *11/21/22*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : N/A **CAVING - ▶ : N/A** **LOGGER:** *M. WATTS*



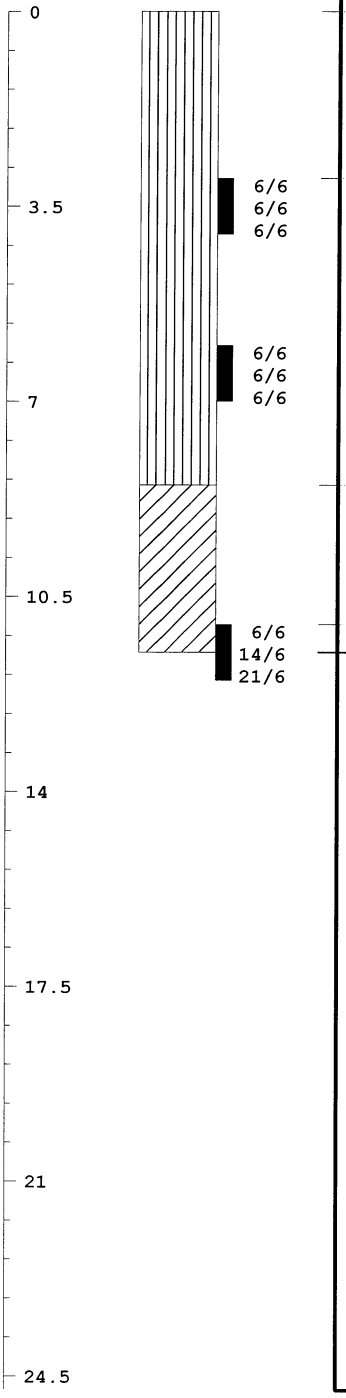
ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		SM	SILTY SAND; light yellowish brown, dry, fine.			
3.5	3/6 4/6 5/6		Loose.		87.5	3.0
		CL	SAND CLAY; red brown, dry to damp, low plasticity.			
7	5/6 10/6 13/6		Very stiff.		113.7	11.9
10.5	10/6 25/6 50/5		Hard.		117.8	14.9
			BOTTOM.			

Figure Number 5

LOG OF TEST BORING
BORING B-5

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
BORING DATE: *11/21/22*
BORING LOCATION: *See Boring Location Map, Figure 1*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ⬟ :** *N/A*

FILE NO: *18633*
ELEV.: *Approx. 449'*
START: *11/21/22*
FINISH: *11/21/22*
LOGGER: *M. WATTS*



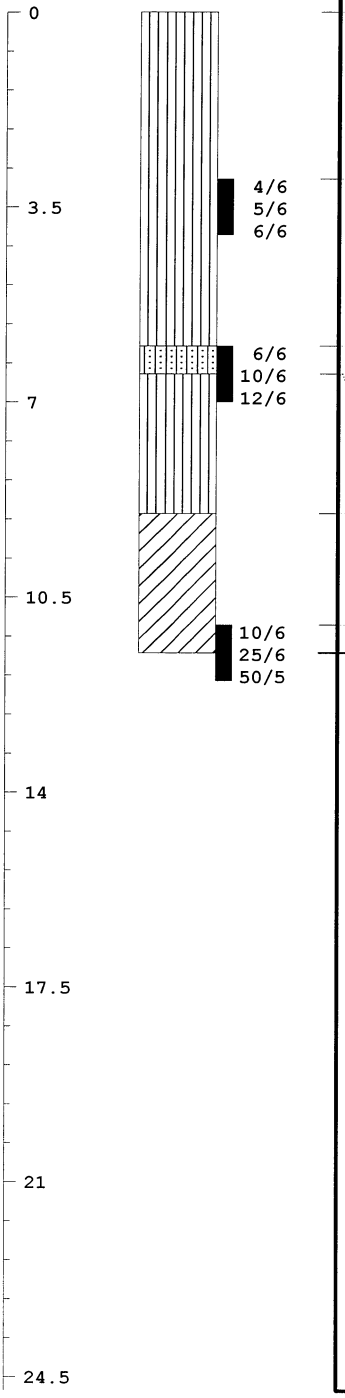
ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		ML	SANDY SILT; light brown, dry, low plasticity.			
3.5	6/6 6/6 6/6		Stiff.		90.8	5.0
7	6/6 6/6 6/6				83.1	9.3
10.5		CL	SANDY CLAY; reddish brown, dry to damp, low to medium plasticity.			
	6/6 14/6 21/6		Hard.		116.8	16.7
			BOTTOM.			

Figure Number 6

LOG OF TEST BORING
BORING B-6

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
BORING DATE: *11/21/22*
BORING LOCATION: *See Boring Location Map, Figure 1*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ⬢ :** *N/A*

FILE NO: *18633*
ELEV.: *Approx. 449'*
START: *11/21/22*
FINISH: *11/21/22*
LOGGER: *M. WATTS*

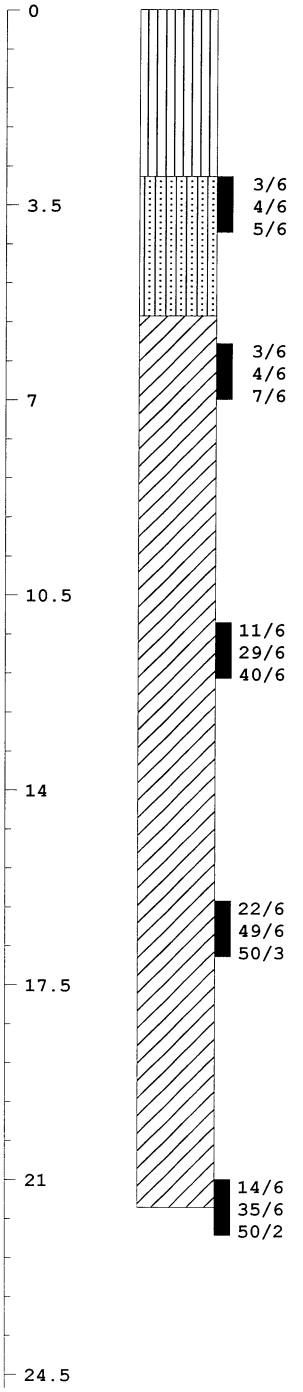


ELEVATION/ DEPTH (feet)	USCS	Description	Remarks	Density pcf	Moisture %
0	ML	SANDY SILT; brown, dry, low plasticity.			
3.5		Stiff.		89.4	4.1
7	SM ML	SILTY SAND; light yellowish brown, dry, cohesive, medium dense, fine. SANDY SILT; light brown, dry, low plasticity.		91.8	7.1
10.5	CL	SANDY CLAY; reddish brown, dry to damp, low to medium plasticity. Hard.		99.4	17.7
		BOTTOM.			

Figure Number 7

LOG OF TEST BORING
BORING B-7

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
FILE NO: *18633*
BORING DATE: *12/9/22*
ELEV.: *Approx. 449'*
BORING LOCATION: *See Boring Location Map, Figure 1*
START: *12/9/22*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
FINISH: *12/9/22*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ⬟ :** *N/A* **LOGGER:** *M. WATTS*



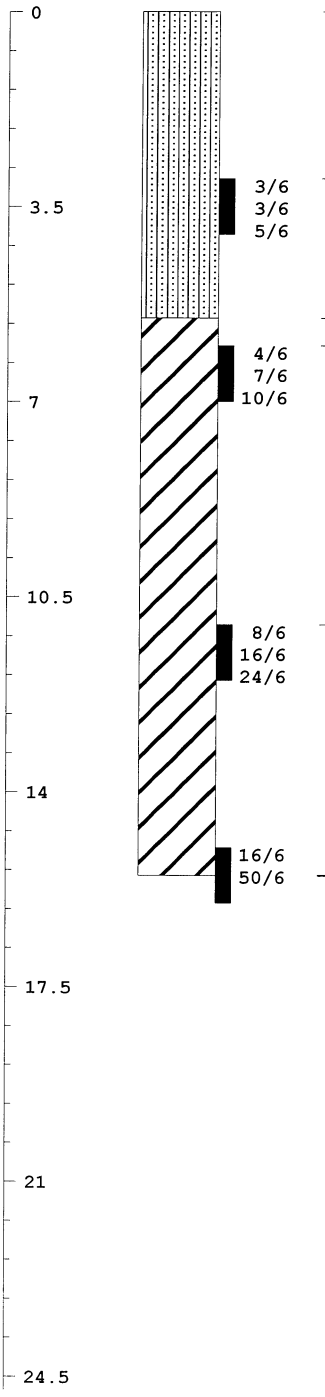
ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		ML	SANDY SILT; light yellowish brown, dry, low plasticity.			
3.5	3/6 4/6 5/6	SM	SILTY SAND; light yellowish brown, dry, loose, fine.			
7	3/6 4/6 7/6	CL	SANDY CLAY; reddish brown, damp, medium to high plasticity. Stiff.			
10.5	11/6 29/6 40/6		Hard.			
14	22/6 49/6 50/3					
17.5						
21	14/6 35/6 50/2		BOTTOM.			
24.5						

Figure Number 8

LOG OF TEST BORING
BORING B-8

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
BORING DATE: *12/9/22*
BORING LOCATION: *See Boring Location Map, Figure 1*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ▶ :** *N/A*

FILE NO: *18633*
ELEV.: *Approx. 449'*
START: *12/9/22*
FINISH: *12/9/22*
LOGGER: *M. WATTS*



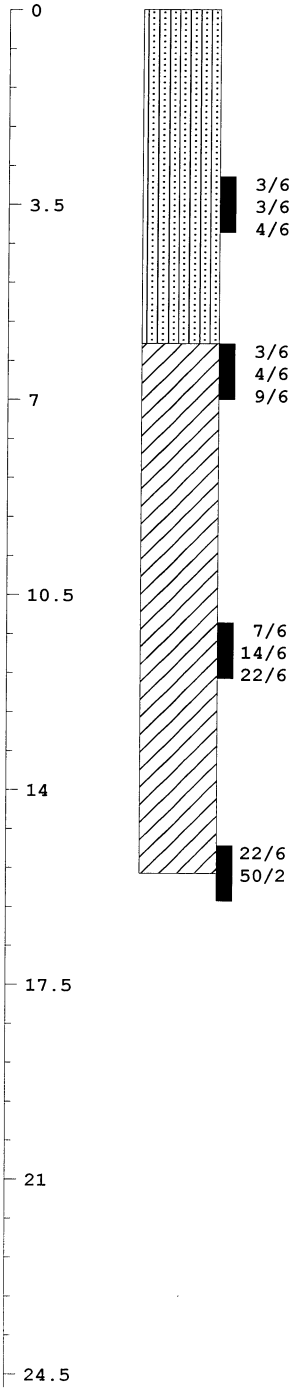
ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		SM	SILTY SAND; light yellowish brown, cohesive, dry, fine.			
3.5	3/6 3/6 5/6		Loose.			
		CH	SANDY CLAY; reddish brown, dry to damp, high plasticity.			
7	4/6 7/6 10/6		Stiff.			
10.5	8/6 16/6 24/6		Hard.			
14	16/6 50/6		BOTTOM.			
17.5						
21						
24.5						

Figure Number 9

LOG OF TEST BORING
BORING B-9

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
BORING DATE: *12/9/22*
BORING LOCATION: *See Boring Location Map, Figure 1*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ⬟ :** *N/A*

FILE NO: *18633*
ELEV.: *Approx. 449'*
START: *12/9/22*
FINISH: *12/9/22*
LOGGER: *M. WATTS*



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		SM	SILTY SAND; light yellowish brown, dry, fine.			
3.5	3/6 3/6 4/6		Loose.			
7	3/6 4/6 9/6	ML	SANDY SILT; brown, dry to damp, stiff, medium to high plasticity.			
10.5	7/6 14/6 22/6		Hard.			
14	22/6 50/2		BOTTOM.			
17.5						
21						
24.5						

Figure Number 10

LOG OF TEST BORING
BORING B-10

PROJECT: *Fourth Street Community Center and Park (2883-01-RC22)*
FILE NO: *18633*
BORING DATE: *12/9/22*
ELEV.: *Approx. 449'*
BORING LOCATION: *See Boring Location Map, Figure 1*
START: *12/9/22*
DRILL METHOD: *4.25" I.D. Hollow-Stem Auger*
FINISH: *12/9/22*
DESCRIPTION: *Geotechnical Engineering Services*
DEPTH TO WATER - ▼ : *N/A* **CAVING - ⬟ :** *N/A* **LOGGER:** *M. WATTS*

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Remarks	Density pcf	Moisture %
0		SM	SILTY SAND; light yellowish brown, dry, fine.			
3.5		CH	SANDY CLAY; reddish brown, dry to damp, medium to high plasticity.			
7						
10.5						
14						
17.5						
21			BOTTOM.			
24.5						

Figure Number 11

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Silty sand
	Low plasticity clay
	Silt
	High plasticity clay
Soil Samplers	
	California sampler

Notes:

1. Six (6) exploratory borings were drilled on 11/21/2022 using an 8-inch outside diameter hollow-stem auger.

2. No free groundwater was encountered to the maximum depth drilled of 21.5'.

3. Boring locations are shown on the Boring Location Map, Figure 1.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.

APPENDIX C

SOIL TEST DATA

SIEVE ANALYSES (ASTM D422 and/or ASTM D1140)

Grain size distributions for specimens retrieved from various subsurface elevations were tested to classify the materials. Test results are presented on Figures A-1 and A-2.

IN-SITU DENSITY & MOISTURE RELATIONSHIPS (ASTM D2216 & D2937)

Moisture & density data for undisturbed native soils was obtained by use of a 2-3/8-inch (inside diameter) split-barrel sampler. Test results are given on the Logs of Test Borings, Figures 2 through 11.

CONSOLIDATION TESTS (ASTM D2435)

Compressibility of soils was determined on saturated, undisturbed samples of native materials. Consolidation Test Diagrams, Figures B-1 through B-3, graphically express the relationship of vertical strain vs. applied vertical (normal) load for earth materials selected as most representative of the soil strata within the anticipated zone of influence of foundation loads.

DIRECT SHEAR TESTS (ASTM D3080)

Quick-consolidated direct shear test was performed on an undisturbed, saturated sample of native earth materials. This test provides information on soil shear strength vs. normal load and is used to determine the angle of internal friction and cohesion of earth materials under essentially drained conditions. Test results are presented on Figures C-1 and C-2.

R-VALUE TESTS (CTM-301)

R-Value tests were performed to obtain flexible pavement design data. Test results are presented on Figures D-1 and D-2.

EXPANSION INDEX (ASTM D4829)

The Expansion Index test is designed to measure a basic index property of soil and in this respect is comparable to other index tests such as the Atterberg Limits. In formulating the test procedures, no attempt has been made to duplicate any particular moisture or loading conditions which may occur in the field. Rather, an attempt has been made to control all variables which influence the expansive characteristics of a particular soil and still retain a practical test for general engineering usage. Near surface soils were obtained and tested for expansiveness. Test results are presented on the Laboratory Testing Recap Table 1.

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SOIL CORROSIVITY (SO4 / pH / Chlorides)

Tests for Soluble Sulfates (SO4), Soluble Chlorides (Cl), and pH values were performed on three (3) composite sample taken from the upper 5 feet to determine the corrosion potential of the soils. Corrosion prevention measures and the extent to which measures should be taken (if any) should be addressed with the corrosion engineer. Soluble Sulfates and Soluble Chlorides values were determined according to EPA 300.0M. The pH values were determined according to EPA 9045C. Results of all the constituent(s) are discussed in the Soil Corrosivity section.

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RRM Design Group

Geotechnical Engineering Services
Fourth Street Community Center and Park (2883-01-RC22)
Southeast CorneSoutheast Corner of N. 4th St. & E. Henderson Ave., Porterville, CA

SEI File No. 22-18633
January 11, 2023

TABLE 1

TEST LOCATION	USCS	% < # 200	CONSOLIDATION				DIRECT SHEAR		UNCONFINED COMPRESSION		E.I.	ATTERBERG LIMITS			R-VALUE @ 300 psi		MAXIMUM DENSITY	
			C_C	C_S	S.P. (psf)	HV %	C, (ksf)	F.A.	Q_U, (psi)	C, (ksf)		LL	PL	PI	R.V.	E.P. (psi)	MDD (pcf)	O.M.
B-1 @ 0-5'	ML	52									47							
B-3 @ 0-5'	SM	35									0							
B-6 @ 0-5'	ML	61									17							
B-6 @ 3'	ML		0.18	0.02	0	-2.5												
B-6 @ 6'	SM	19					0.15	31.5										
B-8 @ 3'	SM	38					0.06	32.8										
B-8 @ 6'	CH		0.23	0.3	5747	4.5												
B-9 @ 6'	ML	58	0.23	0.03	0	-0.4												
B-10 @ 0-5'	SM	35									0							
R-1 @ 0-5'	SM	48													41	0.14		
R-2 @ 0-5'	ML	53													25	0.05		

CONSOLIDATION
Cc - Compression Index
Cs - Swell Index
S.P. (psf) - Swell Pressure
HV % - Heave Precentage / Collapase

UNCONFINED COMPRESSION
Q_U (psi) - Unconfined Compression Strength
C, (ksf) - Cohesion

DIRECT SHEAR
C (ksf) - Cohesion
F.A. - Friction Angle

E.I. - EXPANSION INDEX
ATTERBERG LIMITS
LL - Liquid Limit
PL - Plastic Limit
PI - Plasticity Index

(R)ESISTANCE VALUE
RV - R-Value @ 300 psi
EP - Expansion Press @ 300 psi

MAXIMUM DENSITY
MDD (pcf) - Max Dry Density
O.M. - Optimum Moisture

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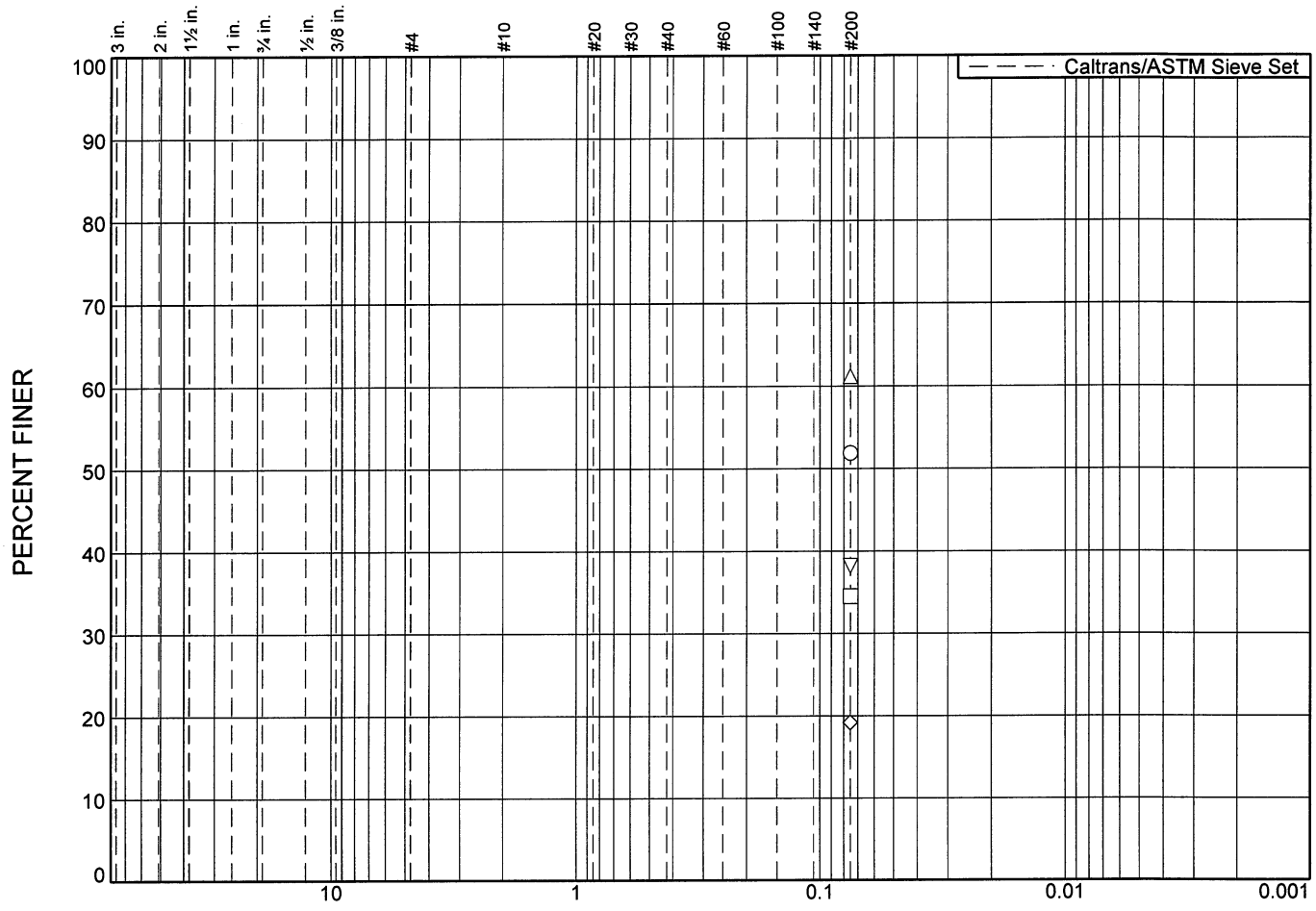
Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							52	
□							35	
△							61	
◇							19	
▽							38	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○		85280	0-5'	SANDY SILT (B-1)	ML
□		85282	0-5'	SILTY SAND (B-3)	SM
△		85290	0-5'	SANDY SILT (B-6)	ML
◇	B-6		6'	SILTY SAND	SM
▽	B-8		3'	SILTY SAND	SM

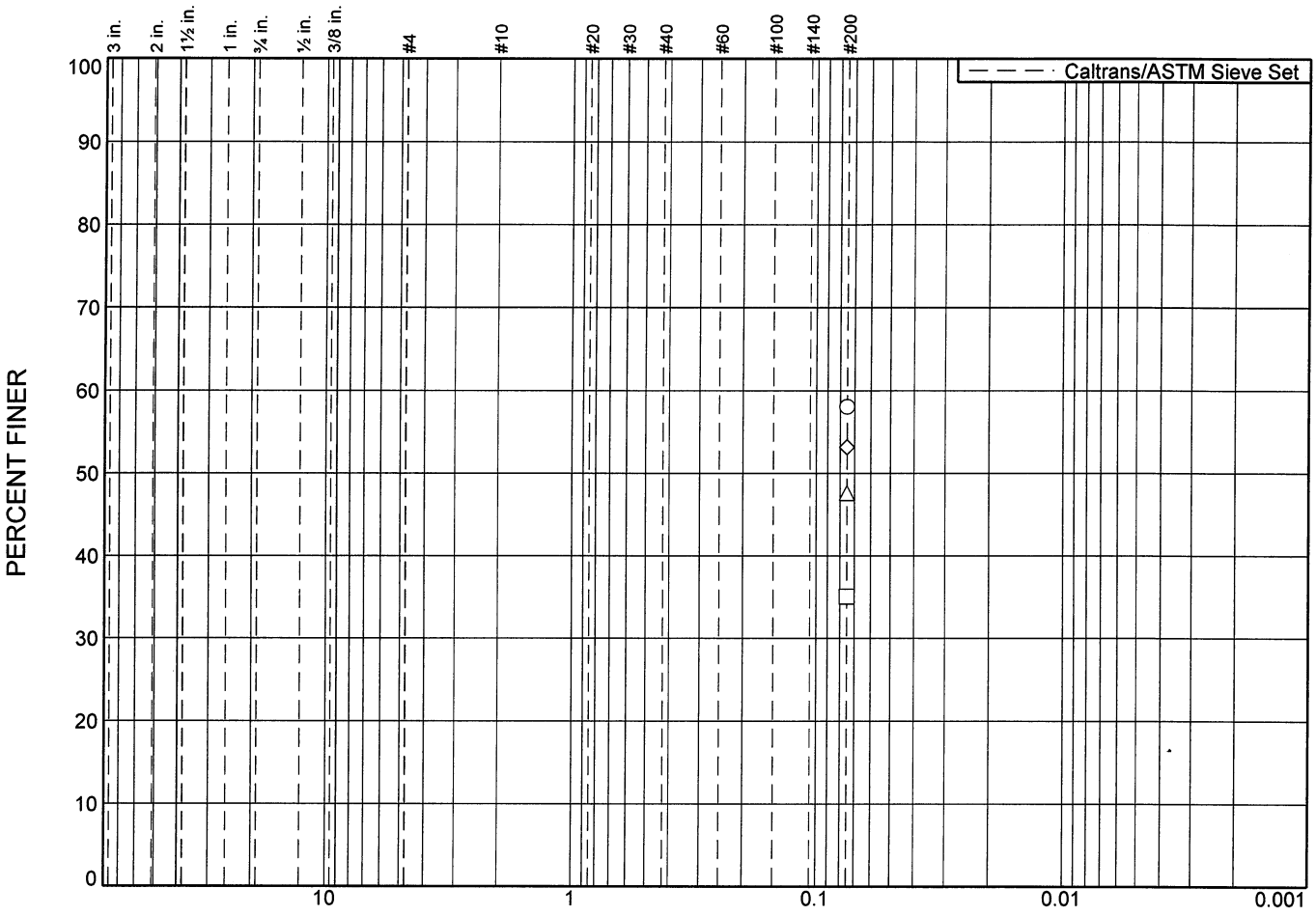
SOILS ENGINEERING, INC.

Client: RRM Design Group

Project: Fourth Street Community Center and Park (2883-01-RC22)

Project No.: 18633 **Figure** A-1

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							58	
□							35	
△							48	
◇							53	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-9		6'	SANDY SILT	ML
□		85479	0-5'	SILTY SAND (B-10)	SM
△		85294	0-5'	SILTY SAND (R-1)	SM
◇		85295	0-5'	SANDY SILT (R-2)	ML

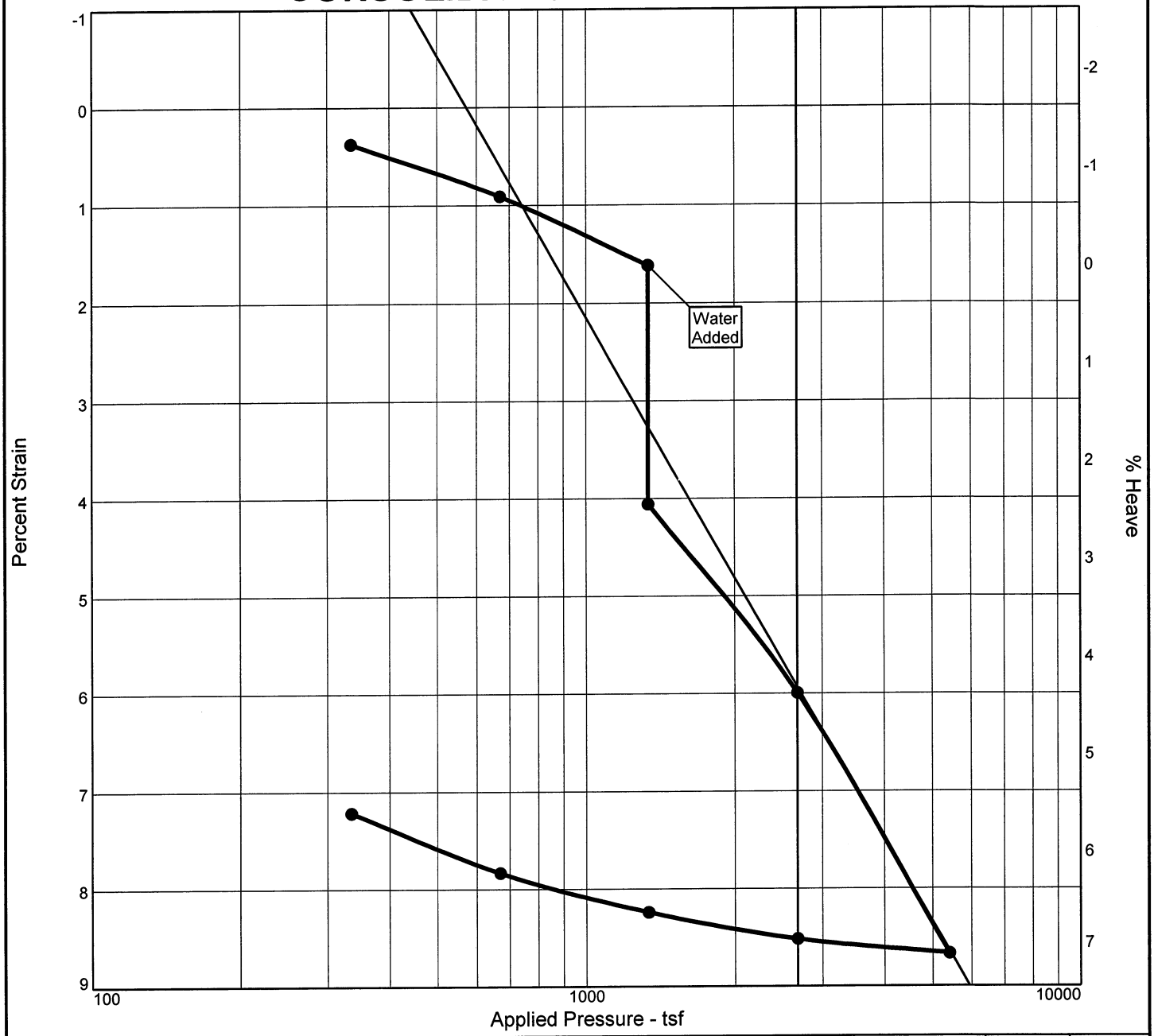
SOILS ENGINEERING, INC.

Client: RRM Design Group

Project: Fourth Street Community Center and Park (2883-01-RC22)

Project No.: 18633 **Figure** A-2

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_s	Swell Press. (tsf)	Heave %	e_o
Sat.	Moist.											
18.6 %	7.3 %	81.2	N/A	N/A	2.65	336	2753.0	0.18	0.02		-2.5	1.036

MATERIAL DESCRIPTION	USCS	AASHTO
SANDY SILT	ML	N/A

Project No. 18633 **Client:** RRM Design Group

Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-6 **Depth:** 3'

Remarks:

Date Tested: 12/28/22

SOILS ENGINEERING, INC.

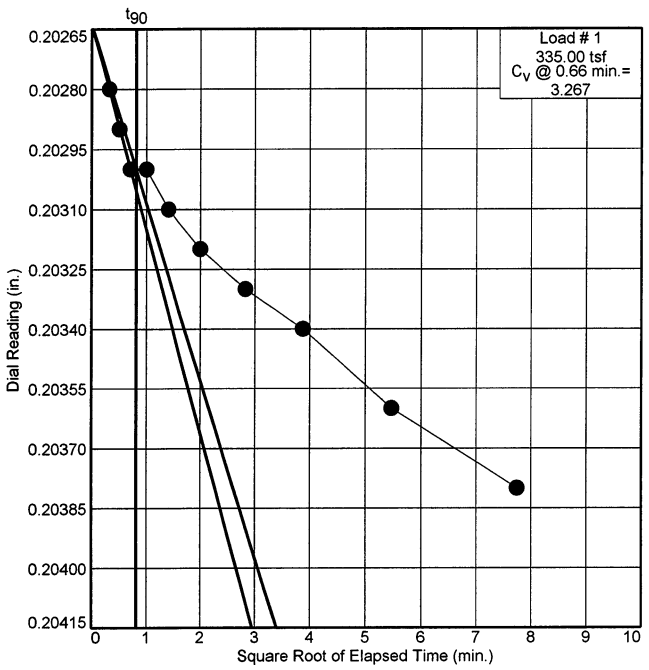
Figure B-1

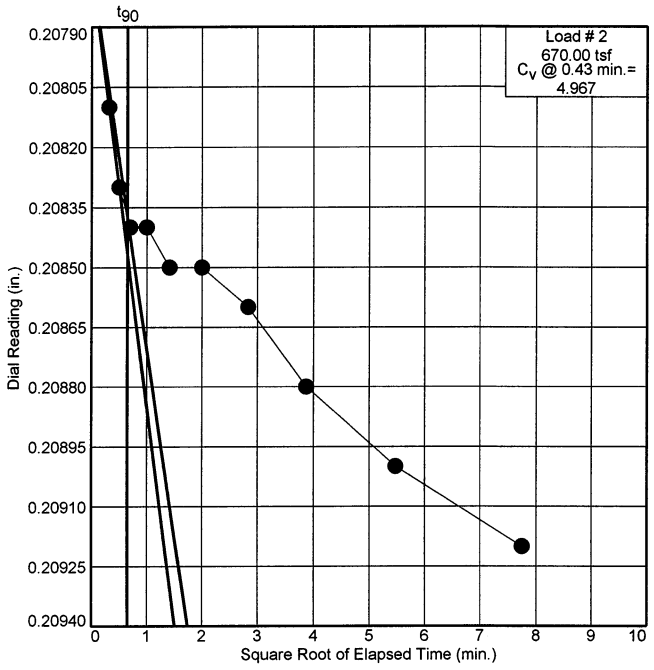
Tested By: JA **Checked By:** AL

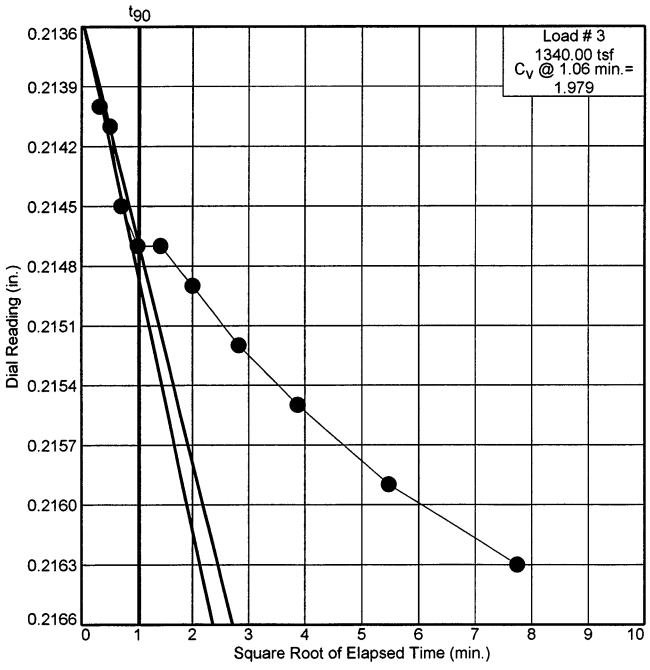
Dial Reading vs. Time

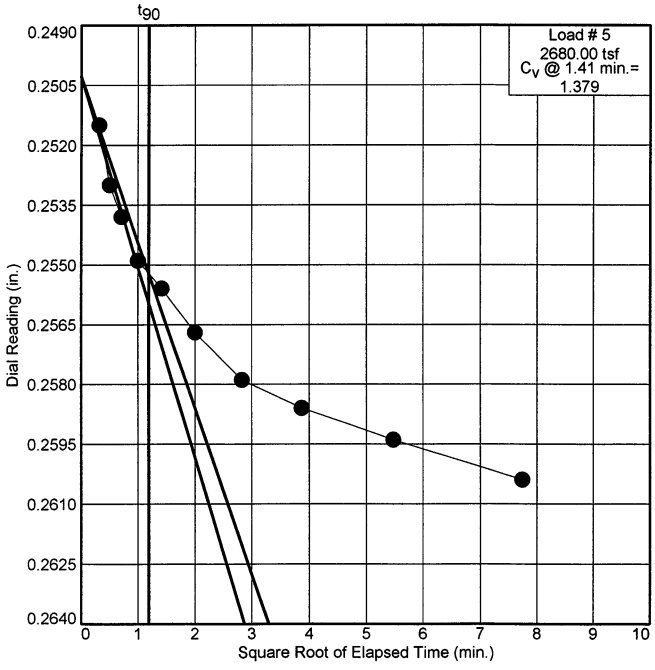
Project No.: 18633
Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-6 Depth: 3'









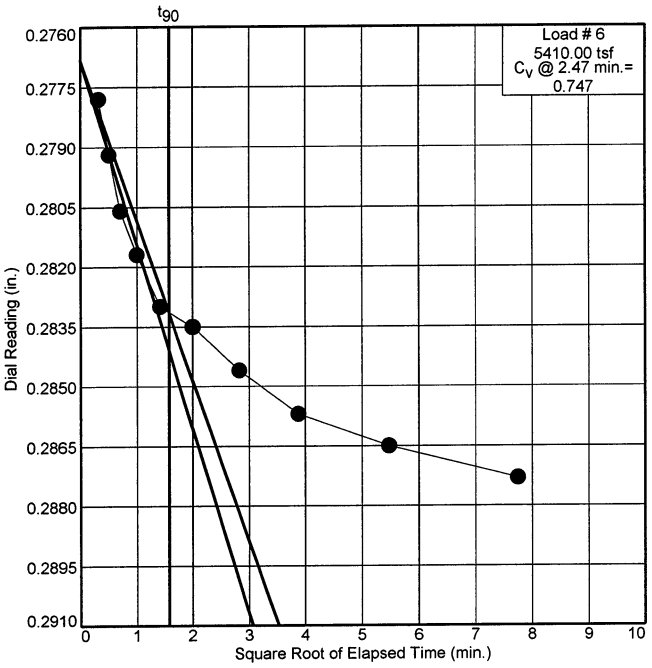
SOILS ENGINEERING, INC.

Figure B-1

Dial Reading vs. Time

Project No.: 18633
Project: Fourth Street Community Center and Park (2883-01-RC22)

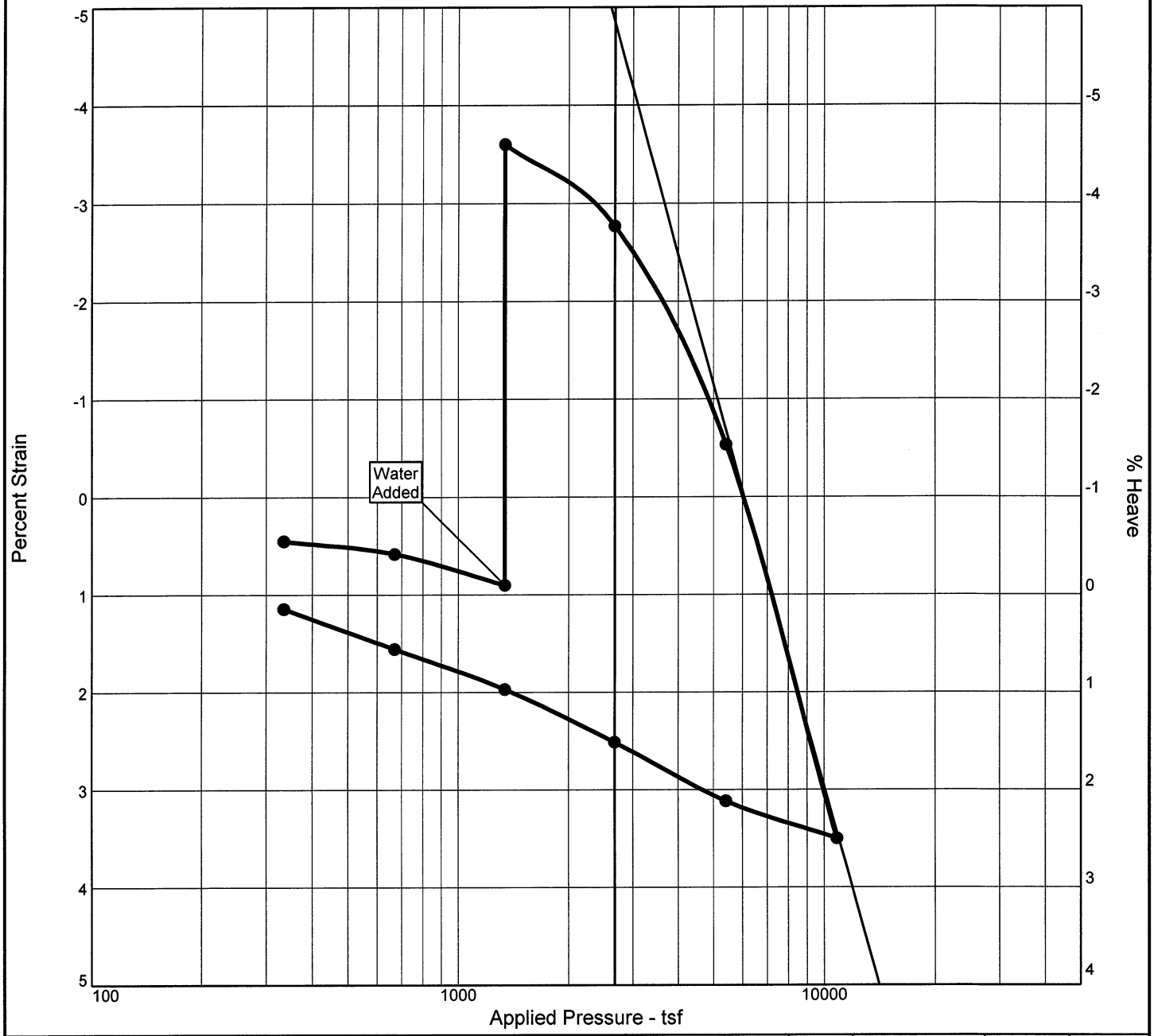
Source of Sample: B-6 Depth: 3'



SOILS ENGINEERING, INC.

Figure B-1

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_s	Swell Press. (tsf)	Heave %	e_o
Sat.	Moist.											
63.9 %	15.9 %	99.8	N/A	N/A	2.65	336	4073.6	0.23	0.03	5747.0	4.5	0.657

MATERIAL DESCRIPTION	USCS	AASHTO
SANDY CLAY	CH	N/A

Project No. 18633 **Client:** RRM Design Group

Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-8 **Depth:** 6'

Remarks:
Test Date: 12/28/22

SOILS ENGINEERING, INC.

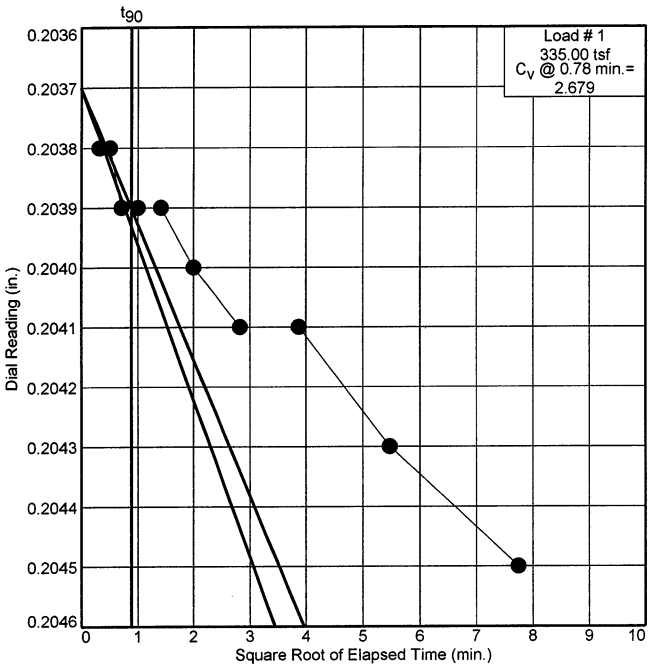
Figure B-2

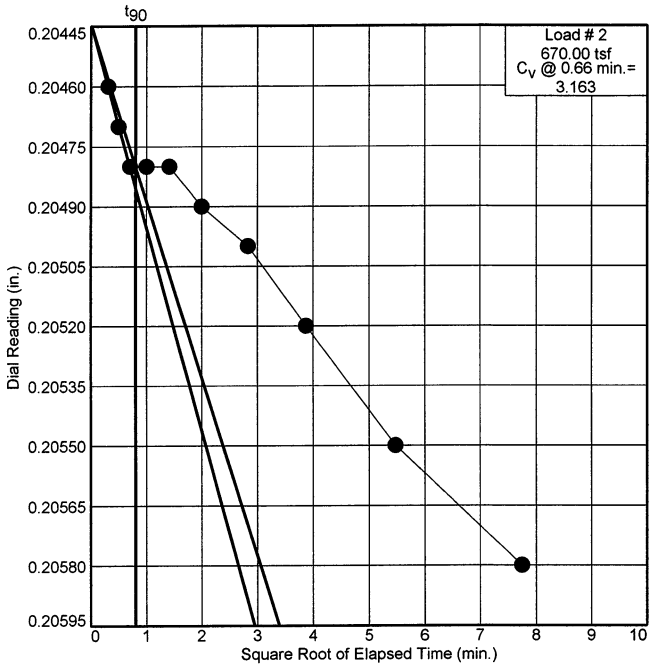
Tested By: JA **Checked By:** AL

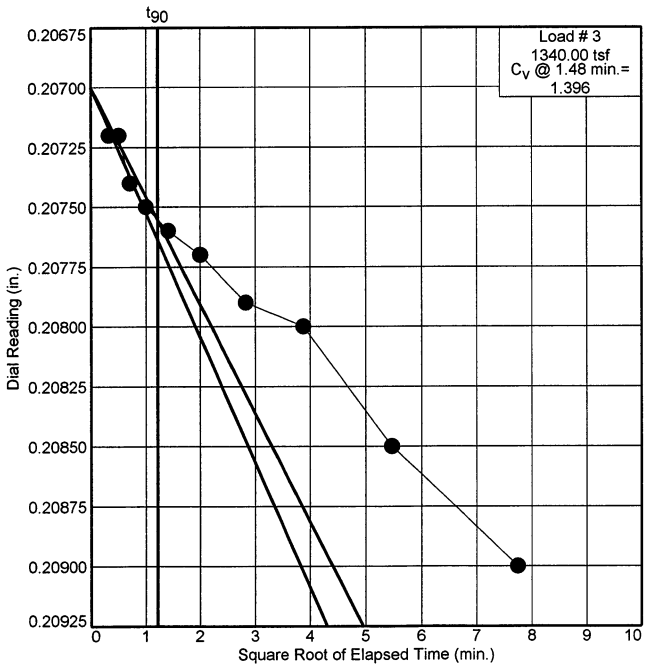
Dial Reading vs. Time

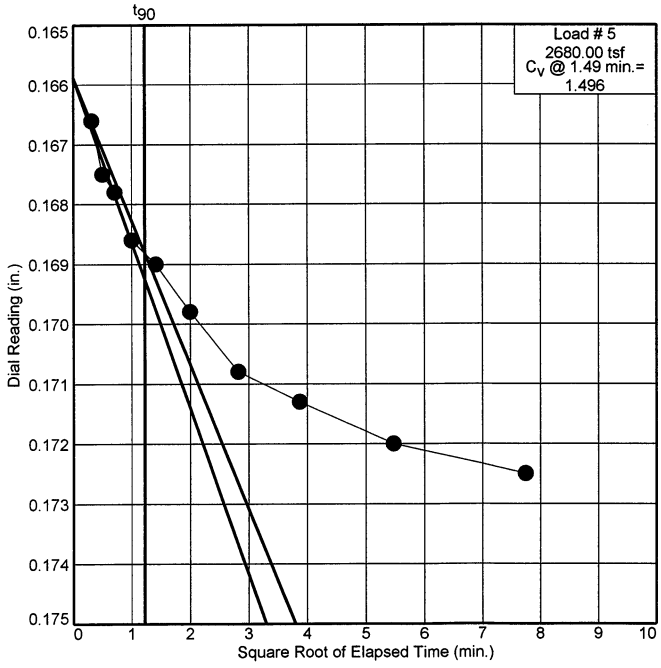
Project No.: 18633
Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-8 Depth: 6'









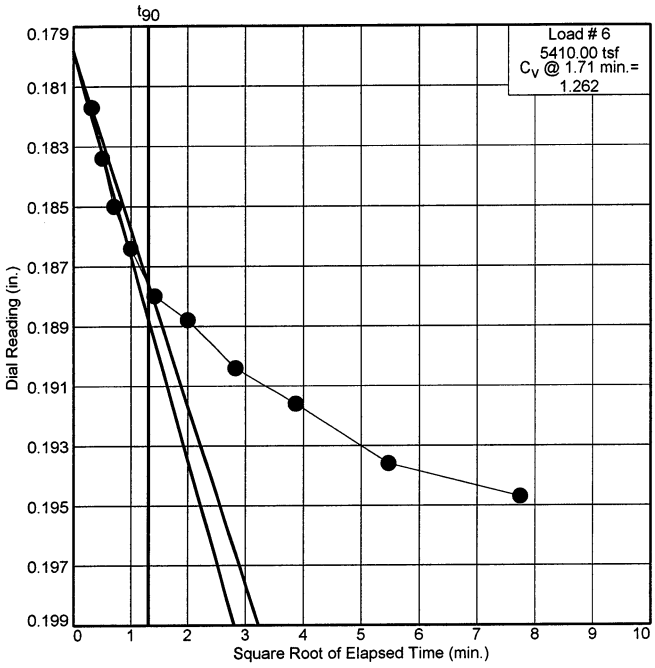
SOILS ENGINEERING, INC.

Figure B-2

Dial Reading vs. Time

Project No.: 18633
Project: Fourth Street Community Center and Park (2883-01-RC22)

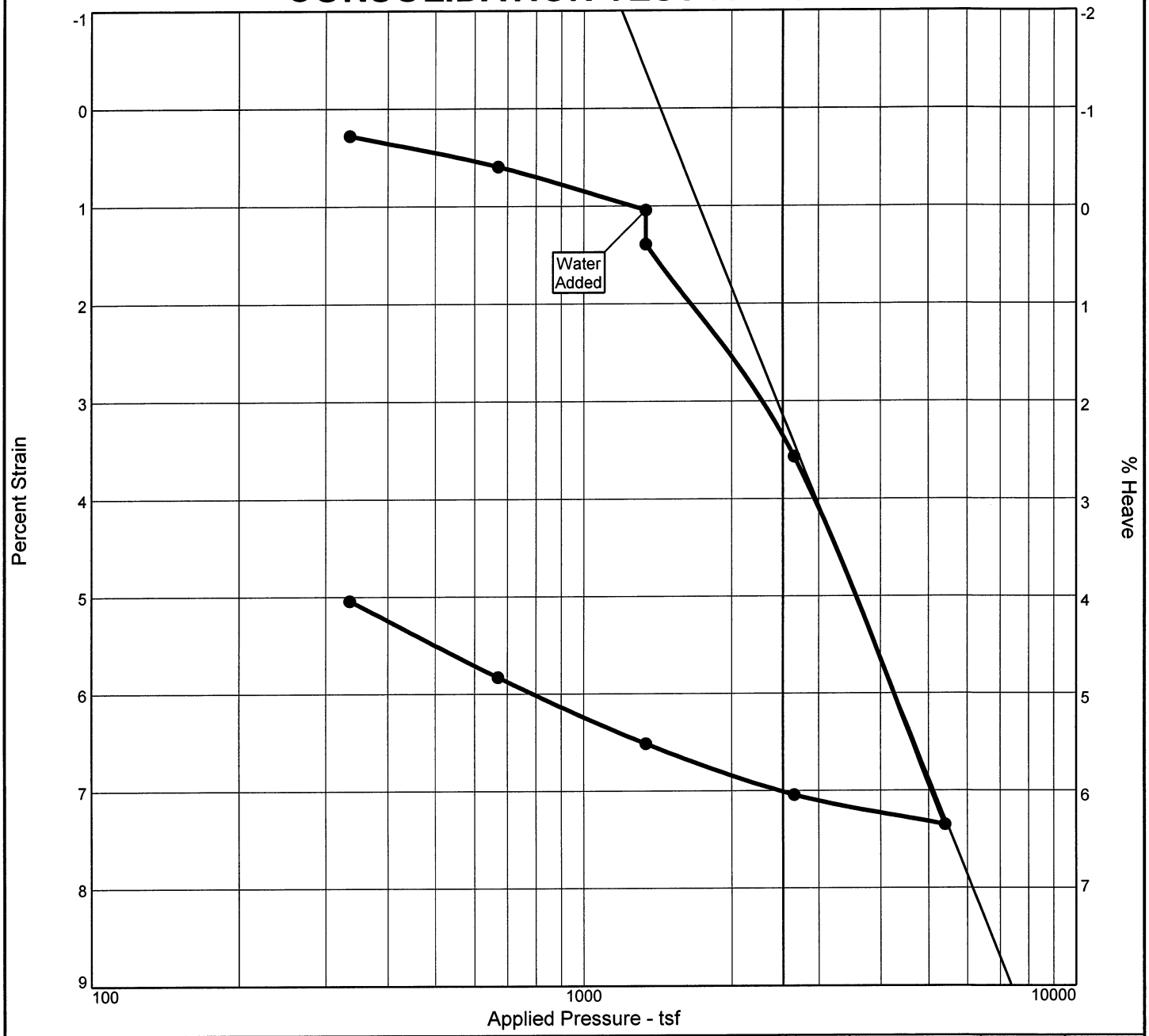
Source of Sample: B-8 Depth: 6'



SOILS ENGINEERING, INC.

Figure B-2

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_s	Swell Press. (tsf)	Heave %	e_o
Sat.	Moist.											
36.2 %	10.7 %	92.9	N/A	N/A	2.65	336	2699.1	0.23	0.03		-0.4	0.781

MATERIAL DESCRIPTION	USCS	AASHTO
SANDY SILT	ML	N/A

Project No. 18633 **Client:** RRM Design Group

Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-9 **Depth:** 6'

Remarks:
Test Date: 12/28/22

SOILS ENGINEERING, INC.

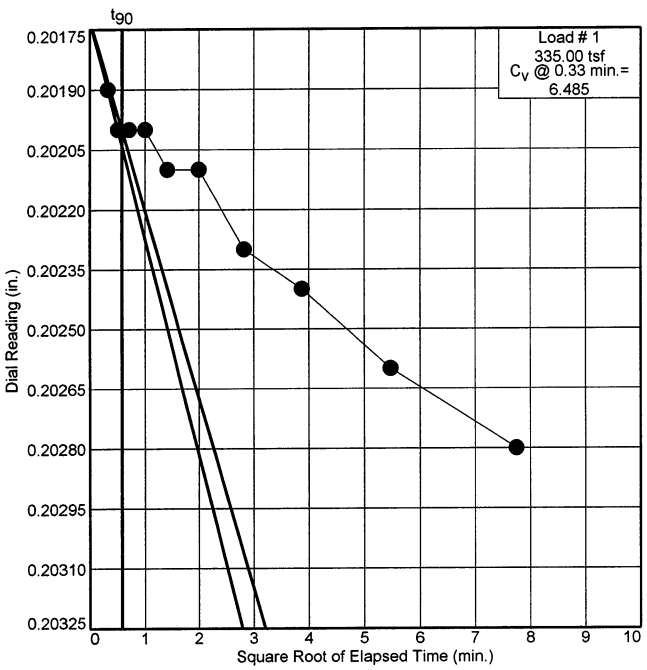
Figure B-3

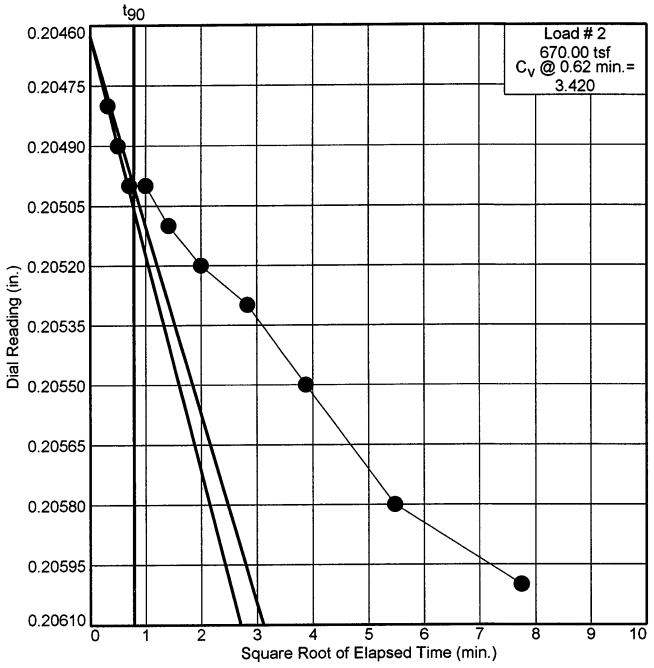
Tested By: JA **Checked By:** AL

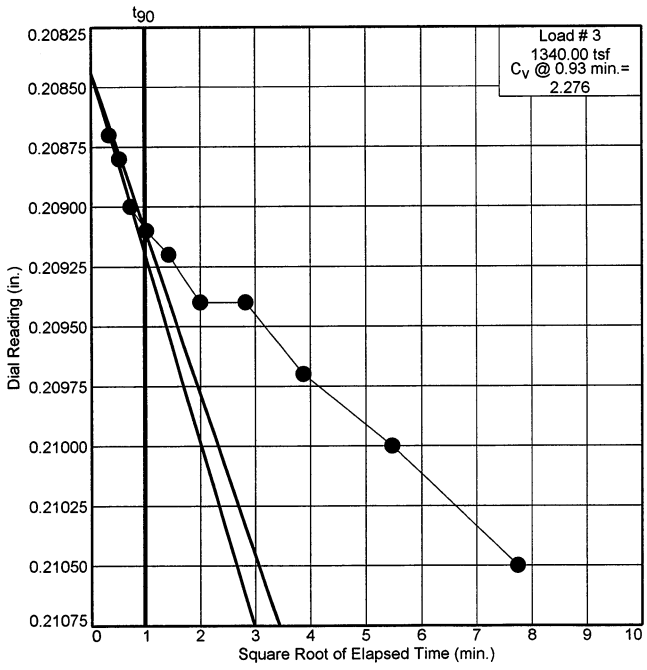
Dial Reading vs. Time

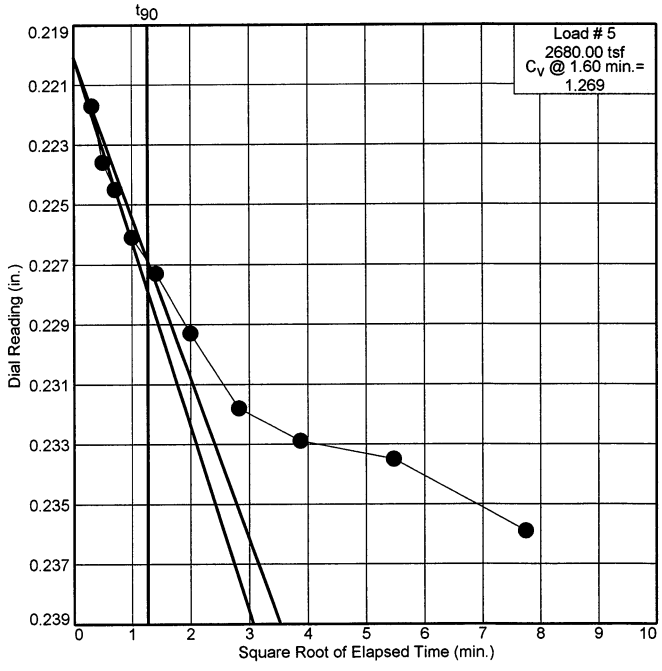
Project No.: 18633
Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-9 Depth: 6'



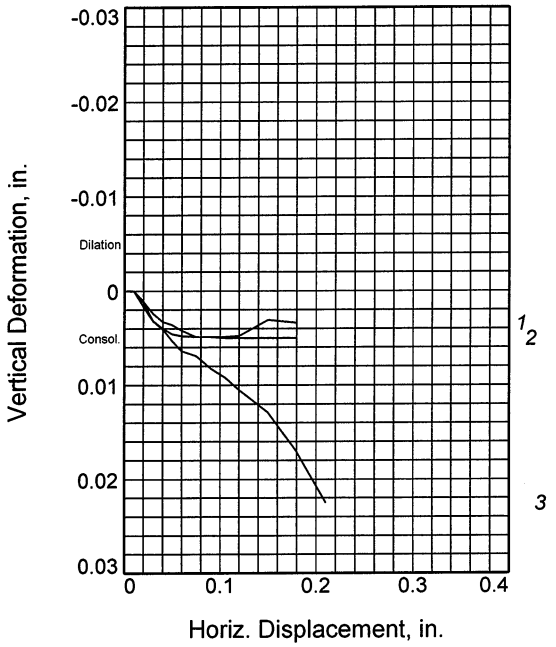


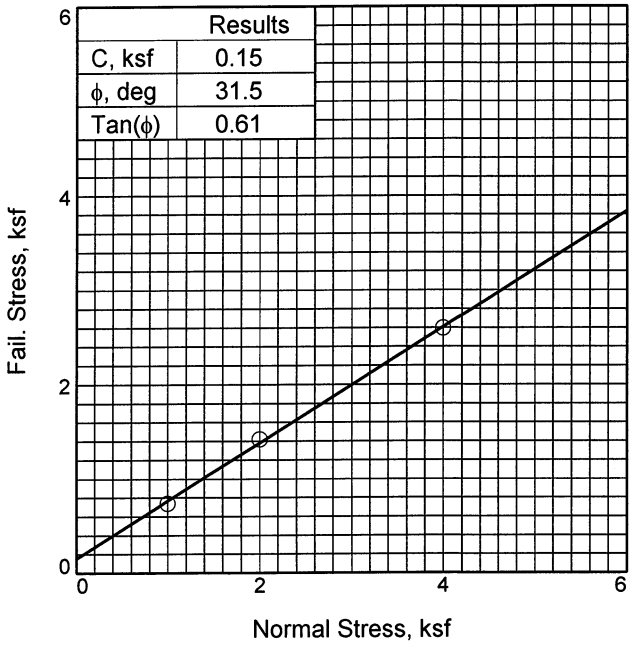


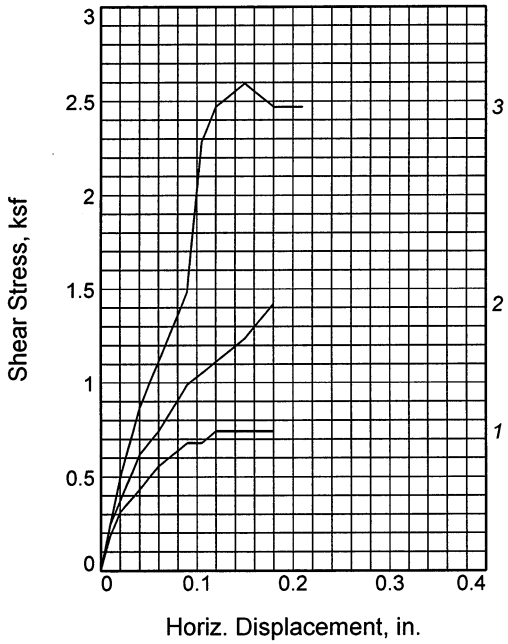


SOILS ENGINEERING, INC.

Figure B-3







Sample No.		1	2	3
Initial	Water Content, %	6.6	7.8	7.5
	Dry Density, pcf	84.7	84.5	84.6
	Saturation, %	18.3	21.7	20.9
	Void Ratio	0.9531	0.9571	0.9551
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	28.1	30.3	28.6
	Dry Density, pcf	84.7	84.5	84.6
	Saturation, %	78.2	83.9	79.2
	Void Ratio	0.9531	0.9571	0.9551
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	1.00	1.00
Normal Stress, ksf		1.00	2.00	4.00
Fail. Stress, ksf		0.74	1.42	2.59
Displacement, in.		0.12	0.18	0.15
Ult. Stress, ksf				
Displacement, in.				
Strain rate, in./min.		N/A	N/A	N/A

Sample Type: 2.5" x 6" TUBE
Description: SILTY SAND; light yellowish brown, dry, cohesive, medium dense, fine.
LL= N/A **PI=** N/A
Assumed Specific Gravity= 2.65
Remarks: Test Date: 12/29/22

Client: RRM Design Group

Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-6 **Depth:** 6'

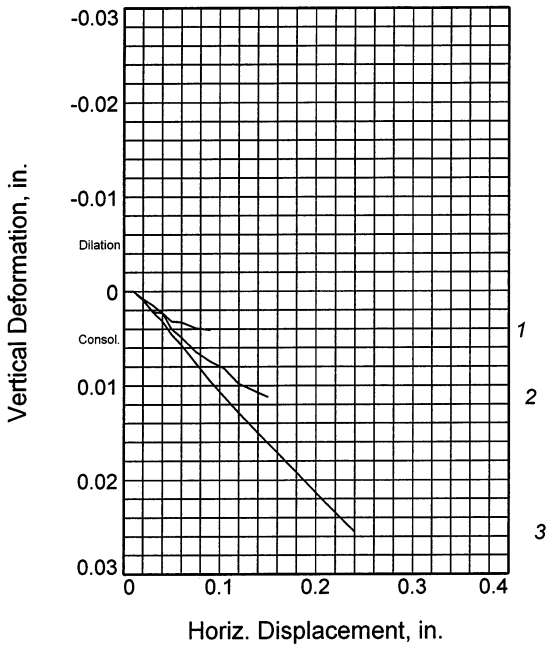
Proj. No.: 18633 **Date Sampled:** 11/21/22

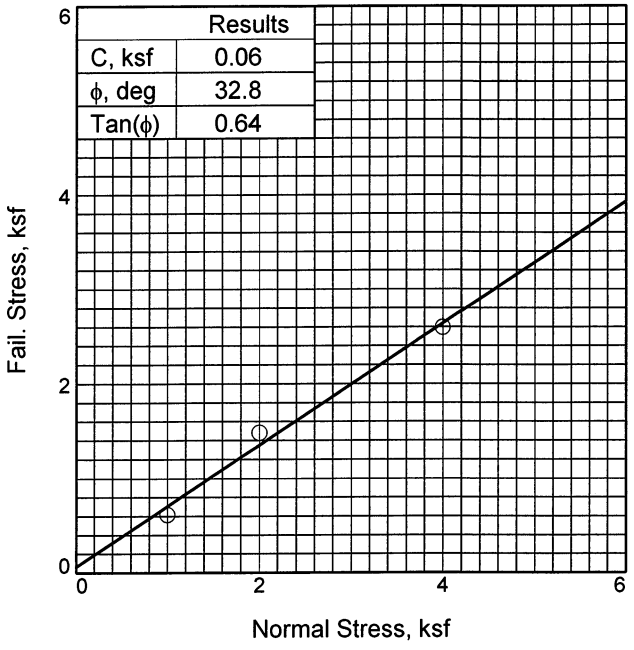
DIRECT SHEAR TEST REPORT

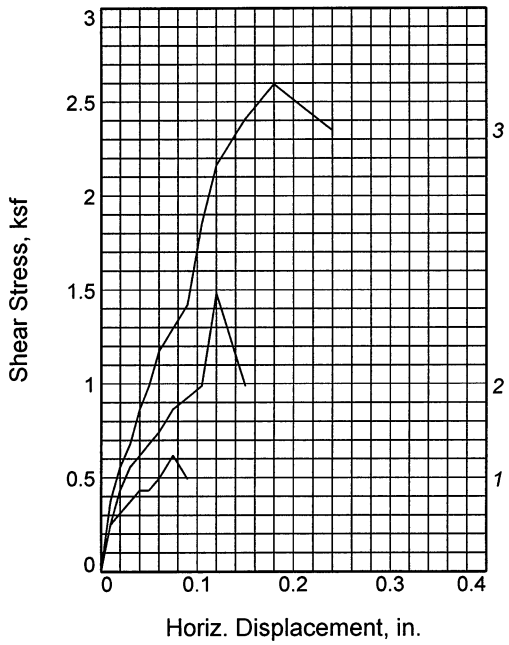
SOILS ENGINEERING, INC.

Figure C-1

Tested By: DH **Checked By:** AL







Sample No.		1	2	3
Initial	Water Content, %	9.9	8.5	8.7
	Dry Density, pcf	72.2	72.9	74.2
	Saturation, %	20.3	17.7	18.7
	Void Ratio	1.2903	1.2687	1.2292
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	39.6	39.7	39.5
	Dry Density, pcf	72.2	72.9	74.2
	Saturation, %	81.4	83.0	85.2
	Void Ratio	1.2903	1.2687	1.2292
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	1.00	1.00
Normal Stress, ksf		1.00	2.00	4.00
Fail. Stress, ksf		0.62	1.48	2.59
Displacement, in.		0.08	0.12	0.18
Ult. Stress, ksf				
Displacement, in.				
Strain rate, in./min.		N/A	N/A	N/A

Sample Type: 2.5" x 6" TUBE

Description: SILTY SAND; light yellowish brown, cohesive, dry, fine.

LL= N/A **PI=** N/A

Assumed Specific Gravity= 2.65

Remarks: Test Date: 12/29/22

Figure C-2

Client: RRM Design Group

Project: Fourth Street Community Center and Park (2883-01-RC22)

Source of Sample: B-8 **Depth:** 3'

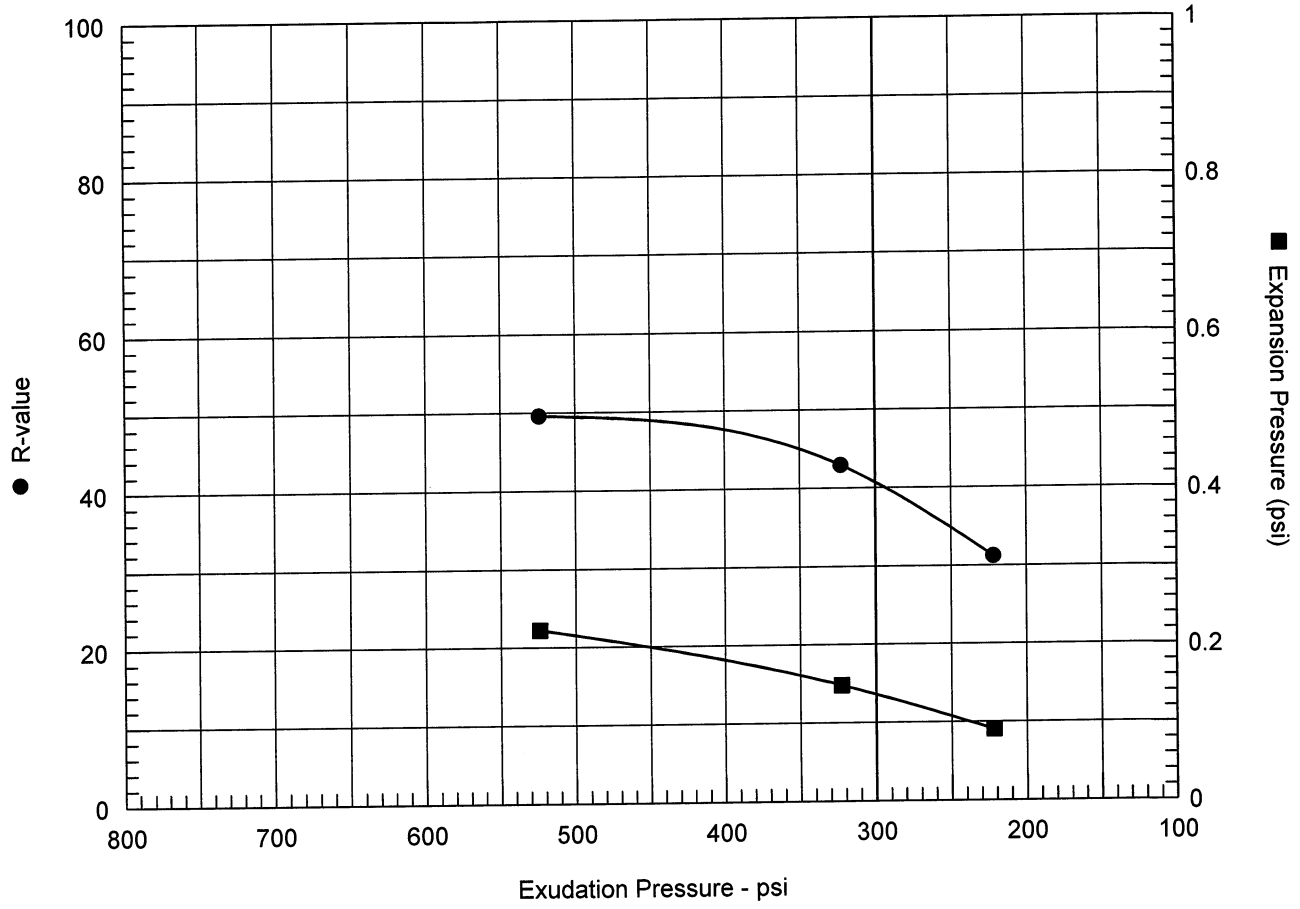
Proj. No.: 18633 **Date Sampled:** 12/09/22

DIRECT SHEAR TEST REPORT

SOILS ENGINEERING, INC.

Tested By: DH **Checked By:** AL

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	240	127.1	9.9	0.22	50	2.49	524	50	50
2	200	127.3	10.9	0.15	65	2.46	323	43	43
3	160	123.8	12.0	0.09	78	2.42	222	33	31

Test Results	Material Description
R-value at 300 psi exudation pressure = 41 **Exp. pressure at 300 psi exudation pressure =** 0.14 psi	SILTY SAND; dark brown, trace of clay, low plasticity, trace of garvel.

Project No.: 18633
Project: Fourth Street Community Center and Park (2883-01-RC22)
Location: R-1 @ 0-5'
Sample Number: 85294 **Depth:** 0-5'
Date: 1/10/2023

Tested by: RG
Checked by: AL

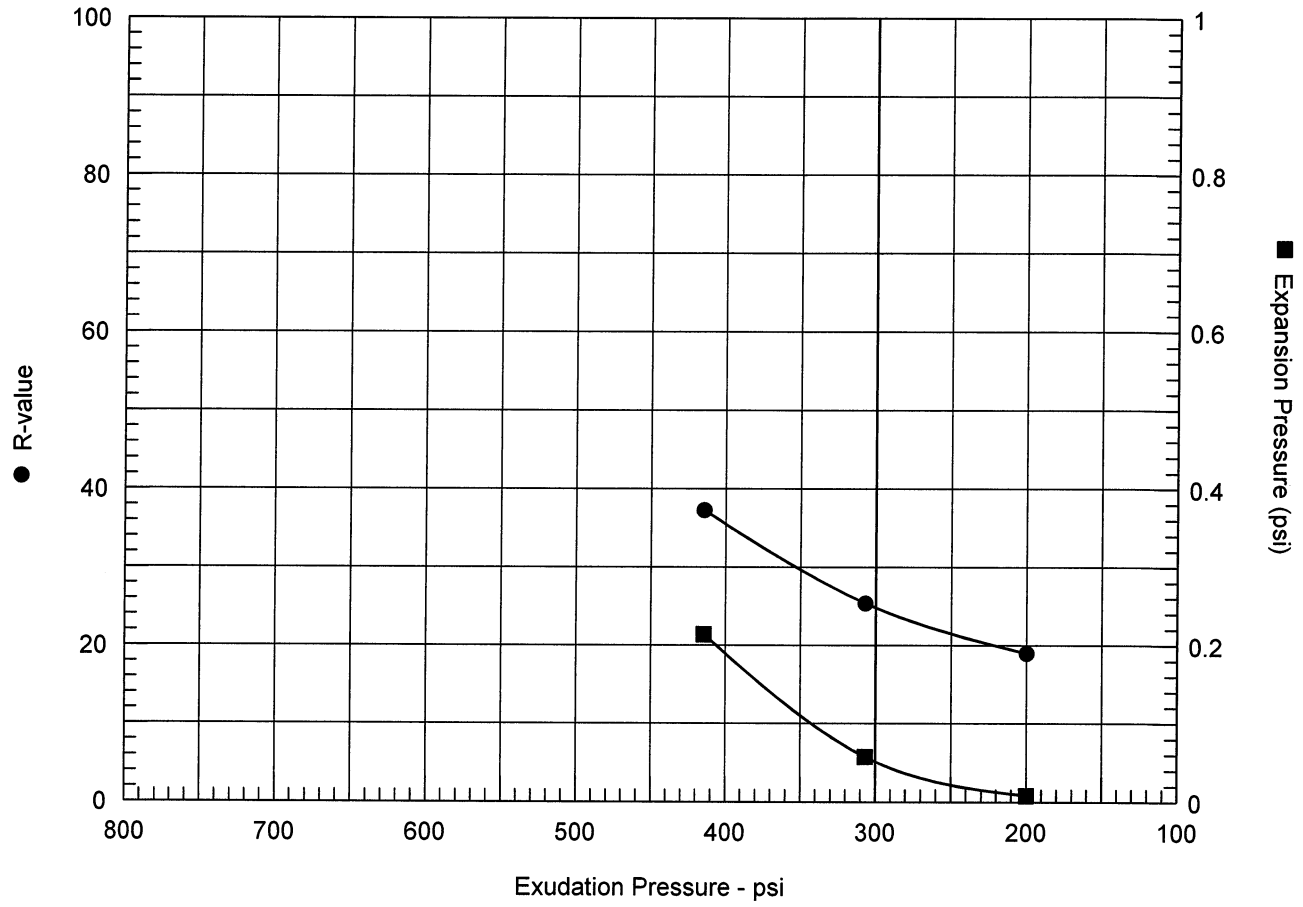
Remarks:
Test Date: 11/28/22

R-VALUE TEST REPORT

SOILS ENGINEERING, INC.

Figure D-1

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	100	116.3	13.9	0.21	70	2.46	415	37	37
2	100	114.0	15.0	0.06	95	2.54	307	25	25
3	80	112.7	16.1	0.01	118	2.57	200	18	19

Test Results	Material Description
R-value at 300 psi exudation pressure = 25 **Exp. pressure at 300 psi exudation pressure =** 0.05 psi	SANDY SILT; dark brown, trace of clay, low plasticity, trace of garvel.

Project No.: 18633
Project: Fourth Street Community Center and Park (2883-01-RC22)
Location: R-2 @ 0-5'
Sample Number: 85295 **Depth:** 0-5'
Date: 1/10/2023

Tested by: RG
Checked by: AL
Remarks:
Test Date: 11/28/22

R-VALUE TEST REPORT

SOILS ENGINEERING, INC.

Figure D-2

APPENDIX D

SEISMIC INVESTIGATION

SEISMIC DESIGN INFORMATION

USGS Design Map Summary and Detail Report

EQFAULT

Version 3.00

California Fault Map

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18633 4th St Community Center and Park

Latitude, Longitude: 36.0794, -119.0121

Date	12/21/2022, 7:48:39 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.574	MCE_R ground motion. (for 0.2 second period)
S_1	0.223	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.769	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.513	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.341	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.248	MCE_G peak ground acceleration
F_{PGA}	1.352	Site amplification factor at PGA
PGA_M	0.335	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	0.574	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.619	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.223	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.237	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.248	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.928	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	0.94	Mapped value of the risk coefficient at a period of 1 s
C_V	1.083	Vertical coefficient

DISCLAIMER

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*                    *
*    E Q F A U L T   *
*                    *
*    Version 3.00    *
*                    *
**********************
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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 18633

DATE: 12-16-2022

JOB NAME: 18633 RRM Design Grp

CALCULATION NAME: Test Run Analysis

FAULT-DATA-FILE NAME: CGSFLTE.DAT

SITE COORDINATES:
   SITE LATITUDE: 36.0794
   SITE LONGITUDE: 119.0121

SEARCH RADIUS: 100 mi

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   DISTANCE MEASURE: cd_2drp
   SCOND: 0
   Basement Depth: 5.00 km   Campbell SSR: Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: CGSFLTE.DAT

MINIMUM DEPTH VALUE (km): 0.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

Page 1

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
Kern Front	15.3(24.7)	6.3	0.160	VIII
GREAT VALLEY 14	52.9(85.2)	6.4	0.065	VI
WHITE WOLF	56.0(90.1)	7.3	0.101	VII
So. SIERRA NEVADA	57.3(92.2)	7.3	0.099	VII
INDEPENDENCE	57.7(92.8)	7.1	0.088	VII
OWENS VALLEY	57.7(92.9)	7.6	0.095	VII
GREAT VALLEY 13	63.9(102.8)	6.5	0.060	VI
LITTLE LAKE	64.2(103.4)	6.9	0.060	VI
SAN ANDREAS - 1857 Rupture M-2a	70.5(113.4)	7.8	0.090	VII
SAN ANDREAS - Cholame M-1c-1	70.5(113.4)	7.3	0.069	VI
SAN ANDREAS - Whole M-1a	70.5(113.4)	8.0	0.100	VII
SAN ANDREAS - Cho-Moj M-1b-1	70.5(113.4)	7.8	0.090	VII
SAN ANDREAS - Carrizo M-1c-2	71.2(114.6)	7.4	0.072	VII
BIRCH CREEK	72.5(116.7)	6.4	0.051	VI
PLEITO THRUST	74.1(119.2)	7.0	0.069	VI
SAN ANDREAS - Parkfield	75.4(121.3)	6.5	0.043	VI

SAN JUAN	76.8(123.6)	7.1	0.058	VI
GREAT VALLEY 12	76.8(123.6)	6.3	0.046	VI
HUNTER MTN. - SALINE VALLEY	77.7(125.0)	7.2	0.061	VI
GARLOCK (East)	77.9(125.4)	7.5	0.071	VI
GARLOCK (West)	78.7(126.7)	7.3	0.063	VI
WHITE MOUNTAINS	80.5(129.5)	7.4	0.066	VI
ROUND VALLEY	83.6(134.5)	7.0	0.063	VI
GREAT VALLEY 11	85.1(137.0)	6.4	0.045	VI
SAN ANDREAS (Creeping)	86.6(139.4)	6.2	0.033	V
BIG PINE	86.9(139.9)	6.9	0.048	VI
LENWOOD-LOCKHART-OLD WOMAN SPRGS	91.7(147.5)	7.5	0.063	VI
PANAMINT VALLEY	92.8(149.3)	7.4	0.059	VI
FISH SLOUGH	93.3(150.2)	6.6	0.047	VI
SAN GABRIEL	94.6(152.3)	7.2	0.052	VI
DEEP SPRINGS	95.7(154.0)	6.6	0.046	VI
HILTON CREEK	96.8(155.8)	6.7	0.048	VI
TANK CANYON	97.9(157.5)	6.4	0.041	V
GREAT VALLEY 10	98.7(158.9)	6.4	0.040	V
RINCONADA	98.7(158.9)	7.5	0.059	VI
BLACKWATER	99.4(159.9)	7.1	0.048	VI
SAN ANDREAS - Mojave M-1c-3	99.5(160.1)	7.4	0.056	VI

****

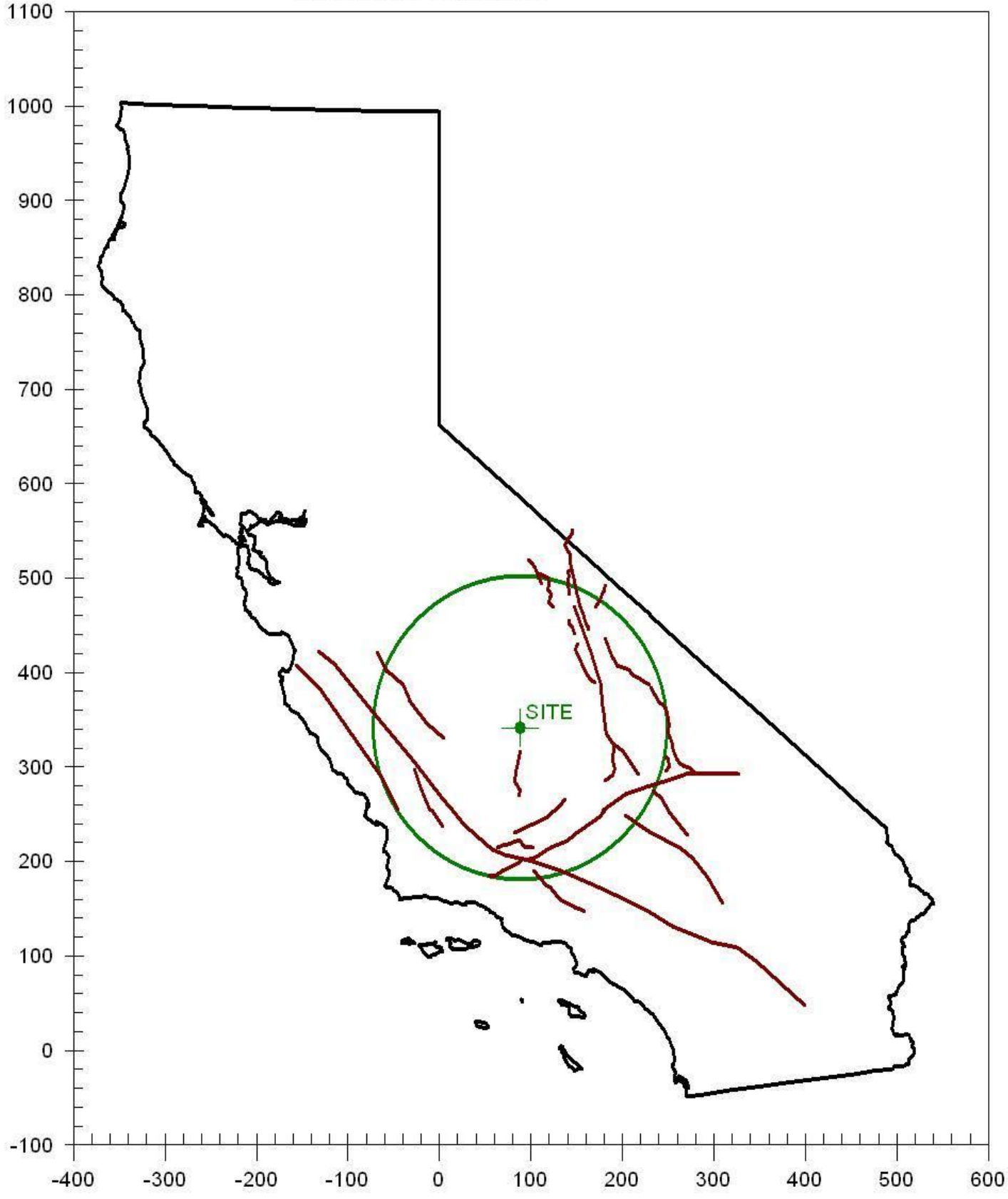
-END OF SEARCH- 37 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE Kern Front FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 15.3 MILES (24.7 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.1596 g

CALIFORNIA FAULT MAP

18633 RRM Design Grp



STORMWATER POLLUTION PREVENTION PLAN

for

New Fourth Street Community Center and Park

Project Location:
SE corner of Henderson Ave. & Fourth Street
Porterville, CA 93257

RISK LEVEL: 1

Legally Responsible Person (LRP):
City of Porterville
291 N. Main Street
Porterville, CA 93257
Javier Sanchez
559-782-7462

Project Address:
SE Corner of Henderson Ave. & Fourth Street
Porterville, CA 93257

Estimated Project Dates:
Start of Construction: 2/01/2025
Completion of Construction: 11/30/2026

SWPPP Prepared by:
Wa Vang, PE, QSD

LANE ENGINEERS, INC.
Civil • Structural • Surveying
979 North Blackstone Street
Tulare, CA 93274
Phone: (559) 688-5263 / Fax: (559) 688-8893
www.laneengineers.com

LANE PROJECT NO. 24002

SWPPP Preparation Date:
11/15/2024

LANE ENGINEERS, INC.
Civil • Structural • Surveying

Date: November 15, 2024
To: **City of Porterville**
From: Wa Vang
Subject: Fourth Street Community Center and Park
Job No: 22306

To Whom it may Concern:

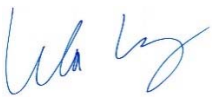
Below is a list of items that must be completed by either the Legally Responsible Person (LRP) or the Qualified SWPPP Practitioner (QSP) and inserted in the SWPPP.

1) The LRP shall ensure that the SWPPPs for all traditional project sites are amended or revised by a Qualified SWPPP Developer (QSD) if major revisions become necessary. It shall be the responsibility of the General Contractor to hire a certified QSP to implement the SWPPP.
2) The LRP should provide a list and documentation of any "Duly Authorized Representative" that is allowed to sign for the LRP and other authorized individuals as mentioned in SWPPP Section 6.1. This documentation should be attached in **Appendix K**.
3) It shall be the responsibility of the QSP to perform all site sampling & monitoring, visual inspections, prepare rain event action plans, maintain field logs, submit non-compliance reports and violations, file all annual reports, and Notice of termination in accordance with the General Permit.
4) The QSP and the General Contractor shall be responsible for stabilizing inactive areas and finished slopes, as defined by the Construction General Permit. The stabilization method shall be left to the discretion of the General Contractor and his/her QSP.
5) The QSP will be responsible for documenting all training activities for his employees and attaching this information in **Appendix J**.
6) The QSP will be responsible for including a list of names of all contractors, subcontractors, and individuals who will be directed by the QSP. This list should be attached in **Appendix L**. The subcontractors working on the project should be notified about the General Permit and SWPPP requirements by the QSP.
7) The SWPPP is a living document. Please update the SWPPP when the QSP deems that alternative BMPs will be used or additional BMP's are added. If the control measures found on the site during inspection do not reflect what is in the SWPPP this can constitute **Non-Compliance**.

Please contact the undersigned engineer if there are any questions about this SWPPP or permit compliance.

Sincerely,

LANE ENGINEERS, INC.



Wa Vang, PE, QSD

SWPPP Table of Contents

Qualified SWPPP Developer Certification

Amendment Log

Stormwater Pollution Prevention Plan

Appendix A - General Permit (See Binder 2)

Appendix B - Permit Registration Documents (including Vicinity Map and Water Pollution Control Drawing)

Appendix C - SWPPP Amendment QSD Certifications

Appendix D - Non Compliance Reports

Appendix E - Submitted Changes of Information

Appendix F - Construction Schedule

Appendix G - Pollutant List

Appendix H - CASQA Stormwater BMP Handbook: Construction Fact Sheets

Appendix I - Construction Inspection Report Forms

Appendix J - Training Forms

Appendix K - Responsible Parties

Appendix L - Contractors and Subcontractors

Appendix M - Example Storm Event Monitoring Forms

Appendix N - Attachment D: Traditional Construction Risk Level Requirements

Qualified SWPPP Developer

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: *Fourth Street Community Center & Park – Porterville, CA*

Project Number/ID: *N/A*

"This Stormwater Pollution Prevention Plan and its appendices were prepared under my direction to meet the requirements of the California Construction Stormwater General Permit (*Order No. 2022-0057-DWQ*). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below and will maintain up to date credentials for the duration of the project."

	11/15/2024
QSD Signature	*Date*
Wa Vang	*22309*
QSD Name	*QSD Certificate Number*
PE, QSD	*(559) 688-5263*
Title and Affiliation	*Telephone Number*
wa@laneengineers.com	
Email	

Amendment Log

Project Name: *Fourth Street Community Center and Park– Porterville, CA*

Project Number/ID:

Amendment No.	Date	Brief Description of Amendment (include section and page number)	Prepared and Approved By
			Name: QSD#
			Name: QSD#
			Name: QSD#

The SWPPP will be revised when:

- There is a 2022 CGP violation (2022 CGP Section VI.Q.1);
- There is a reduction or increase in total disturbed acreage (2022 CGP Section III.F.2. and F.4);
- BMPs are not effective and are not resulting in a reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges (2022 CGP Section VI.Q.1 and Attachment E Section III.C.5);
- There is a change in the project duration that changes the project Risk Type (2022 CGP Section III.F.1);
- Dischargers with projects where all construction activities (including passive treatment, active treatment systems, and/or active equipment) will be suspended for 30 days or more (2022 CGP Section III.G);
- There is a change in construction or operations that may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4) (2022 CGP Sections IV.O. and VI.Q.1); or

When deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1-1 can be field determined by the QSP. All other changes will be made by the QSD as formal amendments to the SWPPP. Note that the 2022 CGP requires that the QSD "revise the SWPPP to address potential problems identified by visual inspections, sampling data, comments from a QSP, or their own site observations (2022 CGP Section V.C.2.).

SWPPP Amendment QSD Certifications are located in **Appendix C**.

Stormwater Pollution Prevention Plan

Section 1 SWPPP Requirements

1.1 INTRODUCTION

This Stormwater Pollution Prevention Plan (SWPPP) is designed to comply with California's *General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (2022 CGP)*, State Water Resources Control Board (State Water Board) *Order No. 2022-0057-DWQ (NPDES No. CAS000002)* (**Appendix A**). This SWPPP has been prepared following the 2022 CGP SWPPP Template for Traditional Projects provided in the California Stormwater Quality Association (CASQA) Stormwater *Best Management Practice (BMP) Handbook: Construction* (CASQA 2023).

This project is considered a traditional construction project.

In accordance with the 2022 CGP, Section IV.O, this SWPPP is designed to address the following:

- Identification of all pollutants, their sources, and control mechanisms, including sources of sediment associated with all construction activities (e.g., sediment, paint, cement, stucco, cleaners, site erosion);
- Pollutant source assessments, including a list of potential pollutant sources and identification of site areas where additional BMPs are necessary to reduce or prevent pollutants in stormwater and authorized non-stormwater discharges, per the minimum requirements when developing the pollutant source assessment;
- Description of site-specific BMPs implemented to reduce or eliminate stormwater pollution;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard; and;
- Stabilization BMPs are installed to reduce or eliminate pollutants after construction is completed are effective and maintained; and
- Calculations and design details, as well as BMP controls, are complete and correct.

The New Fourth Street Community Center and Park project in the City of Porterville comprises approximately 6.65 acres. The Project is located at the SE corner of Henderson Avenue & Fourth Street, Porterville, California. The property is owned by the City of Porterville. The project's location is shown on the Site Maps in **Appendix B**.

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Stormwater Multi Application and Report Tracking System (SMARTS) by the LRP or DAR. The project-specific PRDs include (2022 CGP Section III.A):

1. Notice of Intent (NOI);
2. Risk Level Determination (Construction Site Sediment and Receiving Water Risk Determination);
3. Site Drawings and Map;
4. SWPPP;
5. Applicable plans, calculations, and other supporting documentation for compliance with the Phase I or Phase II municipal separate storm sewer system (MS4) post construction requirements or the post-construction standards of the 2022 CGP:
    - Attachment or web-source containing the applicable Phase I or Phase II MS4 post construction requirements;
    - The post construction plans and calculations submitted to or approved by the applicable Phase I or Phase II MS4; and/or
    - Post-construction water balance calculation;
6. Annual Fee per the current 23 California Code of Regulations Chapter 9 fee schedule for National Pollutant Discharge Elimination System (NPDES) stormwater permits; and
7. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal).

Site Maps can be found in **Appendix B**. A copy of the submitted PRDs shall also be kept in **Appendix B** along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The SWPPP will be available at the construction site during working hours while construction is occurring and shall be made available upon request by a federal, state, or municipal inspector. A current copy of the site-specific SWPPP and any site inspection reports required by the 2022 CGP may be kept in electronic format at the site so long as the information requested by a federal, state, or municipal inspector can be made available during an inspection. Legible maps in hard copy must be available at the site (2022 CGP Section IV.O.1.).

The SWPPP must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The SWPPP must remain on the site during construction activities, commencing with the initial mobilization and ending with the termination of coverage under the 2022 CGP.

1.4 SWPPP AMENDMENTS

SWPPP changes or amendments will be uploaded through SMARTS within 30 calendar days. The SWPPP will be revised when:

- If there is a 2022 CGP violation (2022 CGP Section VI.Q.1);
- There is a reduction or increase in total disturbed acreage (2022 CGP Section III.F.2 and F.4.);
- BMPs are not effective and are not resulting in a reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges (2022 CGP Section VI.Q.1 and Attachment D Section III.C.5);
- There is a change in the project duration that changes the project's risk level (2022 CGP Section III.F.1); or

- Dischargers with projects where all construction activities (including passive treatment, active treatment systems, and/or active equipment) will be suspended for 30 days or more (2022 CGP Section III.G.).

Additionally, the SWPPP will be amended when:

- There is a change in construction or operations that may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4) (2022 CGP Sections IV.O. and VI.Q.1); or

When deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1-1 can be field determined by the QSP. All other changes will be made by the QSD as formal amendments to the SWPPP. Note that the 2022 CGP requires that the QSD revise the SWPPP to address potential problems identified by visual inspections, sampling data, comments from a QSP, or their own site observations (2022 CGP Section V.C.2.).

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;
- The original BMP(s) proposed, if any;
- The new BMP(s) proposed; and
- QSD certification.

SWPPP amendments will be logged at the front of the SWPPP and SWPPP Amendment QSD certifications will be located in **Appendix C**. The SWPPP text will be revised, replaced and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Table 1-1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP (1)	Check changes that can be field located or field determined by QSP
Increase quantity of an Erosion or Sediment Control Measure	✓
Relocate/add stockpiles or stored materials	✓
Relocate or add toilets	✓
Relocate vehicle storage and/or fueling locations	✓
Relocate areas for waste storage	✓
Relocate water storage and/or water transfer location	✓
Changes to access points (entrance/exits)	✓

Table 1-1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP (1)	Check changes that can be field located or field determined by QSP
Change type or location of Erosion or Sediment Control Measure	✓
Minor changes to schedule or phases	✓
Changes in construction materials	✓
(1) Any field changes not identified for field location or field determination by the QSP must be made as an amendment by the QSD.	

1.5 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP will be retained for a minimum of three years from the date generated or date submitted, whichever is later. These records will be available at the Site until construction is complete. Records assisting in the determination of compliance with the 2022 CGP will be made available within a reasonable time to the Regional Water Board, State Water Board, or U.S. Environmental Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years will be adhered to. It shall be the responsibility of the owner to retain all records once project construction is complete. RWQCB's may require records to be retained for longer periods.

1.6 REPORTING

Completed inspection checklists will be kept with the SWPPP on-site or electronically. The 2022 CGP requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1 of each year. Reporting requirements are identified in 2022 CGP Section VI.P. Annual reports will be filed in SMARTS and in accordance with information required by the online forms.

Planned changes in site construction activities that may result in non-compliance with the 2022 CGP are required to be provided in writing to the Regional Water Board and local stormwater agency in advance of the changes.

If a 2022 CGP discharge violation occurs, the QSP will immediately notify the LRP. The LRP will include information on the violation with the Annual Report. Corrective measures will be implemented immediately following identification of the discharge or written notice of non-compliance from the Regional Board. Discharges and corrective actions must be documented and include the following items:

- Risk Level 1 dischargers are not subject to Numeric Effluent Standards NEL's or NAL's (Attachment D.
- The date, time, location, nature of operation, and type of unauthorized discharge;
- The cause or nature of the notice or order;
- The BMPs deployed before the discharge event, or prior to receiving notice or order; and

- The date of deployment and type of BMPs deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

Include the results of all non-compliance events in **Appendix D.**

1.7 CHANGES TO PERMIT COVERAGE

The 2022 CGP allows for the reduction or increase of the total acreage covered under the 2022 CGP when: a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs will be filed electronically through a Change of Information (COI) within 30 days of a reduction or increase in total disturbed area if a change in permit-covered acreage is to be sought. The SWPPP will be modified appropriately and will be logged at the front of the SWPPP. SWPPP Amendments QSD Certifications will be located in **Appendix C**. COIs submitted electronically via SMARTS can be found in **Appendix E**.

1.8 NOTICE OF TERMINATION

A Notice of Termination (NOT) must be submitted electronically by the QSP via SMARTS to terminate coverage under the 2022 CGP. The QSP shall coordinate with the LRP or DAR to successfully terminate the SWPPP permit prior to project completion.

According to the requirements of 2022 CGP Section III.H.4., one of the following final stabilization methods will be used to satisfy final stabilization condition requirements:

70 percent final cover method supported by pre- and post-project photographs demonstrating stabilization.

RUSLE or RUSLE2 method with computation proof supported by pre- and post-project photographs demonstrating stabilization.

Custom method for which Regional Water Board approval has been obtained, supported by documentation required by the Regional Water Board and pre- and pos- project photographs demonstrating stabilization.

The Regional Water Board will consider a construction site complete when the conditions of the 2022 CGP Section III.H., have been met.

The QSP is required to submit the following in SMARTS:

- NOT SMARTS Form;
- QSP-prepared final NOT inspection which includes the QSP name and valid QSP certificate number;
- Final site map with photo orientation references;
- Photos demonstrating final stabilization and the applicable post-construction BMPs and/or low impact development; and
- A long-term maintenance plan, if applicable, for the post-construction stormwater runoff BMPs and/or low impact development features being implemented.

According to the 2022 CGP, the NOT will be automatically approved within 30 calendar days after the date the NOT was submitted, unless, within the 30 calendar days the Regional Water

Board notifies the discharger through SMARTS that the Notice of Termination has been denied, returned, or accepted for review (2022 CGP Section III.H.7).

Note: If an Annual Report has not been filed in the current reporting year, an Annual Report will need to be submitted prior to the NOT.

Section 2 Project Information

2.1 PROJECT AND SITE DESCRIPTION

Project Location: SE Corner of Henderson Avenue & Fourth Street, Porterville, CA
Existing Site Conditions: Open space and pedestrian trial
Existing Land Use: Mostly open space with pedestrian trail
Soils & Geologic Condition: See referenced soils report
Depth to Groundwater: See referenced soils report
Reference Soils Report: See Geotechnical Report by Soils Engineering, Inc. (Project No. 22-18633)
Proposed Drainage Pattern: Site is graded to Bioswales and overflow to City Storm Drain System
Receiving Water: N/A
Watershed Description: None
Description of Discharge Locations: Drains to City Storm Drain System
Environmentally Sensitive Areas: None
Description of Construction Activities: New Community Center and Park
Total Disturbed Surface Area: 6.65 Acres
Typical Rainy Season: October 1st to April 30th

Site maps showing existing topography, proposed drainage patterns, discharge locations and BMP implementation are located in **Appendix B**.

2.2 STORMWATER RUN-ON FROM OFFSITE AREAS

The General Permit requires that the SWPPP address calculations and design details as well as BMP controls for site run-on. This section of SWPPP identifies and provides estimates of any anticipated locations of project run-on. BMP's to control run-on are described here and are shown on the site map in **Appendix B**.

Site Run-On Source & Description: None
Site Run-On quantities: None
Description of BMP's used: Not Applicable

2.3 FINDINGS OF THE CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

This section summarizes the assumptions and input parameters and findings of the sediment and receiving water risk assessment, including the resulting site risk level from the Site Risk Determination. The sediment risk level was determined by the GIS Map, the site specific option, or from values populated by SMARTS.

Rainfall/Runoff, RUSLE R: 41.72

Soil Erodibility, K: 0.2
Length & Steepness of Slope, LS Factors: 1.67
Overall Predicted Sediment Loss from Project: 13.97 tons/acre
Sediment Risk: Low
Receiving Water Risk: Low

Calculated Site Risk Level (**Appendix B**): Level 1
A summary of permit requirements for this Risk Level as are follows:
Risk Level 1 – Dischargers are not subject to a numeric effluent standard. Comply with the requirements of Risk Level 1 of the 2022 CGP Attachment D.

2.4 CONSTRUCTION SCHEDULE

Construction project schedule is located in **Appendix F**. Anticipated start and end dates of construction as well as phases of significant activities and work near drainages or receiving waters is noted. The LRP shall contact the QSD if the schedule changes during construction to address potential impact to the SWPPP.

2.5 POTENTIAL CONSTRUCTION ACTIVITY AND POLLUTANT SOURCES

Construction materials that will be used on activities to be performed that have the potential to contribute pollutants other than sediment to stormwater runoff will be listed in **Appendix G**. This information is required by the General Permit Section IV.0.2.b.

2.6 IDENTIFICATION OF NON-STORMWATER DISCHARGES

Identify non-stormwater discharges that apply to the site. The General Permit requires that dischargers identify all non-stormwater discharges (where not otherwise required to be under a Regional Water Quality permit) and that discharges be eliminated, controlled, or treated. Locations will be noted on the site plan.

Section 3 Best Management Practices

3.1 SCHEDULE FOR BMP IMPLEMENTATION

This section identifies a schedule for deployment of BMPs. BMPs must be implemented, modified, and maintained to reflect the phase of construction and the weather conditions. In order to be effective, some BMPs must be installed before the site is disturbed to provide protection during grading operations or to reduce or minimize pollution from historic areas of contamination during construction. Listed below is a BMP deployment schedule:

EC – Erosion Control:
EC-1 Scheduling: Implemented throughout life of project
EC-2 Preservation of Existing Vegetation: Implement throughout construction
EC-3 to EC-8: It shall be the option of the Owner coordinating with the QSP on which soil stabilization method to use. The QSP will be responsible for working with the Owner and the contractors to use the appropriate BMP that will minimize disruption of the construction activities. Risk Level 1 dischargers must provide effective soil cover for inactive areas and all finished slopes, open space, utility backfill, and completed lots. Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
EC-10 Velocity Dissipation Devices: Deployed where noted on the site map

SE – Sediment Control:
SE-1 Silt Fence: Deployed as noted on the site map.
SE-5 Fiber Rolls: Deployed as noted on the site map
SE-6 Gravel Bag Berm: Deployed as noted on the site map
SE-7 Street Sweeping and Vacuuming: Implement throughout construction

SE-8 Sandbag Barrier: Deploy as noted on the site map
SE-10 Storm Drain Inlet Protection: Deploy as noted on the site map

TC – Tracking Control:
TC-1 Stabilized Construction Entrance/Exit: Construct as noted and shown on the site map and maintain throughout construction

WE – Wind Erosion Control
WE-1 Wind Erosion Control: Implemented throughout construction

NS – Non-Stormwater Management Control
NS-1 Water Conservation Practices: Implement throughout construction
NS-3 Paving and Grinding Operations: Implement during these operations
NS-6 Illicit Connection/Discharge: Implement throughout construction
NS-7 Potable Water/Irrigation: Implement as appropriate
NS-8 Vehicle and Equipment Cleaning: Implement throughout construction
NS-9 Vehicle and Equipment Fueling
NS-10 Vehicle Equipment Maintenance
NS-12 Concrete Curing: Implement during concrete construction
NS-13 Concrete Finishing: Implement during concrete construction

WM – Waste Management and Materials Pollution Control
The following BMPs will be implement throughout the entire life of the construction project:
WM-1 Material Delivery and Storage
WM-2 Material Use
WM-3 Stockpile Management
WM-4 Spill Prevention and Control
WM-5 Solid Waste Management
WM-6 Hazardous Waste Management
WM-7 Contaminated Soil Management
WM-8 Concrete Waste Management: Implement as noted on the site map
WM-9 Sanitary/Septic Waste Management, Contractor shall stake down all portable toilets used on the site to prevent them from being knocked or blown over

3.2 EROSION AND SEDIMENT CONTROL

Erosion and Sediment control BMPs are required to meet the General Permit requirement of providing site BMPs that are effective and result in the reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the BAT/BCT standard (Section IV.O.1). The General Permit additionally requires that SWPPPs be designed to address stabilization BMPs installed to reduce or eliminate pollutants after construction (Section IV.O.1).

BMPs for Erosion Control, Sediment Control, Wind Erosion Control & Tracking Control and drainage control will be installed that meet the minimum requirements for each site risk level category of the General Permit to prevent pollution associated with construction activities.

All BMP references in this SWPPP refer to the CASQA Construction Handbook unless noted otherwise in the plan. BMP locations will be noted on the BMP site map in **Appendix B**. BMP fact sheets are included in **Appendix H**. See SWPPP Section 3.1 for a list of BMPs expected to be used with this project.

3.3 NON-STORMWATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT

BMPs for non-stormwater dischargers will be required to effectively reduce pollutants associated with material storage, material use, waste management, and reduce/properly manage "non-stormwater" that is used or generated on site. The General Permit requires that SWPPPs be designed to address the following objective: to identify all non-stormwater discharges (where not otherwise required to be under a Regional Water Quality permit) and that discharges be eliminated, controlled, or treated.

Non-stormwater BMPs that meet the minimum requirements for each site risk level and otherwise prevent pollution associated with construction activities will be installed. These BMPs will be identified on the BMP site map in **Appendix B**. BMP fact sheets are included in **Appendix H**. See SWPPP Section 3.1 for a list of BMPs expected to be used with this project.

The QSP shall be responsible for providing equipment and materials for cleanup of spills on the site (spill kit). All spills and leaks shall be cleaned up immediately and disposed of properly.

3.4 POST CONSTRUCTION STORMWATER MANAGEMENT MEASURES

This project is located in an area subject to a Phase II MS4 permit approved Stormwater Management Plan and is, therefore, exempt from the runoff reduction requirements in the Construction General Permit. The QSP is not responsible for the implementation of post-construction BMPs, or any other maintenance after permit coverage has been terminated

Section 4 BMP Inspection and Maintenance

4.1 BMP INSPECTION AND MAINTENANCE

BMP inspection and maintenance will be performed in accordance with the requirements of the General Permit. A blank inspection form is located in **Appendix I**. Completed inspection forms should be included in **Appendix I** or in an accompanying file/binder that is referenced in the SWPPP and readily accessible on site.

The General Permit requires (Attachment D; Section IV.A) that completed inspection checklists be maintained with the on-site SWPPP or electronically. In general the information required to be recorded for BMP/facility inspections includes: the date of the inspection, weather information, site information, observations, descriptions of the inspected BMPs and any deficiencies, and the corrective actions that were taken such as BMPs that were fixed or additional BMPs that were implemented, and the inspectors name, title, and signature (Attachment D; Section III.C.7).

The required frequency of BMP inspections depends on the type of BMP that is implemented. The General Permit (Attachment D; Section III.C) requires routine weekly inspections and daily inspections during rain events of all BMPs (for all Risk Categories); however, some BMPs (e.g. tracking controls) may require daily monitoring. BMPs must be maintained regularly based on permit-required inspections and observations during the course of normal construction activities. The General Permit requires dischargers to begin implementing corrective actions within 72 hours for deficiencies identified during inspections (Attachment D; Section II.J). SWPPP amendments should be prepared by the QSD if warranted by the problem encountered and corrective action required.

Section 5 Training

The General Permit requires (Section V) that all elements of the SWPPP be developed by a Qualified SWPPP Developer (QSD) and implemented by a Qualified SWPPP Practitioner (QSP). The QSP may delegate tasks to trained employees provided adequate supervision and oversight is provided. Personnel at the site shall receive training appropriate for individual roles and responsibilities on the project. Appropriate personnel shall receive training on SWPPP implementation, BMP inspection and maintenance, and record keeping. Document all training activities (formal and informal) and retain a record of training activities in **Appendix J**. Training documentation must also be submitted in the Annual Report.

Section 6 Responsible Parties and Operators

6.1 RESPONSIBLE PARTIES

The General Permit requires that the name of any "**Duly Authorized Representative**" be listed in the SWPPP, and a copy of the written agreement or other mechanism that provides this authority from the LRP be provided in the SWPPP.

A list of authorized representatives is included in **Appendix K** along with project site personnel who will be responsible for SWPPP activities, including the QSD and QSP. This list should include the names of the individuals granted authority to sign permit-related documents.

Include copies of the written authorizations for duly authorized representatives in the appendix. The appendix or list should include the name and contact information for the individual, their role on the project, date of training, and date of recorded entry as well as a copy of training certificates or other verification of training.

QSD(s) identified for the project are identified in **Appendix K**. The QSD will have primary responsibility for assessing how construction activities will affect sediment transport, erosion, and other discharges of pollutants in stormwater runoff throughout the project. The QSD is required to revise the SWPPP to address potential problems identified by visual inspections, sampling data, comments from a QSP, or their own site observations. The QSD is required to perform the following on-site visual inspections:

- Within 30 days of construction activities commencing on site;
- Within 30 days when a new QSD is assigned to the project;
- Twice annually, once August through October and once January through March;
- Within 14 calendar days after a numeric action level exceedance; and
- Within the time period requested in writing from Regional Water Board staff.

QSPs and QSP Delegates identified for the project are identified in **Appendix K**. The QSP will have primary responsibility and significant authority for the implementation, maintenance, and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project.

Duties of the QSP include but are not limited to:

- Implementing all elements of the 2022 CGP and SWPPP, including, but not limited to:
    - Performing the following on-site visual inspections:

        - One inspection per calendar month; other weekly inspections in the month can be delegated to a trained QSP Delegate under the specific direction of the QSP.
        - Within 72 hours prior to a forecasted qualifying precipitation event, to inspect any areas of concern and to verify the status of any deficient BMPs, or other identified issues at the site. If extended forecast precipitation data (greater than 72 hours) is available from the *National Weather Service*, then the Pre-Precipitation Event inspection may be done up to 120 hours in advance.
        - Within 14 days after a NAL exceedance, the QSP shall visually inspect the drainage area for exceedance and document any areas of concern.
        - Prior to the submittal for the NOT or COI (for acreage changes) for all or part of the site.
    - Ensuring that all BMPs are implemented, inspected, and properly maintained;
    - Ensure that the SMARTS generated WDID Number Notification form is posted on-site, in a location viewable by the public or readily available upon request, and the dates are correct and match the dates listed in SMARTS.
- Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems, etc.;
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the 2022 CGP, and approved plans at all times.
- Notifying the LRP or Duly Authorized Representative immediately of off-site discharges or other non-compliance events.
- Providing foundation and site-specific training to QSP Delegates and overseeing QSP Delegate work. Tasks that may be delegated to appropriately trained QSP-delegates include:
    - Performing non-stormwater and stormwater visual observations and inspections;
    - Performing stormwater sampling and analysis, as required; and
    - Performing routine inspections and observations.

Table 6-1. QSP and QSP Delegate Authorized Inspections

	Weekly BMP and NSW	Pre-QPE	Daily-QPE Visual Inspections	Post-QPE Visual Inspections	Post NAL Exceedances	Monthly BMP and NSW	NOT
QSP	X	X	X	X	X	X	X
QSP Delegate	X		X	X			

6.2 CONTRACTOR LIST

The General Permit requires that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the QSP. Upon selection of a trained and certified QSP it will be the responsibility of the QSP to complete this list and include it in **Appendix L**. The list is required to include telephone numbers and work addresses and the specific areas of responsibility of each subcontractor and emergency contact numbers.

Section 7 Construction Site Monitoring Program

7.1 Purpose

The General Permit (Section IV.O.2.i) requires that a written site specific Construction Site Monitoring Program (CSMP) be developed by each discharger prior to the commencement of construction activities, and be revised as necessary to reflect project revisions and that the CSMP be included with the SWPPP. Section 7 of this SWPPP is the CSMP that will be used for this construction project categorized as a Risk Level 1 site. All Monitoring and Reporting requirements will be in accordance with General Permit Attachment D; which is included in **Appendix N** for reference. See SWPPP Section 2.1 for a description of the project site's watershed, drainage patterns, and all site discharge locations. See the site map located in **Appendix B** for discharge locations and all monitoring locations as applicable. See SWPPP Section 2.3 for a brief summary NAL/NEL numeric effluent limits.

7.2 Applicability of Permit Requirements

General Permit monitoring requirements for stormwater and non-stormwater visual observations; stormwater and non-stormwater sample collection; and receiving water monitoring are described in General Permit Attachment D; which is included in **Appendix N.** This project has been determined to be a Risk Level 1 project. The 2022 CGP identifies the following types of monitoring as being applicable for a Risk 1 project.

Risk Level 1

- Visual inspections of BMPs;
- Visual monitoring of the site related to qualifying precipitation events;
- Visual monitoring of the site for non-stormwater discharges;

- Sampling and analysis of construction site runoff for non-visible pollutants [including TMDL pollutants] identified during the pollutant source assessments when applicable; and
- Sampling and analysis of construction site runoff as required by the Regional Water Board when applicable.

7.3. Weather and Precipitation Event Tracking

Visual monitoring and inspections requirements of the 2022 CGP are triggered by a Qualifying Precipitation Event. The 2022 CGP defines a Qualifying Precipitation Event as any weather pattern that is forecast to have a 50 percent or greater Probability of Precipitation (PoP) and a Quantitative Precipitation Forecast (QPF) of 0.5 inches or more within a 24-hour period. The event begins with the 24-hour period when 0.5 inches has been forecast and continues on subsequent 24-hour periods when 0.25 inches of precipitation or more is forecast.

7.4 Monitoring Locations

Risk Level 1 projects are only required to collect water quality samples if there is a BMP breach, malfunction, leakage, or spill. Water quality samples should be taken for non-pollutants that may have been discharged from the site as identified in the site pollutant source assessment. Monitoring and testing of water quality samples shall be in accordance with General Permit Attachment D; attached in **Appendix N** for reference.

7.5 Safety and Monitoring Exemptions

All sampling and visual inspection shall be performed in a safe manner at the direction of the QSP. The QSP shall be responsible for applying the appropriate safety measures if it becomes necessary to perform inspections/obtain samples in particularly inclement weather.

7.6 Visual Monitoring

Per Section III.B.2. of Attachment D in the 2022 CGP, "For inactive projects, dischargers may reduce the visual inspection frequency and suspend sampling per Section III.G of the 2022 CGP. Dischargers shall provide an explanation with supporting information for all missed visual inspections or sampling required by this Attachment, to be included in the Annual Report." Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

The General Permit Attachment D; attached in **Appendix N** identifies the required frequency of visual observations and inspections. Example template field logs are provided in **Appendix M** for inspections. It shall be the responsibility of the QSP to modify the attached forms as necessary to reflect current site conditions. A description of the visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures shall be included in the records. All completed inspection logs should be kept in **Appendix M**.

Exemptions:

Risk Level 1 dischargers are not required to conduct visual observations/inspections during dangerous weather conditions such as flooding and electrical storms or outside of scheduled site business hours. If no required observations are collected due to these exceptions, Risk Level 1 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the visual observations/inspections were not conducted.

7.7 Water Quality Sampling and Analysis

The level of detail and the amount of information provided in this section will depend upon the risk level determined for the site as part of the PRDs. See General Permit Attachment D for more details on sampling and analysis.

Risk Level 1 Sites are required to monitor runoff for non-visible pollutants in the event of a BMP failure, breach, or spill. An area unaffected by the failure, breach, or spill must also be sampled to serve as the basis of comparison.

7.8 Watershed Monitoring Option

This option is not being pursued with this project.

7.9 Quality Assurance and Quality Control

It shall be the responsibility of the QSP to document all numeric effluent limit and other violations and submit this information to the SMARTS system as required by the General Permit. Copies of all violation records and corrective measures shall be attached to the SWPPP.

7.10 Reporting Requirements and Records Retention

Risk Level 1 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports and Violations) for a period of at least three years. Risk Level 1 dischargers shall retain all records on-site while construction is ongoing. These records include all of the information listed under General Permit Attachment D; attached in **Appendix N** for reference.

References

SWRCB (State Water Resources Control Board). (2022). Order 2022-0057-DWQ, NPDES General Permit No. CAS000002: Stormwater Discharges Associated with Construction and Land Disturbing Activities. Available online at: https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/general_permit_reissuance.html.

CASQA 2023. *Stormwater BMP Handbook: Construction.* Available online at: www.casqa.org

APPENDIX A
BINDER 2
CONSTRUCTION GENERAL PERMIT

APPENDIX B
PERMIT REGISTRATION DOCUMENTS (PRDs)

An official website of the United States government

Rainfall Erosivity Factor Calculator for Small Construction

Introduction

EPA's stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

- the construction site disturbs less than five acres, and
- the rainfall erosivity factor ("R" in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or "CGP-NeT". Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- Submit your LEW through EPA's eReporting Tool <https://www.epa.gov/npdes/submitting-notice-intent-noi-notice-termination-not-or-low-erosivity-waiver-lew-under>

Total R-Factor = 19.87 + 21.75 = 41.72

- List of states, Indian country, and territories where EPA is the permitting authority (pdf) <https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-b-areas-of-permit-cover.pdf>
- Construction Rainfall Erosivity Waiver Fact Sheet <https://www.epa.gov/npdes/construction-rainfall-erosivity-waiver-fact-sheet>
- Small Construction Waivers and Instructions (pdf) <https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-c-waivers.pdf>

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service <https://epa.gov/api-docs/>.

Steps to Calculate an R Factor for your Small Construction Project

1 Select the estimated start and end dates of construction by clicking the calendar icons below and using the dropdown calendar. The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 02/01/2025

End Date: 12/31/2025

2 Locate your small construction project by entering the address in the search box or by clicking on the map.

Location: 36.079474, -119.012188 **Search**

3 Click the "Calculate R Factor" button below.

Calculate R Factor

Facility Information

Start Date: 02/01/2025	**Latitude:** 36.0795
End Date: 12/31/2025	**Longitude:** -119.0122

Calculation Results

Rainfall erosivity factor (R Factor) = **19.87**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority (pdf)
<https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-b-areas-of-permit-

An official website of the United States government

Rainfall Erosivity Factor Calculator for Small Construction

Introduction

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- the construction site disturbs less than five acres, and
- the rainfall erosivity factor ("R" in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or "CGP-NeT". Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- Submit your LEW through EPA's eReporting Tool <https://www.epa.gov/npdes/submitting-notice-intent-noi-notice-termination-not-or-low-erosivity-waiver-lew-under>

- List of states, Indian country, and territories where EPA is the permitting authority (pdf) <https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-b-areas-of-permit-cover.pdf>
- Construction Rainfall Erosivity Waiver Fact Sheet <https://www.epa.gov/npdes/construction-rainfall-erosivity-waiver-fact-sheet>
- Small Construction Waivers and Instructions (pdf) <https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-c-waivers.pdf>

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service <https://epa.gov/api-docs/>.

Steps to Calculate an R Factor for your Small Construction Project

1 Select the estimated start and end dates of construction by clicking the calendar icons below and using the dropdown calendar. The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 01/01/2026

End Date: 11/30/2026

2 Locate your small construction project by entering the address in the search box or by clicking on the map.

Location: 36.079474, -119.012188 **Search**

3 Click the "Calculate R Factor" button below.

Calculate R Factor

Facility Information

Start Date: 01/01/2026	**Latitude:** 36.0795
End Date: 11/30/2026	**Longitude:** -119.0122

Calculation Results

Rainfall erosivity factor (R Factor) = **21.75**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority (pdf)
<https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-b-areas-of-permit-

Permit Type: Traditional:Construction - NOI **Status:** Not Submitted

Owner Information
On-Site Contact Information
Site Information
Additional Site Information
Risk
TMDL
Post Construction
QSD Information
Attachments
Billing Information
Certification
Linked Users

Sediment Risk | Receiving Water Risk | Combined Risk

1. SEDIMENT RISK FACTOR CALCULATION

Instructions: Enter R, K, and LS factor values. System will calculate watershed erosion estimates and segment sediment risk factor.

A) R Factor Value: ***(What's this?)** 41.72 Erosivity Calculator Help

Populate K and LS using GIS layer data

B) K Factor Value: (weighted average, by area, for all site soils) ***(What's this?)** 0.2

C) LS Factor: (weighted average, by area, for all slopes) ***(What's this?)** 1.67

Watershed Erosion Estimate (=R*K*LS) in tons/acre 13.97

Project Sediment Risk Factor: **(What's this?)** **Low**

Save & Continue

Fields marked with * are mandatory fields.

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Permit Type: Traditional:Construction - NOI **Status:** Not Submitted

Owner Information
On-Site Contact Information
Site Information
Additional Site Information
Risk
TMDL
Post Construction
QSD Information
Attachments
Billing Information
Certification
Linked Users

Sediment Risk | Receiving Water Risk | Combined Risk

2. RECEIVING WATER RISK FACTOR CALCULATION

Statewide Map of High Receiving Water Risk Watersheds

A. Watershed Characteristics

A.1.(a) Does the disturbed area discharge directly or indirectly to a 303(d) listed waterbody impaired by sediment?

OR

A.1.(b) Is the disturbed area located within a sub-watershed draining to a 303(d) listed waterbody impaired by sediment?

OR

A.2. Is the disturbed area located within a planning watershed draining to a waterbody with designated beneficial uses of COLD, SPAWN AND MIGRATORY?

Receiving Water Risk (answer to above questions): No Populate Receiving Water Risk

Project Receiving Water Risk Factor: Low

Save & Continue

Fields marked with * are mandatory fields.

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Permit Type: Traditional:Construction - NOI **Status:** Not Submitted

Owner Information
On-Site Contact Information
Site Information
Additional Site Information
Risk
TMDL
Post Construction
QSD Information
Attachments
Billing Information
Certification
Linked Users

Sediment Risk | Receiving Water Risk | Combined Risk

3. COMBINED RISK LEVEL MATRIX

Receiving Water Risk	Sediment Risk: Low	Sediment Risk: Medium	Sediment Risk: High
Low	Level1		Level2
High		Level2	Level3

Project Sediment Risk: Low

Project Receiving Water Risk: Low

Project Combined Risk: **Level1**

Continue

Fields marked with * are mandatory fields.

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FOURTH STREET COMMUNITY CENTER AND PARK

PORTERVILLE, CA

NORTH

SCALE 1 INCH = 500 FT.

LANE JOB: 22306

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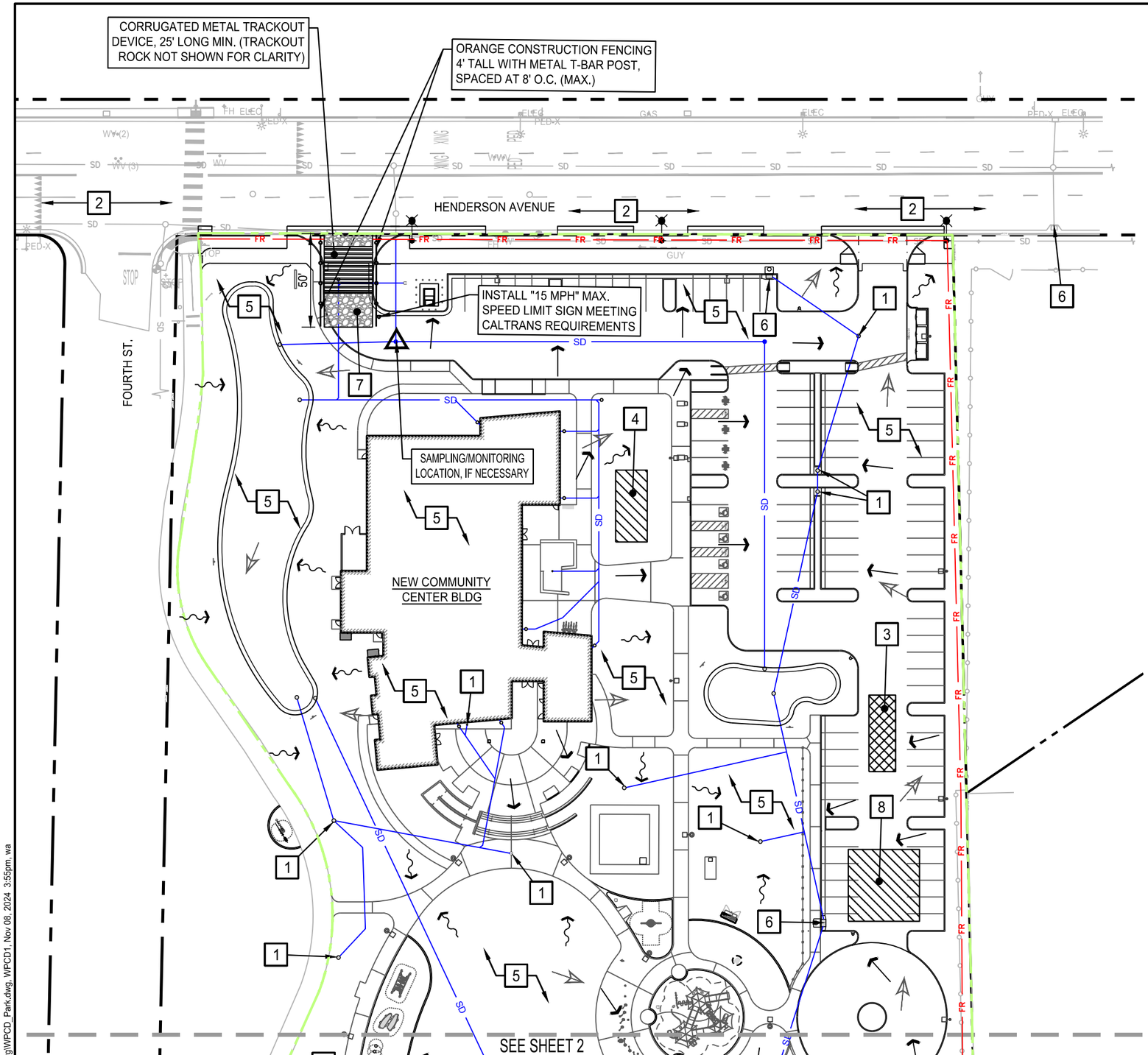

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NOTES

1. PORTABLE TOILETS SHALL BE MANAGED IN ACCORDANCE WITH WM-9. THE QSP CAN UPDATE TOILET LOCATIONS AS NECESSARY ON THIS PLAN.
2. A MINIMUM OF 1 SPILL KIT SHALL BE LOCATED ON THE SITE TO CLEAN UP SPILLS RELATED TO ANY POLLUTANT SOURCES ON THE SITE. THE SPILL KIT SHALL CONTAIN EQUIPMENT AND MATERIALS FOR CLEAN UP.
3. THE QSP SHALL BE RESPONSIBLE FOR PERFORMING ALL VISUAL INSPECTIONS LISTED UNDER THE RISK LEVEL 1 REQUIREMENTS.
4. ALL BMP'S NOTED ABOVE SUCH AS WE-1 REFERENCE THE SHEETS FROM THE CASQA STORMWATER BMP HANDBOOK.
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NORTH

SCALE: 1" = 60'

LEGEND

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WATER POLLUTION CONTROL DRAWING

CITY OF PORTERVILLE
SHEET 1 OF 3

SHEET 1 OF 3
LANE JOB: 22306

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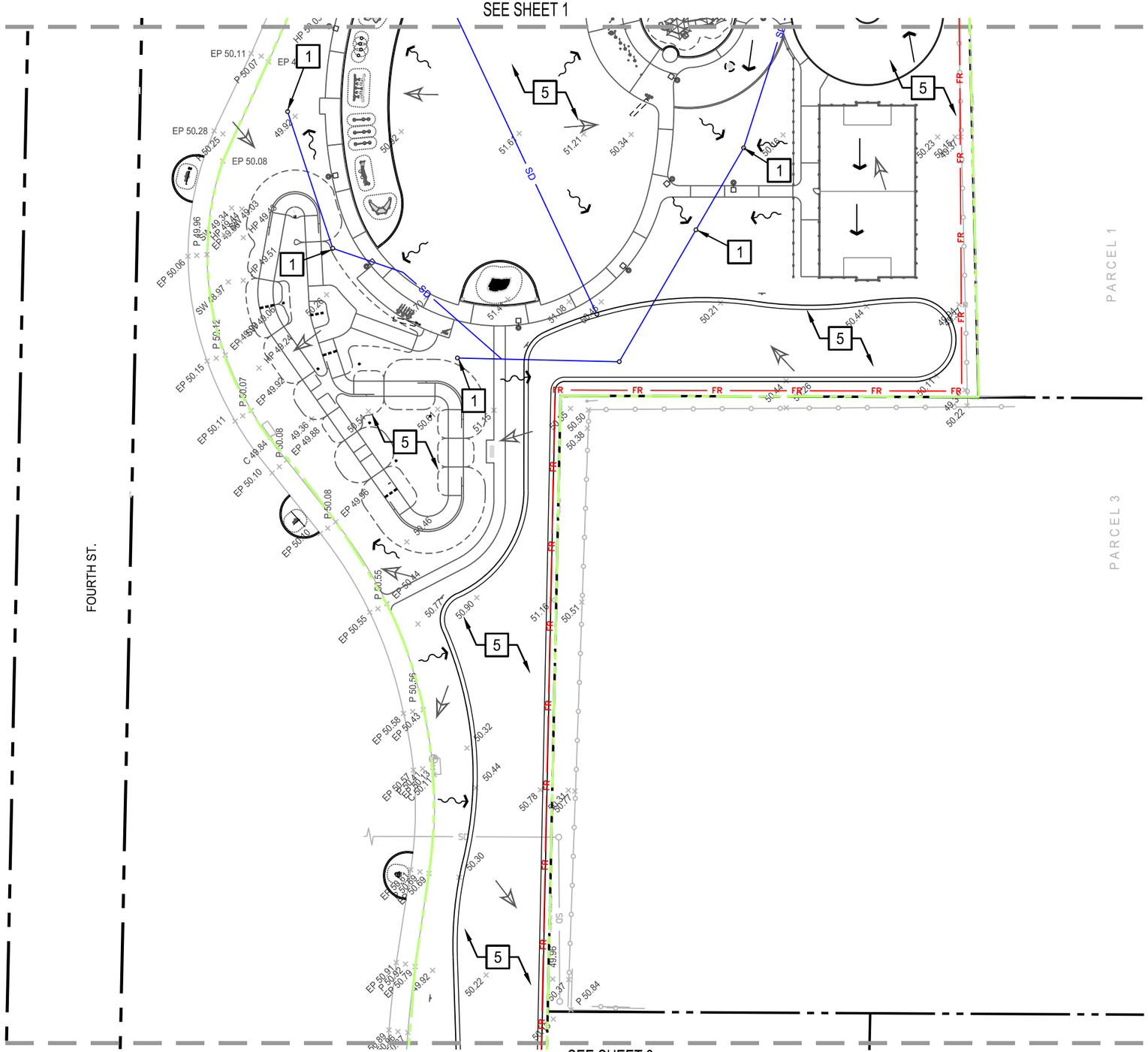

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979 N. Blackstone Street
Tulare, California 93274
559.688.5263
www.laneengineers.com

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WATER POLLUTION CONTROL DRAWING

CITY OF PORTERVILLE
SHEET 2 OF 3

SHEET 2 OF 3
LANE JOB: 22306

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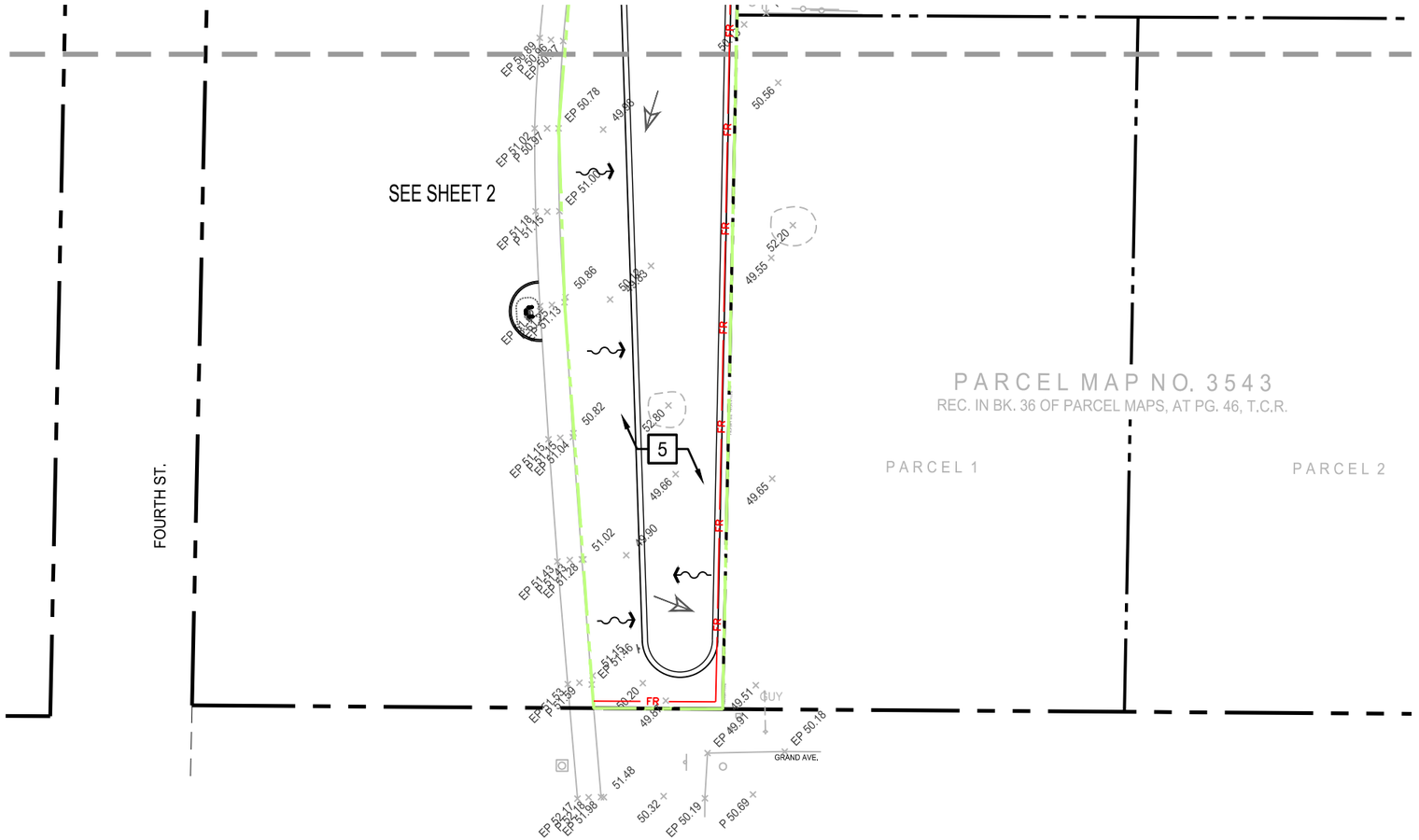

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WATER POLLUTION CONTROL DRAWING

CITY OF PORTERVILLE
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LANE JOB: 22306

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APPENDIX C
SWPPP AMENDMENT LOG

SWPPP Amendment No. _____

Project Name: _____

Project Number: _____

Qualified SWPPP Developer's Certification of the Stormwater Pollution Prevention Plan Amendment

"This Stormwater Pollution Prevention Plan and its appendices were prepared under my direction to meet the requirements of the 2022 CGP (SWRCB Order No. 2022-0057-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD's Signature	Date
QSD Name	QSD Certificate Number
Title and Affiliation	Telephone
Address	Email

APPENDIX D
NON COMPLIANCE REPORTS

(NAL/NEL EXCEEDANCE SITE EVALUATIONS ARE NOT REQUIRED FOR THIS PROJECT BECAUSE IT IS RISK LEVEL 1)

APPENDIX E
SUBMITTED CHANGE OF INFORMATION(DUE TO CHANGE IN OWNERSHIP OR ACREAGE)

APPENDIX F
CONSTRUCTION SCHEDULE

Approximate Construction Schedule:

Site Clearing and Rough Grading – __02_/01/2025___ thru ___03/30/2025_____

Underground Utilities – ___04/1/2025_____ thru ____07/30/2025_____

Vertical Building Construction – ____08/01/2025_____ – ____03/30/2026_____

Site Improvements Concrete, Concrete Paving and other Hardscape – __12/01/2025_____ thru _03/30/2026_____

Final Site Cleanup and Landscaping - ____03/01/2026_____ thru Project Completion

Note:

Construction schedule shown above is approximate. It shall be the responsibility of the QSP to insert the final construction schedule obtained from the general contractor upon completion of the bidding process.

APPENDIX G
CONSTRUCTION ACTIVITIES, MATERIALS USED AND ASSOCIATED POLLUTANTS

Water Line Flushing: Chlorinated Water

Concrete & Masonry: Acid Wash, Curing Compounds, Concrete Rinse Water

Painting: Resins, Thinners, Paint Strippers, Solvents, Adhesives, Sealants

Cleaning: Detergents, Bleaches, Solvents

Landscaping: Pesticides/Herbicides, Fertilizers, Lime and Gypsum, Aluminum Sulfate, Sulfur

Treated Wood: Copper, Arsenic, Selenium

Soil Amendments & Dust Control: Lime/Gypsum, Plant gums, Magnesium Chloride, Calcium Chloride, Natural Brines, Lignosulfonates

Asphalt Paving: Asphaltic Emulsions associated with asphalt paving operations

General Construction Equipment: Vehicle Fluids including oils, grease, petroleum, and coolants

Note:
See the attached Pollutant Testing Guidance Table.

Pollutant Testing Guidance Table

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Asphalt Products	Hot Asphalt	Yes - Rainbow Surface or Brown Suspension	Visually Observable - No Testing Required		
	Asphalt Emulsion				
	Liquid Asphalt (tack coat)				
	Cold Mix				
	Crumb Rubber	Yes – Black, solid material	Visually Observable - No Testing Required		
	Asphalt Concrete (Any Type)	Yes - Rainbow Surface or Brown Suspension	Visually Observable - No Testing Required		
Cleaning Products	Acids	No	**pH** Acidity Anions (acetic acid, phosphoric acid, sulfuric acid, nitric acid, hydrogen chloride)	pH Meter Acidity Test Kit	EPA 150.1 (pH)
					SM 2310B (Acidity)
					EPA 300.0 (Anion)
	Bleaches	No	**Residual Chlorine**	Chlorine	SM 4500-CL G (Res. Chlorine)
	Detergents	Yes - Foam	Visually Observable - No Testing Required		
	TSP	No	**Phosphate**	Phosphate	EPA 365.3 (Phosphate)
	Solvents	No	**VOC**	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)
Portland Concrete Cement & Masonry Products	Portland Cement (PCC)	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Masonry products	No	**pH**	pH Meter	EPA 150.1 (pH)

Pollutant Testing Guidance Table

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
			Alkalinity	Alkalinity or Acidity Test Kit	SM 2320 (Alkalinity)
	Sealant (Methyl Methacrylate - MMA)	No	**Methyl Methacrylate**	None	EPA 625 (SVOC)
			Cobalt		EPA 200.8 (Metal)
			Zinc		
	Incinerator Bottom Ash Bottom Ash Steel Slag Foundry Sand Fly Ash Municipal Solid Waste	No	**Aluminum** **Calcium** **Vanadium** **Zinc**	Calcium Test	EPA 200.8 (Metal) EPA 200.7 (Calcium)
	Mortar	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Concrete Rinse Water	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Non-Pigmented Curing Compounds	No	Acidity	pH Meter Alkalinity or Acidity Test Kit	SM 2310B (Acidity)
			Alkalinity		SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
Landscaping and Other Products	Aluminum Sulfate	No	Aluminum	TDS Meter Sulfate	EPA 200.8 (Metal)
			TDS		EPA 160.1 (TDS)
			Sulfate		EPA 300.0 (Sulfate)

Pollutant Testing Guidance Table

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
	Sulfur-Elemental	No	**Sulfate**	Sulfate	EPA 300.0 (Sulfate)
	Fertilizers-Inorganic [4]	No	**Nitrate**	Nitrate	EPA 300.0 (Nitrate)
			Phosphate	Phosphate	EPA 365.3 (Phosphate)
			Organic Nitrogen	None	EPA 351.3 (TKN)
			Potassium	None	EPA 200.8 (Metal)
	Fertilizers-Organic	No	TOC	Nitrate	EPA 415.1 (TOC)
			Nitrate		EPA 300.0 (Nitrate)
			Organic Nitrogen		EPA 351.3 (TKN)
			COD		EPA 410.4 (COD)
	Natural Earth (Sand, Gravel, and Topsoil)	Yes - Cloudiness and turbidity	Visually Observable - No Testing Required		
	Herbicide	No	**Herbicide**	None	Check lab for specific herbicide or pesticide
	Pesticide		**Pesticide**		
	Lime		Alkalinity	pH Meter Alkalinity or Acidity Test Kit	SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)
Painting Products	Paint	Yes	Visually Observable - No Testing Required		
	Paint Strippers	No	**VOC**	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)
	Resins	No	**COD**	None	EPA 410.4 (COD)

Pollutant Testing Guidance Table

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
			SVOC		EPA 625 (SVOC)
	Sealants	No	**COD**	None	EPA 410.4 (COD)
	Solvents	No	**COD**	None	EPA 410.4 (COD)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
	Lacquers, Varnish, Enamels, and Turpentine	No	**COD**	None	EPA 410.4 (COD)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
	Thinners	No	VOC	None	EPA 601/602 or EPA 624 (VOC)
			COD		EPA 410.4 (COD)
Portable Toilet Waste Products	Portable Toilet Waste	Yes	Visually Observable - No Testing Required		
Contaminated Soil	Aerially Deposited Lead[3]	No	**Lead**	None	EPA 200.8 (Metal)
	Petroleum	Yes – Rainbow Surface Sheen and Odor	Visually Observable - No Testing Required		
	Mining or Industrial Waste, etc.	No	**Contaminant Specific**	Contaminant Specific – Check with laboratory	Contaminant Specific – Check with laboratory

Pollutant Testing Guidance Table

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Line Flushing Products	Chlorinated Water	No	**Total chlorine**	Chlorine	SM 4500-CL G (Res. Chlorine)
Adhesives	Adhesives	No	COD	None	EPA 410.4 (COD)
			Phenols	Phenol	EPA 420.1 (Phenol)
			SVOC	None	EPA 625 (SVOC)
Dust Palliative Products	Salts (Magnesium Chloride, Calcium Chloride, and Natural Brines)	No	Chloride	Chloride	EPA 300.0 (Chloride)
			TDS	TDS Meter	EPA 160.1 (TDS)
			Cations (Sodium, Magnesium, Calcium)	None	EPA 200.7 (Cations)
Vehicle	Antifreeze and Other Vehicle Fluids	Yes - Colored Liquid	Visually Observable - No Testing Required		
	Batteries	No	Sulfuric Acid	None	EPA 300.0 (Sulfate)
			Lead	None	EPA 200.8 (Metal)
			pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
	Fuels, Oils, Lubricants	Yes - Rainbow Surface Sheen and Odor	Visually Observable - No Testing Required		
Soil Amendment/Stabilization Products	Polymer/Copolymer [6, 7]	No	**Organic Nitrogen**	None	EPA 351.3 (TKN)
			BOD	None	EPA 405.1 (BOD)
			COD	None	EPA 410.4 (COD)
			DOC	None	EPA 415.1 (DOC)
			Nitrate	Nitrate	EPA 300.0 (Nitrate)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Nickel	None	EPA 200.8 (Metal)

Pollutant Testing Guidance Table

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
	Straw/Mulch	Yes - Solids	Visually Observable - No Testing Required		
	Lignin Sulfonate	No	Alkalinity	Alkalinity	SM 2320 (Alkalinity)
			TDS	TDS Meter	EPA 160.1 (TDS)
	Psyllium	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
	Guar/Plant Gums	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
			Nickel		EPA 200.8 (Metal)
	Gypsum	No	pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
			Calcium	Calcium	EPA 200.7 (Calcium)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Aluminum	None	EPA 200.8 (Metal)
			Barium		
			Manganese		
			Vanadium		
Treated Wood Products	Ammoniacal-Copper-Zinc-Arsenate (ACZA) Copper-Chromium-Arsenic (CCA) Ammoniacal-Copper-Arsenate (ACA) Copper Naphthenate	No	Arsenic	Total Chromium	EPA 200.8 (Metal)
			Total Chromium		
			Copper		
			Zinc		

Pollutant Testing Guidance Table

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
	Creosote	Yes - Rainbow Surface or Brown Suspension	Visually Observable - No Testing Required		

Notes:

1. 1 If specific pollutant is known, analyze only for that specific pollutant. See Material Safety Data Sheet to verify.
2. For each construction material, test for one of the pollutant indicators. Bolded pollutant indicates lowest analysis cost or best indicator. However, the composition of the specific construction material, if known, is the first criterion for selecting which analysis to use.
3. See www.hach.com, www.lamotte.com, www.ysi.com and www.chemetrics.com for some of the test kits
4. If the type of inorganic fertilizer is unknown, analyze for all pollutant indicators listed.
5. Only if special handling requirements are required in the Standard Special Provisions for aerially deposited lead (ADL)
6. If used with a dye or fiber matrix, it is considered visually observable and no testing is required.
7. Based upon research conducted by Caltrans, the following copolymers/polymers do not discharge pollutants and water quality sampling and analysis is **not** required: Super Tak™, M-Binder™, Fish Stik™, Pro40dc™, Fisch-Bond™, Soil Master WR™, and EarthGuard™.

Acronyms:

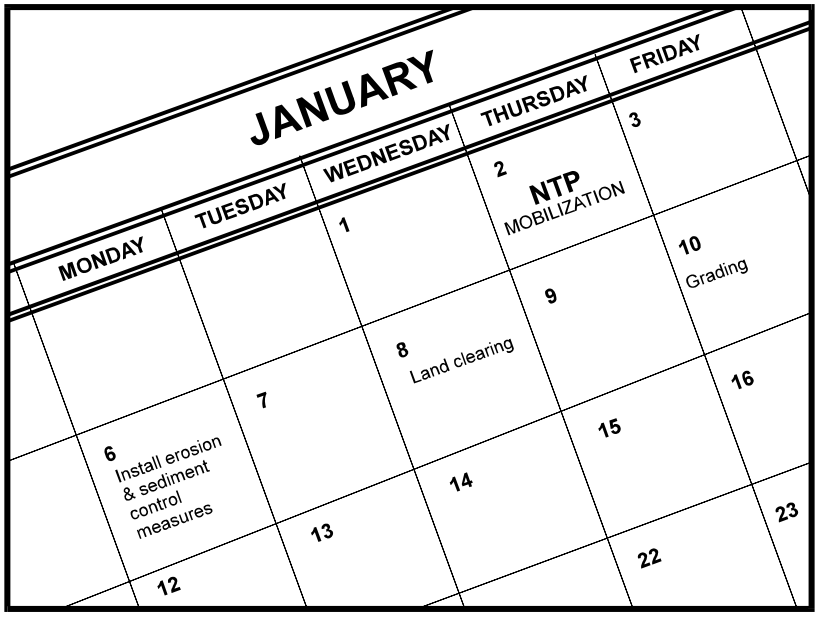
BOD – Biochemical Oxygen Demand
COD – Chemical Oxygen Demand
DOC – Dissolved Organic Carbon
EPA – Environmental Protection Agency
HACH – Worldwide company that provides advanced analytical systems and technical support for water quality testing.
SM – Standard Method
SVOC – Semi-Volatile Organic Compounds
TDS – Total Dissolved Solids
TKN – Total Kjeldahl Nitrogen
TOC – Total Organic Carbon
TSP – Tri-Sodium Phosphate
VOC - Volatile Organic Compounds

References:

Construction Storm Water Sampling and Analysis Guidance Document, California Stormwater Quality Task Force, October 2001.
Environmental Impact of Construction and Repair Materials on Surface and Ground Waters, Report 448, National Cooperative Highway Research Program, 2001
Soil Stabilization for Temporary Slopes, Environmental Programs, California Department of Transportation, October 1, 1999.
Statewide Storm Water Management Plan, Division of Environmental Analysis, California Department of Transportation, April 2002.
Statewide Storm Water Quality Practice Guidelines, Environmental Program, California Department of Transportation, August 2000.
Soil Stabilization for Temporary Slopes and District 7 Erosion Control Pilot Study, June 2000.
Stormwater Monitoring Protocols, Guidance Manual, California Department of Transportation, May 2000.

APPENDIX H
CASQA BMP HANDBOOK
FACT SHEETS

Scheduling EC-1



Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year-round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year-round and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.
- Avoid soil disturbance during periods with high wind velocities.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques

should be compared with the other less effective erosion and sedimentation controls to achieve a cost-effective balance.

Inspection and Maintenance

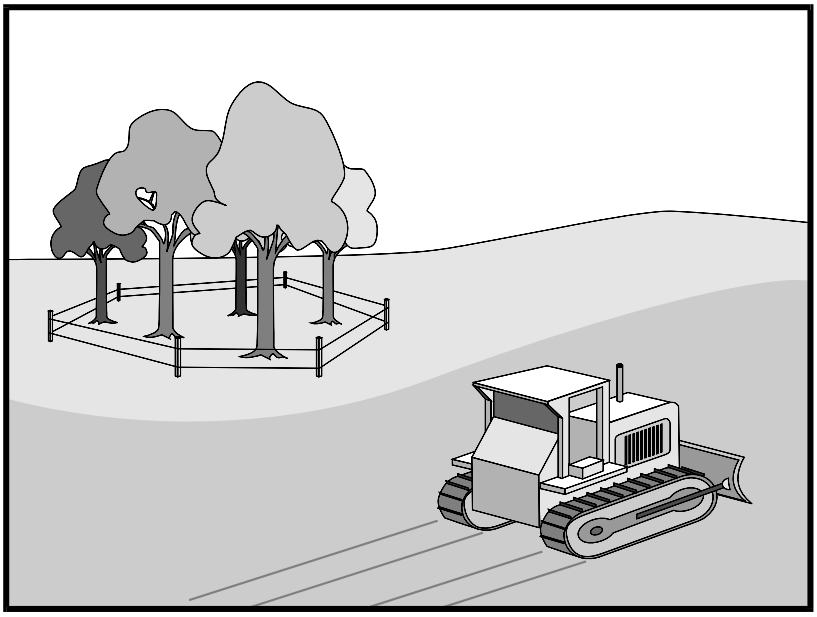
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation of Existing Vegetation EC-2



Categories		
EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.
- Protecting existing vegetation buffers and swales.

Preservation of Existing Vegetation EC-2

Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

- Consider pruning or mowing vegetation instead of removing it to allow for regrowth.
- If possible, retain vegetation buffer around the site and adjacent waterways.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization:

- Fertilize trees in the late fall or early spring. Although to note, many native species do not require fertilization.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

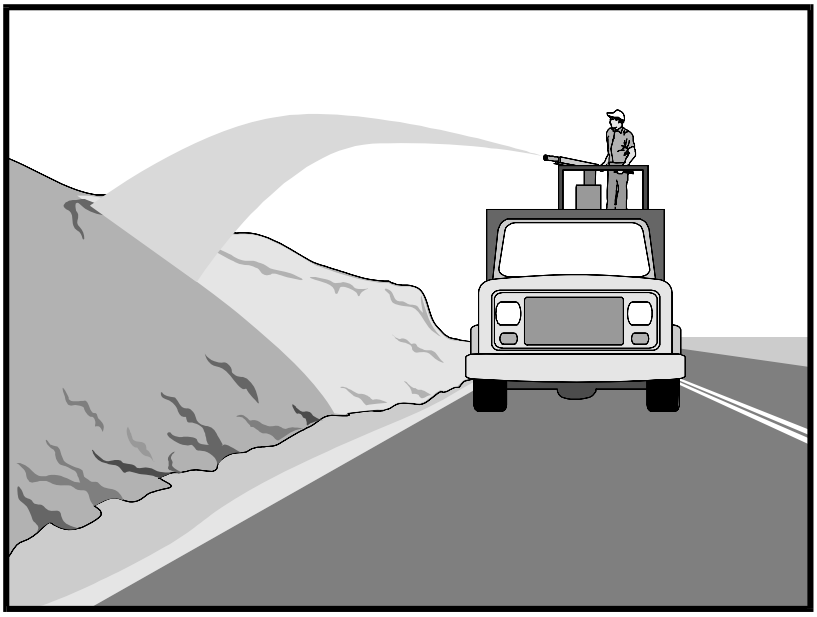
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydraulic Mulch EC-3



Categories		
EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives
EC-4 Hydroseeding
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching
EC-14 Compost Blanket
EC-16 Non-Vegetative Stabilization

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Description and Purpose

Hydraulic Mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

Suitable Applications

Hydraulic mulch as a temporary, stand alone, erosion control BMP is suitable for disturbed areas that require temporary protection from wind and water erosion until permanent soil stabilization activities commence. Examples include:

- Rough-graded areas that will remain inactive for longer than permit-required thresholds (e.g., 14 days) or otherwise require stabilization to minimize erosion or prevent sediment discharges.
- Soil stockpiles.
- Slopes with exposed soil between existing vegetation such as trees or shrubs.
- Slopes planted with live, container-grown vegetation or plugs.
- Slopes burned by wildfire.
- To stabilize earthen berms
- Areas seeded by broadcasting or drilling

- Temporary stabilization during high wind conditions

Hydraulic mulch can also be applied to augment other erosion control BMPs such as:

- In conjunction with straw mulch (see EC-6 Straw Mulch) where the rate of hydraulic mulch is reduced to 100-500 lbs per acre and the slurry is applied over the straw as a tackifying agent to hold the straw in place.
- Supplemental application of soil amendments, such as fertilizer, lime, gypsum, soil bio-stimulants or compost.

Limitations

In general, hydraulic mulch is not limited by slope length, gradient or soil type. However, the following limitations typically apply:

- Most hydraulic mulch applications, particularly bonded fiber matrices (BFMs), require at least 24 hours to dry before rainfall occurs.
- Temporary applications (i.e., without a vegetative component) may require a second application in order to remain effective for an entire rainy season.
- Treatment areas must be accessible to hydraulic mulching equipment.
- Availability of water sources in remote areas for mixing and application.
- As a stand-alone temporary BMP, hydraulic mulches may need to be re-applied to maintain their erosion control effectiveness, typically after 6-12 months depending on the type of mulch used.
- Availability of hydraulic mulching equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Cellulose fiber mulches alone may not perform well on steep slopes or in course soils.
- This BMP consists of a mixture of several constituents (e.g., fibers/mulches, compost, tackifiers, and other chemical constituents), some of which may be proprietary and may come pre-mixed by the manufacturer. The water quality impacts of these constituents are relatively unknown, and some may have water quality impacts due to their chemical makeup. Refer to specific chemical properties identified in the product Safety Data Sheet (may not include ecological information); products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to factsheet EC-05 for further guidance on selecting soil binders.
- A water supply is needed to refill hydro mulch equipment tank.
- Cannot be disturbed by walking or driving on the surface after application.
- Recommend using in conjunction with other BMPs (i.e., fiber rolls, etc.).

Implementation

- Where feasible, it is preferable to prepare soil surfaces prior to application by roughening embankments and fill areas with a crimping or punching type roller or by track walking.
- The majority of hydraulic mulch applications do not necessarily require surface/soil preparation (See EC-15 Soil Preparation) although in almost every case where re-vegetation is included as part of the practice, soil preparation can be beneficial. One of the advantages of hydraulic mulch over other erosion control methods is that it can be applied in areas where soil preparation is precluded by site conditions, such as steep slopes, rocky soils, or inaccessibility.
- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Hydraulic mulching is generally performed utilizing specialized machines that have a large water-holding/mixing tank and some form of mechanical agitation or other recirculation method to keep water, mulch and soil amendments in suspension. The mixed hydraulic slurry can be applied from a tower sprayer on top of the machine or by extending a hose to areas remote from the machine.
- Where possible apply hydraulic mulch from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage and failure of the BMP.
- Hydraulic mulch can also include a vegetative component, such as seed, rhizomes, or stolons (see EC-4 Hydraulic Seed).
- Typical hydraulic mulch application rates range from 2,000 pounds per acre for standard mulches (SMs) to 3,500 lbs. per acre for BFMs. However, the required amount of hydraulic mulch to provide adequate coverage of exposed topsoil may appear to exceed the standard rates when the roughness of the soil surface is changed due to soil preparation methods (see EC-15 Soil Preparation) or by slope gradient.
- Other factors such as existing soil moisture and soil texture can have a profound effect on the amount of hydraulic mulch required (i.e. application rate) applied to achieve an erosion-resistant covering.
- Avoid use of mulch without a tackifier component, especially on slopes.
- Mulches used in the hydraulic mulch slurry can include:
  - Cellulose fiber (paper- or corn-based)
  - Wood fibers
  - Cotton
  - Synthetics
  - Compost (see EC-14, Compost Blanket)
  - Straw

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Categories of Hydraulic Mulches

Standard Hydraulic Mulch (SM)

Standard hydraulic mulches are generally applied at a rate of 2,000 lbs. per acre and are manufactured containing around 5% tackifier (i.e. soil binder), usually a plant-derived guar or psyllium type. Most standard mulches are green in color derived from food-color based dyes.

Hydraulic Matrices (HM) and Stabilized Fiber Matrices (SFM)

Hydraulic matrices and stabilized fiber matrices are slurries which contain increased levels of tackifiers/soil binders; usually 10% or more by weight. HMs and SFMs have improved performance compared to a standard hydraulic mulch (SM) because of the additional percentage of tackifier and because of their higher application rates, typically 2,500 – 4,000 lbs. per acre. Hydraulic matrices can include a mixture of fibers, for example, a 50/50 blend of paper and wood fiber. In the case of an SFM, the tackifier/soil binder is specified as a polyacrylamide (PAM).

Bonded Fiber Matrix (BFM)

Bonded fiber matrices (BFMs) are hydraulically-applied systems of fibers, adhesives (typically guar- or polymer-based) and chemical cross-links. Upon drying, the slurry forms an erosion-resistant blanket that prevents soil erosion and promotes vegetation establishment. The cross-linked adhesive in the BFM should be biodegradable and should not dissolve or disperse upon re-wetting. BFMs are typically applied at rates from 3,000 to 4,000 lbs. per acre based on the manufacturer's recommendation. BFMs should not be applied immediately before, during or immediately after rainfall or if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Hydraulic Compost Matrix (HCM)

Hydraulic compost matrix (HCM) is a field-derived practice whereby finely graded or sifted compost is introduced into the hydraulic mulch slurry. A guar-type tackifier can be added for steeper slope applications as well as any specified seed mixtures. An HCM can help to accelerate seed germination and growth. HCMs are particularly useful as an in-fill for three-dimensional re-vegetation geocomposites, such as turf reinforcement mats (TRM) (see EC-7 Geotextiles and Mats).

Costs

Average installed costs for hydraulic mulch categories are is provided in Table 1, below.

Table
HYDRAULIC MULCH BMPs
INSTALLED COSTS

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	$2,100 - $4,700 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	$2,600 - $5,200 per acre
PAM-based	$3,200 - $7,200 per acre
Bonded Fiber Matrix (BFM)	$5,000 - $8,800 per acre
Hydraulic Compost Matrix (HCM)	$3,800 - $4,500 per acre

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.

Inspection and Maintenance

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Compare the number of bags or weight of applied mulch to the area treated to determine actual application rates and compliance with specifications.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Controlling Erosion of Construction Sites, Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, an Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

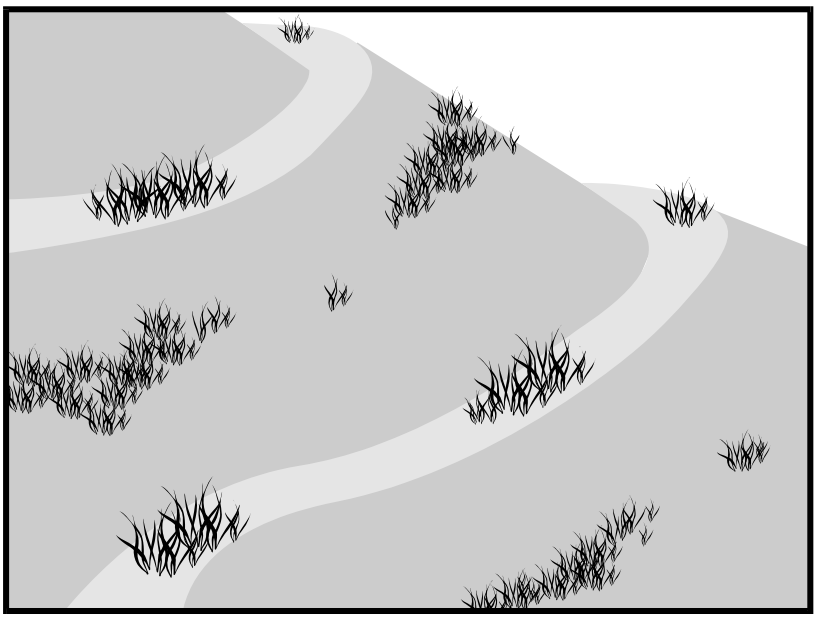
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding EC-4



Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, and water with the possible addition of tackifier, compost, mycorrhizae inoculant, fertilizer, and/or soil conditioner, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface and temporary erosion control is established by means of the mulch component.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g., EC-7, Geotextiles and Mats) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- To vegetate swales and earthen berms.

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching
EC-14 Compost Blanket
EC-16 Non-Vegetative Stabilization

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- Areas not subject to heavy wear by construction equipment or high traffic.

Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
    - Straw mulch (see Straw Mulch EC-6)
    - Rolled erosion control products (see Geotextiles and Mats EC-7)
    - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.
- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e., less than 3-6 months).
- Vegetation may not establish when hydroseed is applied to very compact soils.
- Mulch may inhibit germination when applied at high rates.
- This BMP consists of a mixture of several constituents (e.g., fibers/mulches, tackifiers, and other chemical constituents), some of which may be proprietary and may come pre-mixed by the manufacturer. The water quality impacts of these constituents are relatively unknown, and some may have water quality impacts due to their chemical makeup. Additionally, these constituents may require non-visible pollutant monitoring. Refer to specific chemical properties identified in the product's Safety Data Sheet (SDS), although, note that not all SDS's provide ecological information; products should be evaluated for project-specific implementation by the QSD. Refer to fact sheet EC-05, Soil Binders, for further guidance on selecting soil binders.

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS), Resource Conservation Districts and Agricultural Extension Service can provide information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.
- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at: http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as $2,400 per acre for flat slopes and stable soils, to $5,200 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$2,400-$5,200

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

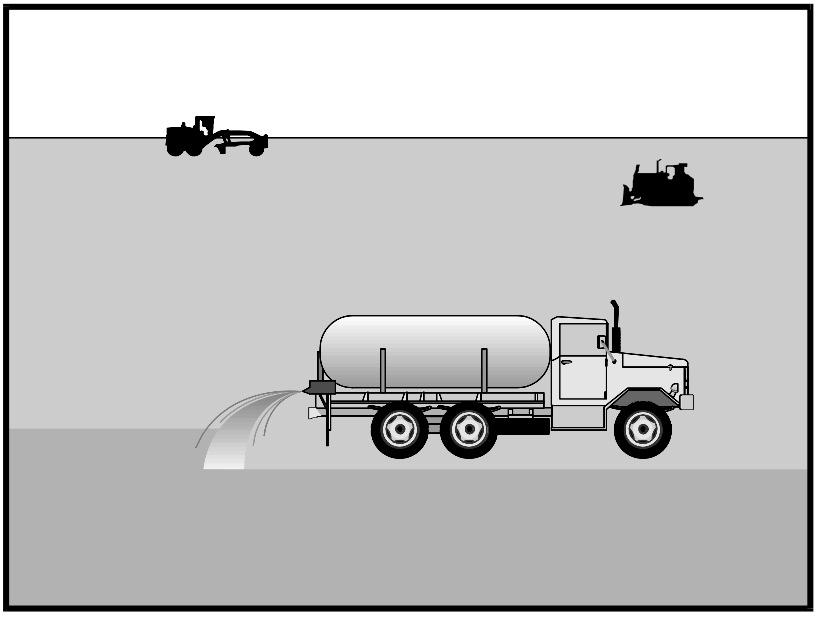
References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Soil Binders EC-5



Description and Purpose

Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring temporary protection. Because soil binders, when used as a stand-alone practice, can often be incorporated into the soil, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are commonly used in the following areas:

- Rough graded soils that will be inactive for a short period of time.
- Soil stockpiles.
- Temporary haul roads prior to placement of crushed rock.
- Compacted soil road base.
- Construction staging, materials storage, and layout areas.
- Slopes and areas requiring stabilization prior to rain.
- Disturbed areas subject to high winds.

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

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Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.
- Plant-material-based soil binders do not generally hold up to pedestrian or vehicular traffic across treated areas as well as polymeric emulsion blends or cementitious-based binders.
- Soil binders may not sufficiently penetrate compacted soils.
- Some soil binders are soil texture specific in terms of their effectiveness. For example, polyacrylamides (PAMs) work very well on silt and clayey soils but their performance decreases dramatically in sandy soils.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of some chemical soil binders are relatively unknown, and some may have water quality impacts due to their chemical makeup. Additionally, these chemicals may require non-visible pollutant monitoring. Products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to the product Material Safety Data Sheet for chemical properties.

Implementation

General Considerations

- Soil binders should conform to local municipality specifications and requirements.
- Site soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater when cured. Obtain a Safety Data Sheet (SDS) from the manufacturer to ensure non-toxicity (note however, the SDS may not include ecological information).
- Stormwater runoff from PAM treated soils should pass through one of the following sediment control BMP prior to discharging to surface waters.
    - When the total drainage area is greater than or equal to 5 acres, PAM treated areas should drain to a sediment basin.

- Areas less than 5 acres should drain to sediment control BMPs, such as a sediment trap, or a series of check dams. The total number of check dams used should be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam should be spaced evenly in the drainage channel through which stormwater flows are discharged off site.

- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Some soil binders are designed for application to roads.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this Fact Sheet. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application is related to the functional longevity of the binder, which can be affected by subgrade conditions, surface type, climate, and maintenance schedule.
- Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material-Based (Short Lived, <6 months) Binders

Guar: Guar is a non-toxic, biodegradable, natural galactomannan-based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

Psyllium: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

Starch: Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material-Based (Long Lived, 6-12 months) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1-part emulsion
- For sandy soil: 10 parts water to 1-part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound typically requires 12 to 24 hours drying time. Liquid copolymer should be diluted at a rate of 10 parts water to 1-part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with the manufacturer's recommendations and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:1 to 1:1	10.0 – 20.0

Poly-Acrylamide (PAM) and Copolymer of Acrylamide**:** Linear copolymer polyacrylamide for use as a soil binder is packaged as a dry flowable solid, as a liquid. Refer to the manufacturer's recommendation for dilution and application rates as they vary based on liquid or dry form, site conditions and climate.

- Limitations specific to PAM are as follows:
  - Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.
  - The specific PAM copolymer formulation must be anionic. Cationic PAM should not be used in any application because of known aquatic toxicity problems. Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, should be used for soil applications.
  - PAM designated for erosion and sediment control should be "water soluble" or "linear" or "non-cross linked".
  - PAM should not be used as a stand-alone BMP to protect against water-based erosion. When combined with mulch, its effectiveness increases dramatically.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum-based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.
- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd^2 or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically, at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd^2.

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate installed costs:

Soil Binder	Cost per Acre
Plant-Material-Based (Short Lived) Binders	$900-$1,200
Plant-Material-Based (Long Lived) Binders	$1,500-$1,900
Polymeric Emulsion Blend Binders	$900-$1,900
Cementitious-Based Binders	$1,000-$1,500

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech Inc.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.

- Reapply the selected soil binder as needed to maintain effectiveness.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	**Plant Material Based (Long Lived)**	**Polymeric Emulsion Blends**	**Cementitious-Based Binders**
Relative Cost	Low	Moderate to High	Low to High	Low to Moderate
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

References

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

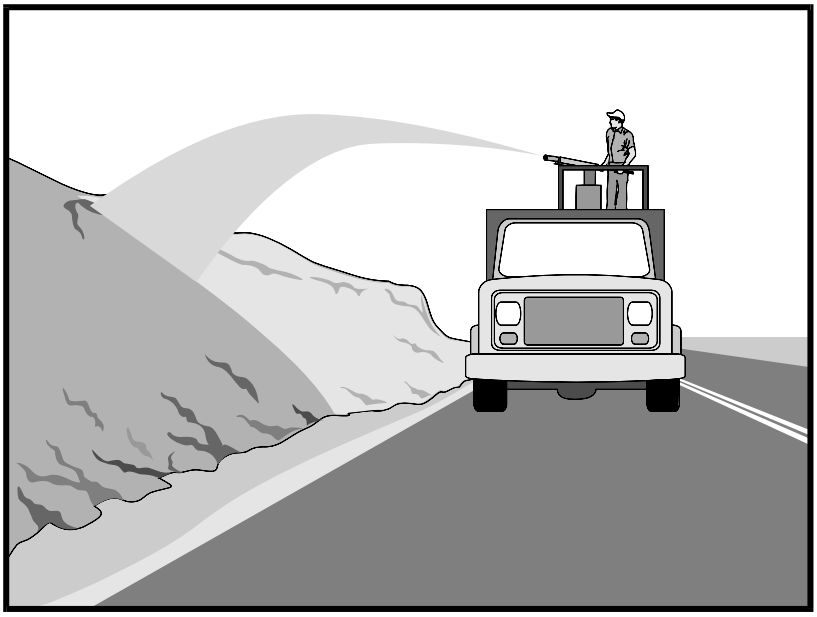
Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Straw Mulch EC-6



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

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Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

Limitations

Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- "Punching" of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb./acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.

  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb./acre. In windy conditions, the rates are typically 180 lb./acre.

  - On very small areas, a spade or shovel can be used to punch in straw mulch.

  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper."

Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	$3,150-$6,900
Straw mulch with tackifier	$2,300-$6,200

Source: Cost information received from individual product suppliers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.

- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.

- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.

- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Controlling Erosion of Construction Sites, Agricultural Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

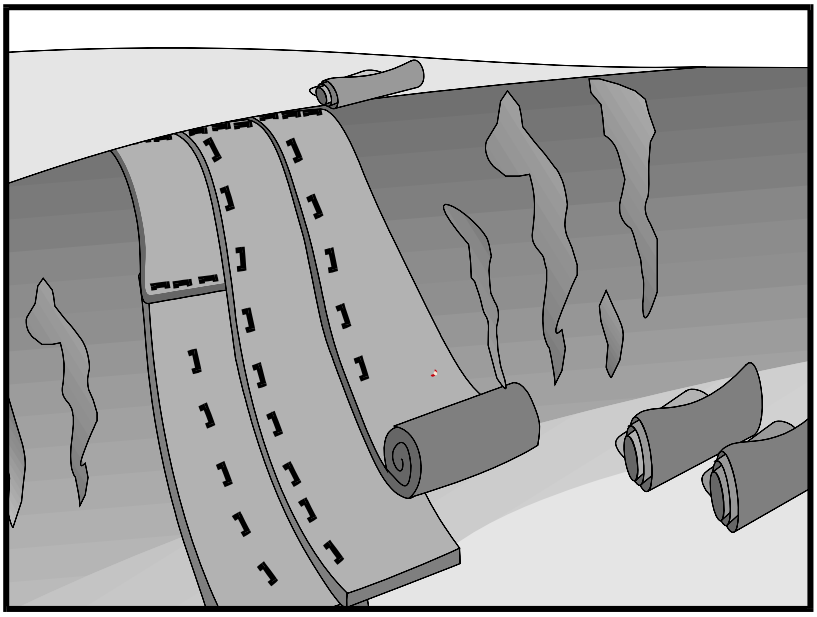
Soil Erosion by Water, Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Geotextiles and Mats EC-7



Categories

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Legend:
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☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

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Description and Purpose

Rolled Erosion Control Products (RECPs), also known as erosion control matting or blankets, can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high, and vegetation will be slow to establish. Mattings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations:

- Steep slopes, generally steeper than 3:1 (H:V).
- Long slopes.
- Slopes where the erosion potential is high.
- Slopes and disturbed soils where mulch must be anchored.

- Disturbed areas where temporary cover is needed, or plants are slow to establish or will not establish.
- Channels with flows exceeding 3.3 ft/s.
- Channels to be vegetated.
- Stockpiles.
- Slopes adjacent to water bodies.

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g., channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature and/or sunlight.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic sheeting should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until other measures, such as seeding and mulching, may be installed.
    - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
    - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- According to the State Water Board's *CGP Review, Issue #2*, only RECPs that either do not contain plastic netting or contain netting manufactured from 100% biodegradable non-plastic materials, such as jute, sisal, or coir fiber should be used due to plastic pollution and wildlife concerns. If a plastic-netted product is used for temporary stabilization, it must be promptly removed when no longer needed and removed or replaced with non-plastic netted RECPs for final stabilization.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting. As per State Water Board guidance, RECPs that

contain plastic netting are discouraged for temporary controls and are not acceptable alternatives for permanent controls. RECPs that do not contain plastic netting or contain netting manufactured from 100% biodegradable non-plastic materials such as jute, sisal, or coir fiber should be used.

- RECPs may have limitations in extremely windy climates; they are susceptible to wind damage and displacement. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Implementation

Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11-gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.

- Plastic sheeting should have a minimum thickness of 6 mils and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired

immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

  - **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11-gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

  - **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11-gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

  - **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5

lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11-gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11-gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well. Only biodegradable RECPs can remain on a site applying for a Notice of Termination due to plastic pollution and wild life concerns (State Waterboard, 2016). RECPs containing plastic that are used on a site must be disposed of for final stabilization.

  - **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three-dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Bonded synthetic fibers** consist of a three-dimensional geometric nylon (or other synthetic) matting. Typically, it has more than 90 percent open area, which facilitates

root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11-gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.

- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))

Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake ½-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre
Biodegradable	Jute Mesh	$7,700-$9,000
	Curled Wood Fiber	$10,200-$13,400
	Straw	$10,200-$13,400
	Wood Fiber	$10,200-$13,400
	Coconut Fiber	$16,600-$18,000
	Coconut Fiber Mesh	$38,400-$42,200
	Straw Coconut Fiber	$12,800-$15,400
Non-Biodegradable	Plastic Netting	$2,600-$2,800
	Plastic Mesh	$3,800-$4,500
	Synthetic Fiber with Netting	$43,500-$51,200
	Bonded Synthetic Fibers	$57,600-$70,400
	Combination with Biodegradable	$38,400-$46,100

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

References

CGP Review #2, State Water Resources Control Board, 2014. Available online at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/training/cgp_review_issue2.pdf.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005

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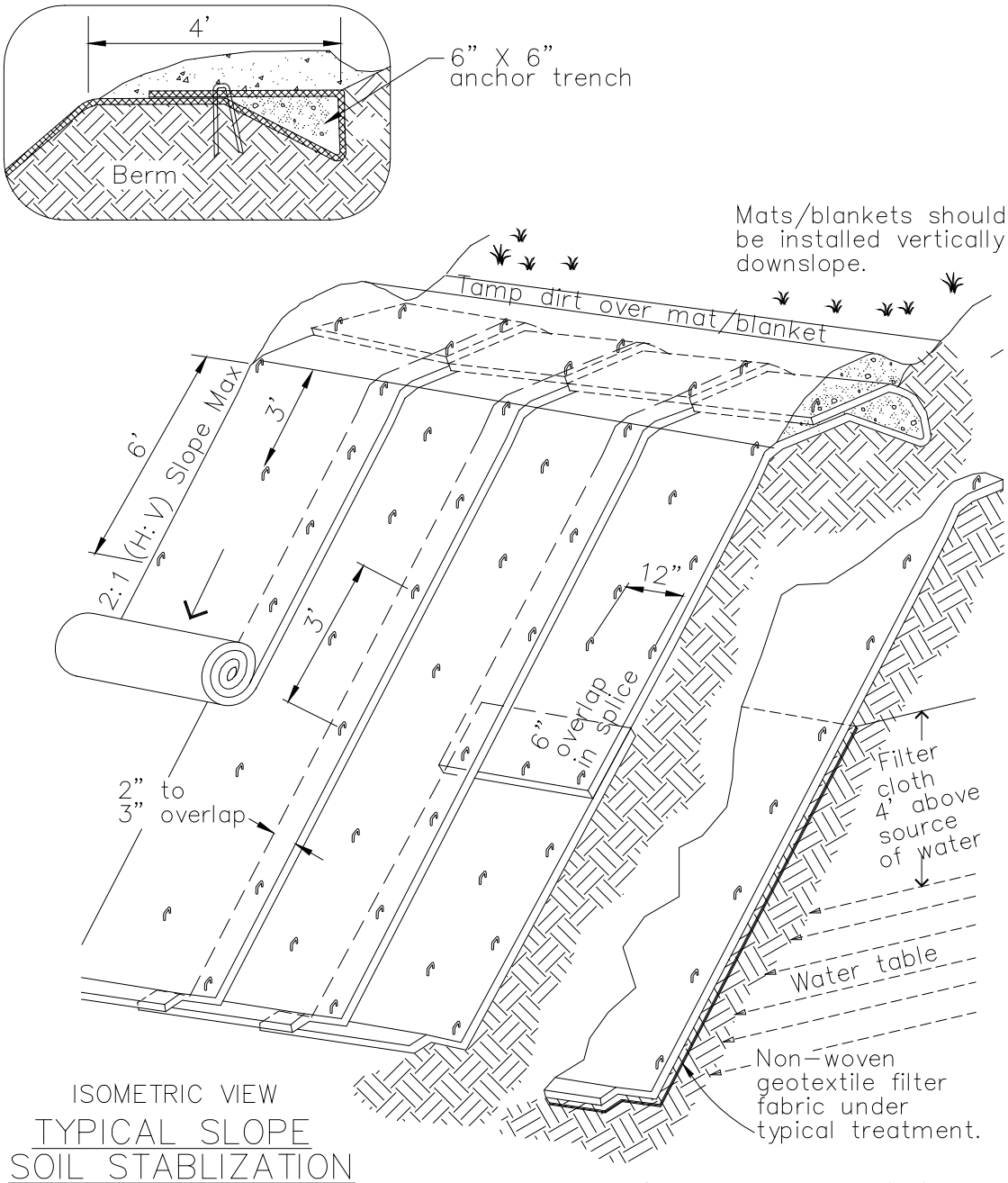


ISOMETRIC VIEW

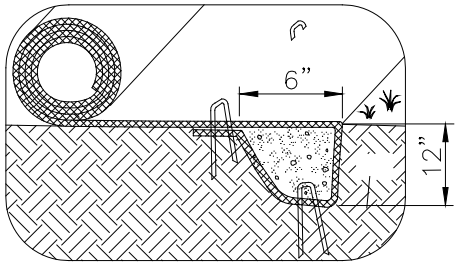
TYPICAL SLOPE
SOIL STABLIZATION
NTS

WET SLOPE LINING
NTS

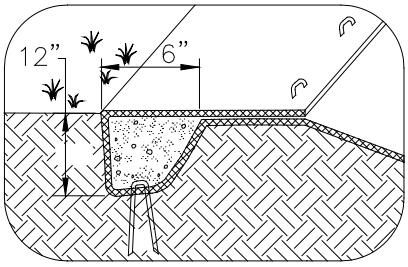
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

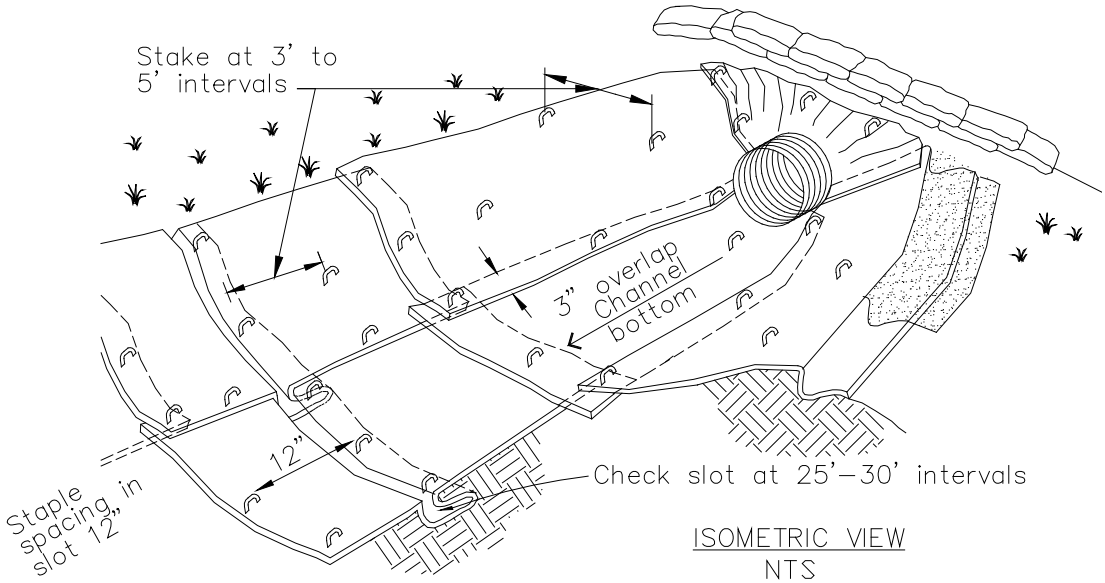
TYPICAL INSTALLATION DETAIL



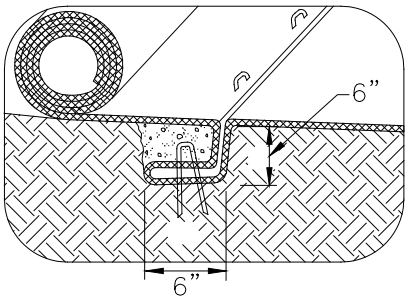
INITIAL CHANNEL ANCHOR TRENCH
NTS



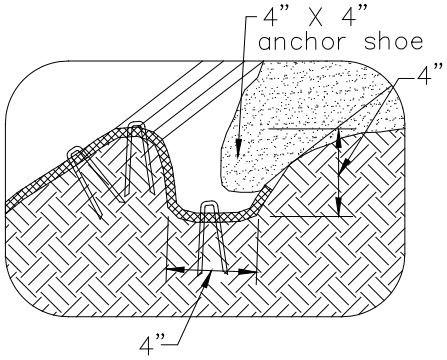
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
NTS



ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
NTS



LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:
1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL

Wood Mulching EC-8

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

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Description and Purpose

Wood mulching consists of applying a mixture of shredded wood mulch or bark to disturbed soils. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Suitable Applications

Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established. Wood mulch may also be used for final stabilization; generally, used in a landscape setting or areas that will have pedestrian traffic.

Limitations

- Best suited to flat areas or gentle slopes or 5:1 (H:V) or flatter. Not suitable for use on slopes steeper than 3:1 (H:V). For slopes steeper than 3:1, consider the use of Compost Blankets (EC-14).
- Wood mulch may introduce unwanted species if it contains seed, although it may also be used to prevent weed growth if it is seed-free.
- Not suitable for areas exposed to concentrated flows.
- If used for temporary stabilization, wood mulch may need to be removed prior to further earthwork.

Implementation

Mulch Selection

There are many types of mulches. Selection of the appropriate type of mulch should be based on the type of application, site conditions, and compatibility with planned or future uses.

Application Procedures

Prior to application, after existing vegetation has been removed, roughen embankment and fill areas by rolling with a device such as a punching type roller or by track walking. The construction application procedures for mulches vary significantly depending upon the type of mulching method specified. Two methods are highlighted here:

- Green Material: This type of mulch is produced by the recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Chipped brush from on-site vegetation clearing activities may be used (this may require stockpiling and reapplying after earthwork is complete). Methods of application are generally by hand although pneumatic methods are available.
  - Green material can be used as a temporary ground cover with or without seeding.
  - The green material should be evenly distributed on site to a depth of not more than 2 in.
- Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.
  - Shredded wood/bark is conditionally suitable. See note under limitations.
  - Distribute by hand or use pneumatic methods.
  - Evenly distribute the mulch across the soil surface to a depth of 2 to 3 in.
- Avoid mulch placement onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Assuming a 2-in. layer of wholesale landscaping-grade wood mulch, the average one-time cost for installation may range from $15,000 – $23,000 per acre[1]. Costs can increase if the source is not close to the project site.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

[1] Costs based on estimates provided by the California Department of Transportation's *Soil Stabilization BMP Research for Erosion and Sediment Controls Cost Survey Technical Memorandum*, CTSW-TM-07-172.35.1, July 2007 (available at: http://www.dot.ca.gov/hq/LandArch/16_la_design/guidance/estimating/Soil_Stabilization_Pricing.pdf) and adjusted for inflation from 1997 to 2016.

- Regardless of the mulching technique selected, the key consideration in inspection and maintenance is that the mulch needs to last long enough to achieve erosion control objectives. If the mulch is applied as a stand-alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- Reapply mulch when bare earth becomes visible.

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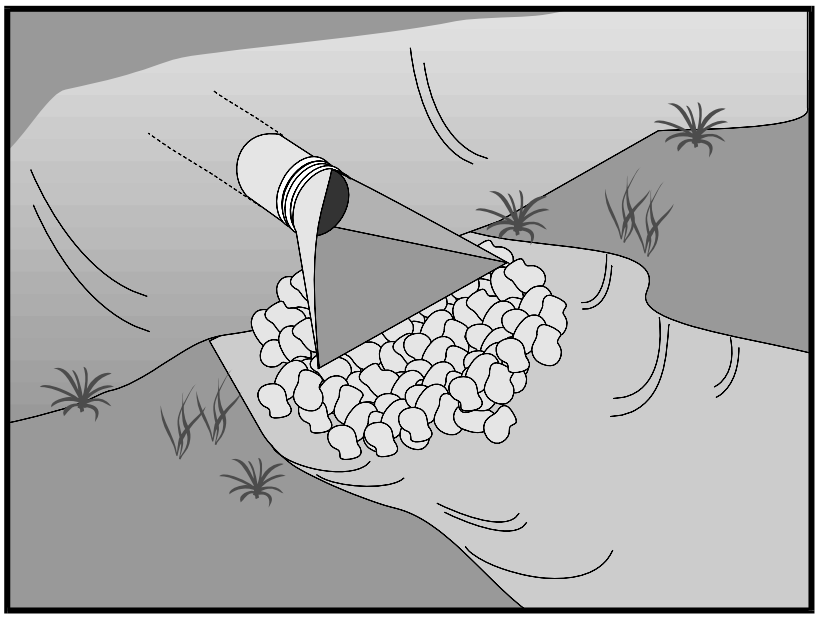
Velocity Dissipation Devices EC-10



Categories

EC	Erosion Control	☑
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TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools) and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5-year flow for temporary structures planned for one rainy season, or the 10-year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.

- Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $250 per device.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

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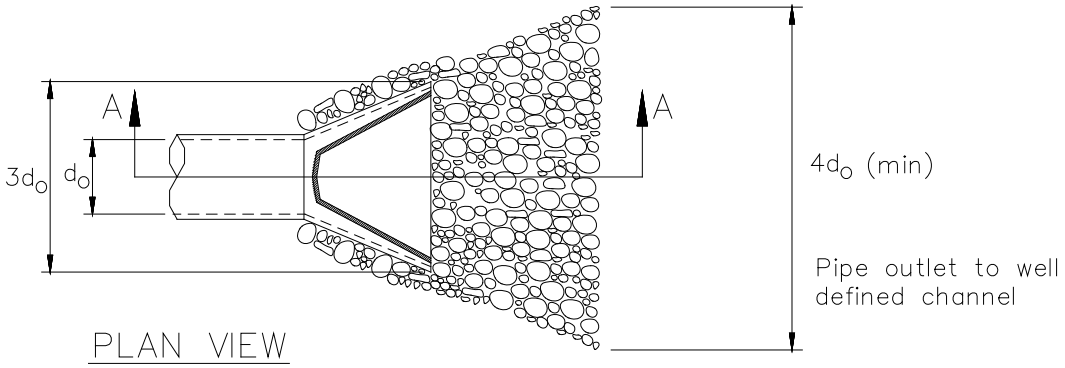
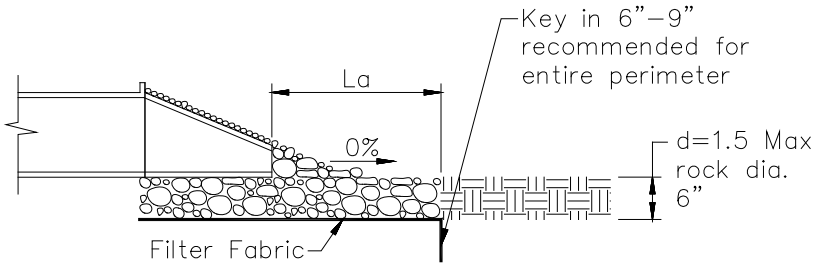


PLAN VIEW

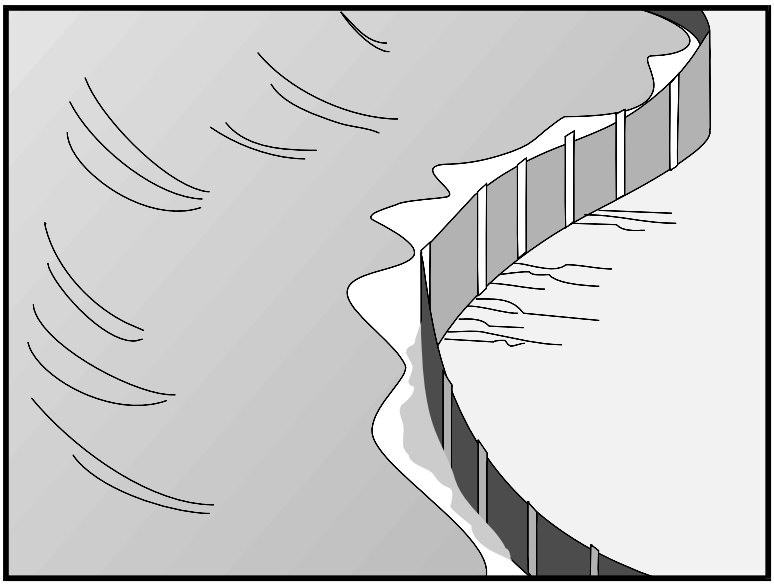


SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Silt Fence SE-1



Categories		
EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (Storm Drain Inlet Protection, SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project (although they should not be installed up and down slopes).
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Targeted Constituents	
Sediment (coarse sediment)	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls

SE-13 Compost Socks and Berms

SE-14 Biofilter Bags

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Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- According to the State Water Board's *CGP Review, Issue #2* (2014), silt fences reinforced with metal or plastic mesh should be avoided due to plastic pollution and wildlife concerns.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft. at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft.^{2} of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)

- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb-100-feet of silt fence per 10,000 ft.^{2} of disturbed area.) (EPA, 2012)
- The maximum length of slope draining to any point along the silt fence should be 100 ft. per ft of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.

- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15-gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft. apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

- Cross barriers should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.

- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 in. into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2-person crew).
    - Minimal soil disturbance.
    - Better level of compaction along fence, less susceptible to undercutting
    - Uniform installation.
- Limitations:
    - Does not work in shallow or rocky soils.
    - Complete removal of geotextile material after use is difficult.
    - Be cautious when digging near potential underground utilities.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.

- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

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Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

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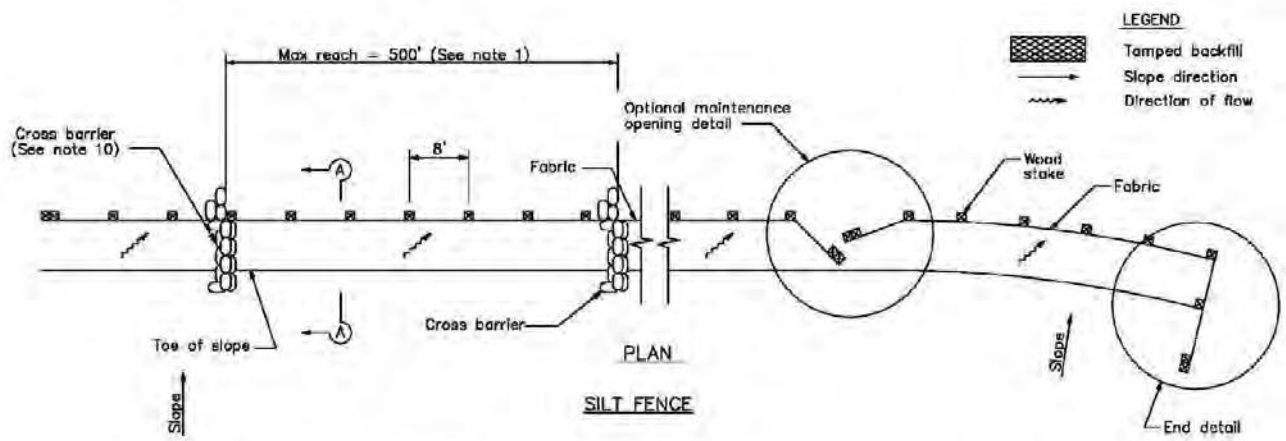
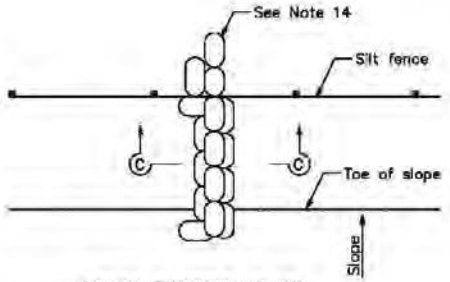
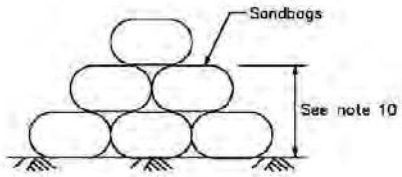


NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.



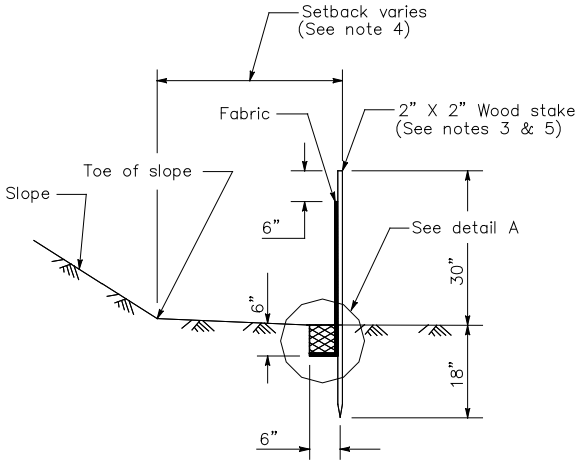
CROSS BARRIER DETAIL



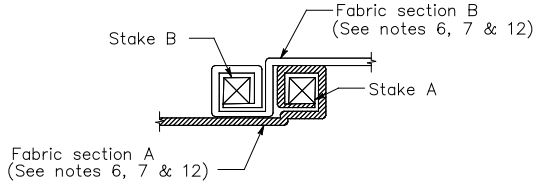
SECTION C–C

Silt Fence

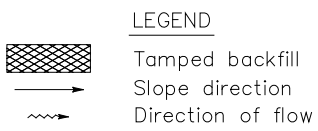
SE-1

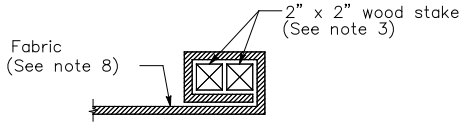


SECTION A–A

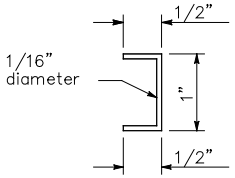


JOINING SECTION DETAIL (TOP VIEW)

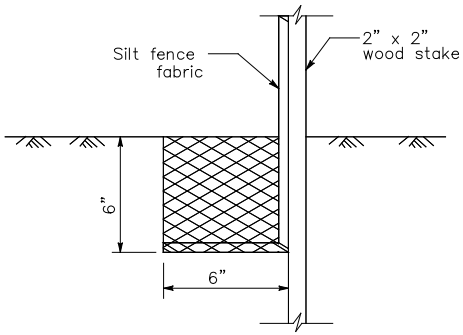




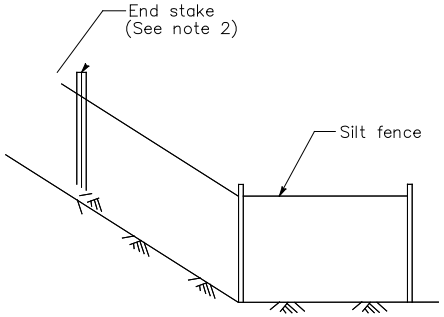
END STAKE DETAIL (TOP VIEW)



STAPLE DETAIL
(SEE NOTE 9)



DETAIL A



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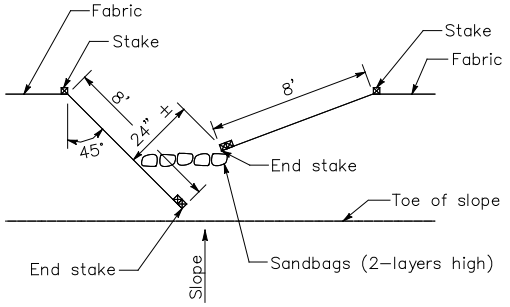
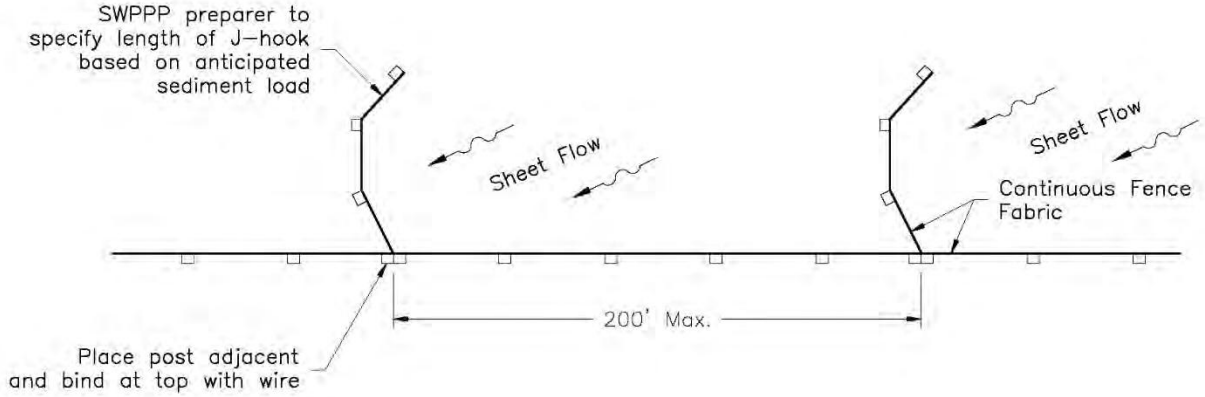
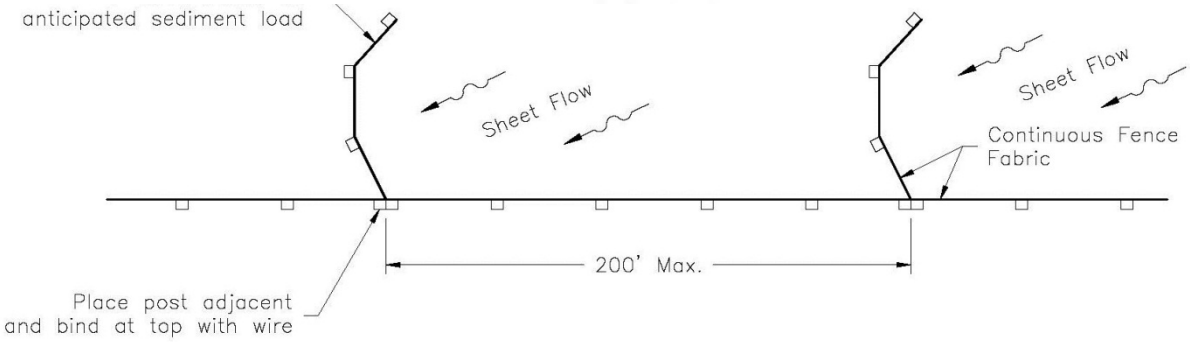


OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)



Plan

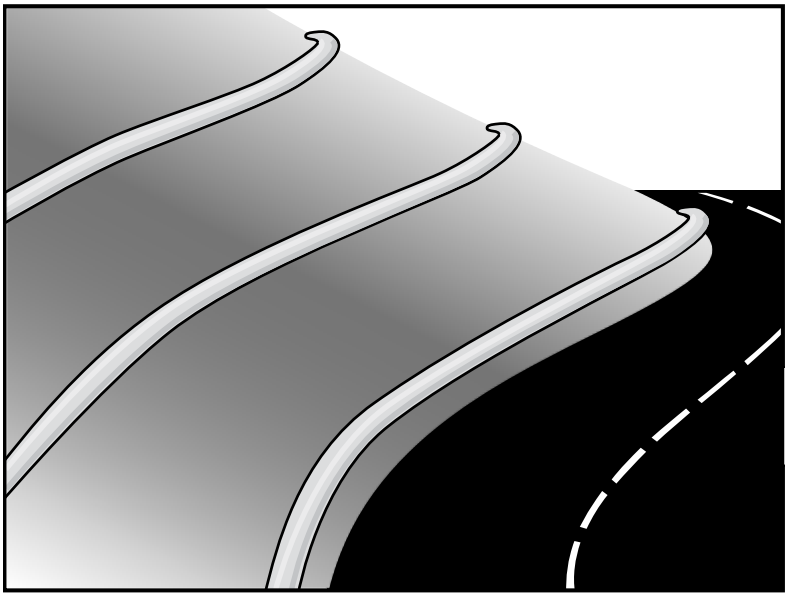
J–HOOK



Plan

J–HOOK

Fiber Rolls SE-5



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Description and Purpose

A fiber roll (also known as wattles or logs) consists of straw, coir, curled wood fiber, or other biodegradable materials bound into a tight tubular roll wrapped by plastic netting, which can be photodegradable, or natural fiber, such as jute, cotton, or sisal. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

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- At operational storm drains as a form of inlet protection.
- Around temporary stockpiles.

Limitations

- Fiber rolls should be used in conjunction with erosion control, such as hydroseed, RECPs, etc.
- Only biodegradable fiber rolls containing no plastic can remain on a site applying for a Notice of Termination due to plastic pollution and wildlife concerns (State Water Board, 2016). Fiber rolls containing plastic that are used on a site must be disposed of for final stabilization.
- Fiber rolls are not effective unless trenched in and staked. If not properly staked and trenched in, fiber rolls will not work as intended and could be transported by high flows.
- Not intended for use in high flow situations (i.e., for concentrated flows).
- Difficult to move once saturated.
- Fiber rolls have a limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months, depending upon local conditions and roll material.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed-free rice straw, flax, curled wood fiber, or coir bound into a tight tubular roll by netting or natural fiber (see *Limitations* above regarding plastic netting).
- Typical fiber rolls vary in diameter from 6 in. to 20 in. Larger diameter rolls are available as well. The larger the roll, the higher the sediment retention capacity.
- Typical fiber rolls lengths are 4, 10, 20 and 25 ft., although other lengths are likely available.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.

  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).

  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).

- Prepare the slope before beginning installation.

- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.

- Start building trenches and installing rolls from the bottom of the slope and work up.

- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.

- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.

- Stake fiber rolls into the trench.

  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.

  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.

- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.

- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Fiber rolls encased with plastic netting or containing any plastic material will need to be removed from the site for final stabilization. Fiber rolls used in a permanent application are to be encased with a non-plastic material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance; therefore, during the BMP planning phase, the areas where fiber rolls will be used on final slopes, only fiber rolls wrapped in non-plastic material should be selected.

- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for straw fiber rolls range from $26 - $38 per 25-ft. roll[1] and curled wood fiber rolls range from $30 - $40 per roll[2].

Material costs for PAM impregnated fiber rolls range between $9.00-$12.00 per linear foot, based upon vendor research[1] .

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

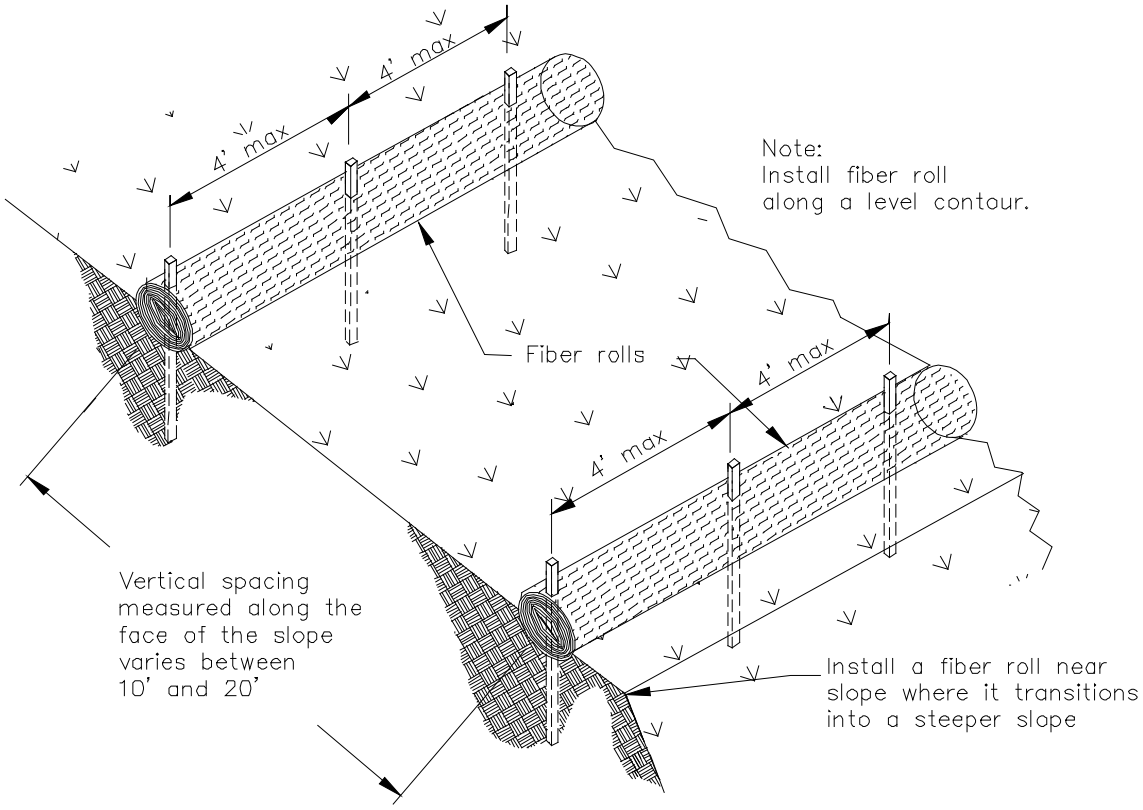
References

General Construction – Frequently Asked Questions, Storm Water Program website, State Water Resources Control Board, 2009 updated in 2016. Available online at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/gen_const_faq.shtml.

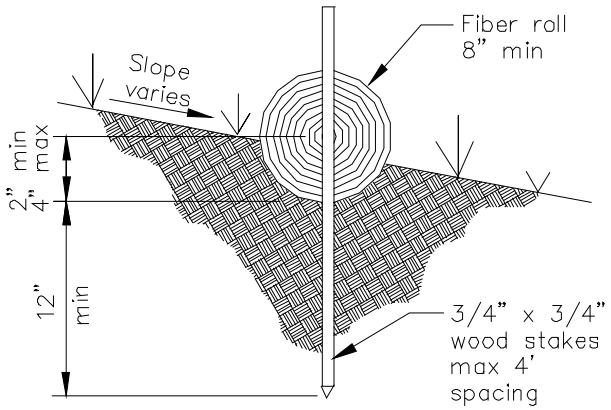
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

[1] Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.
[2] Costs estimated based on vendor query by Tetra Tech, Inc. 2016.

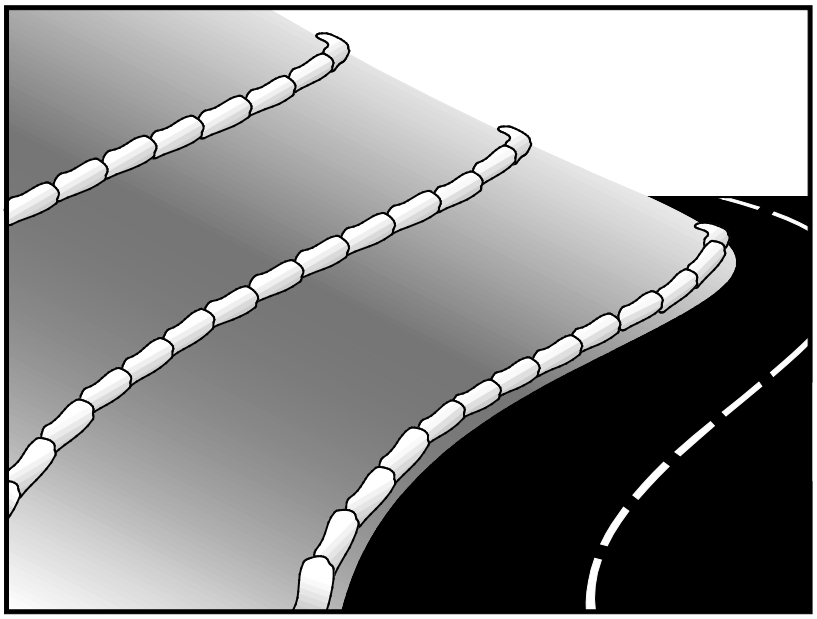


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm SE-6



Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

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- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited, and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more-layer construction
  - Top width = 12 in. minimum for one- or two-layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more-layer construction.
  - Top width = 12 in. minimum for one- or two-layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. Crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $3.20-$3.80 per filled gravel bag is standard based upon vendor research (Adjusted for inflation, 2016 dollars, by Tetra Tech, Inc.).

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

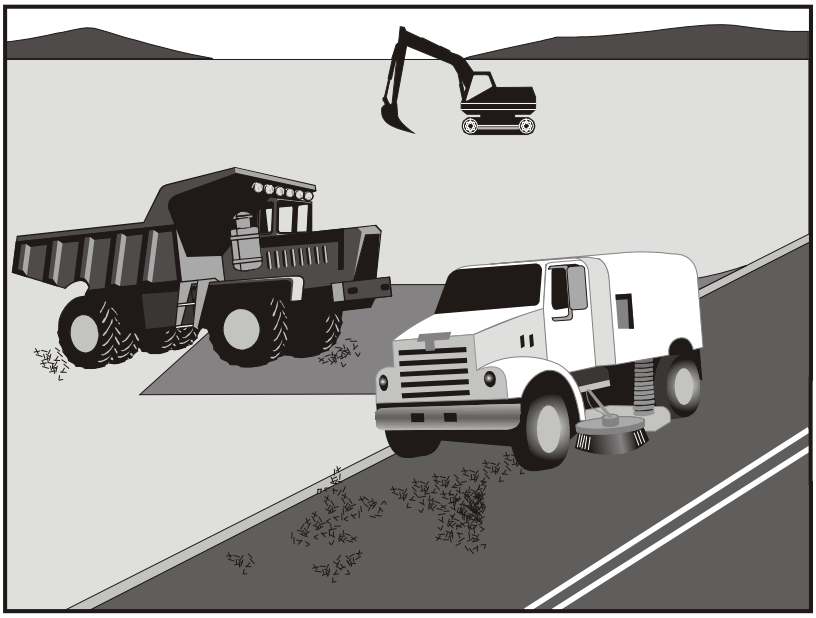
Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

- Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).
- Sweeping may be less effective for fine particle soils (i.e., clay).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused and perhaps save money.
- Inspect potential sediment tracking locations daily.

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- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $ 650/day to $2,500/day[1], plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

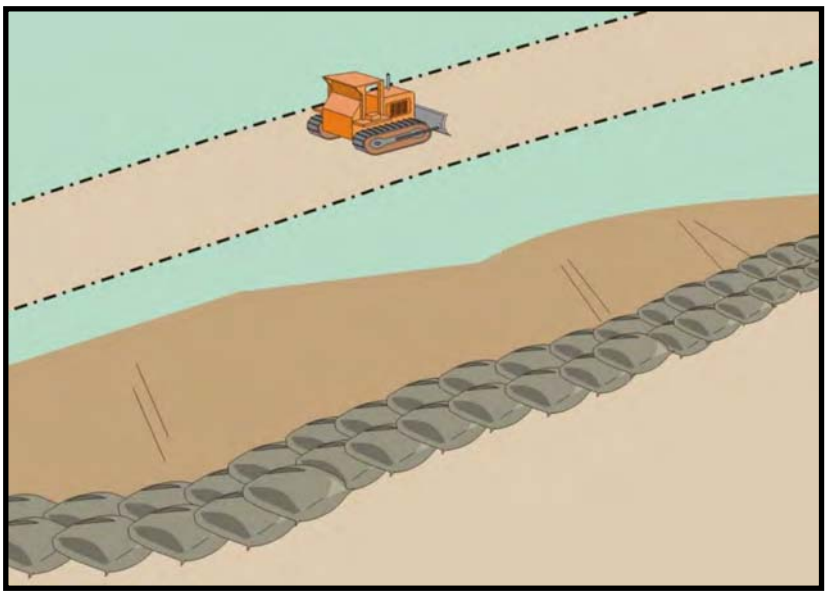
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

[1] Based on contractor query conducted by Tetra Tech, Inc. November 2016.

Sandbag Barrier SE-8



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept or to divert sheet flows. Sandbag barriers placed on a level contour pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be a suitable control measure for the applications described below. It is important to consider that sand bags are less porous than gravel bags and ponding or flooding can occur behind the barrier. Also, sand is easily transported by runoff if bags are damaged or ruptured. The SWPPP Preparer should select the location of a sandbag barrier with respect to the potential for flooding, damage, and the ability to maintain the BMP.

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes.
  - As sediment traps at culvert/pipe outlets.
  - Below other small cleared areas.
  - Along the perimeter of a site.
  - Down slope of exposed soil areas.
  - Around temporary stockpiles and spoil areas.
  - Parallel to a roadway to keep sediment off paved areas.
  - Along streams and channels.

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives
SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-12 Manufactured Linear Sediment Controls
SE-14 Biofilter Bags

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- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
  - At the top of slopes to divert runoff away from disturbed slopes.
  - As check dams across mildly sloped construction roads.

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited, and bags will need to be replaced when there are signs of damage or wear.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

  - Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Butt ends of bags tightly.
- Overlap butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more-layer construction
  - Side slope = 2:1 (H:V) or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more-layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- See typical sandbag barrier installation details at the end of this fact sheet.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal and may vary based on locally available materials.

- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) or similar permeable material free from clay and deleterious material, such as recycled concrete or asphalt.

Costs

Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag. These costs are based upon vendor research.

Inspection and Maintenance

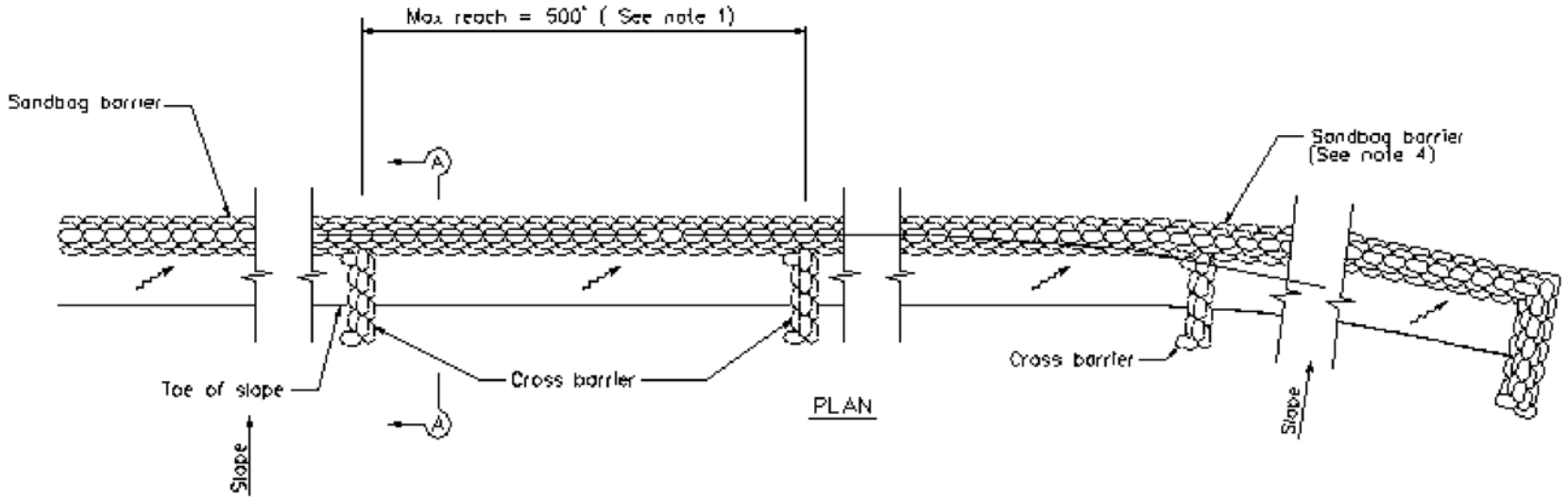
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

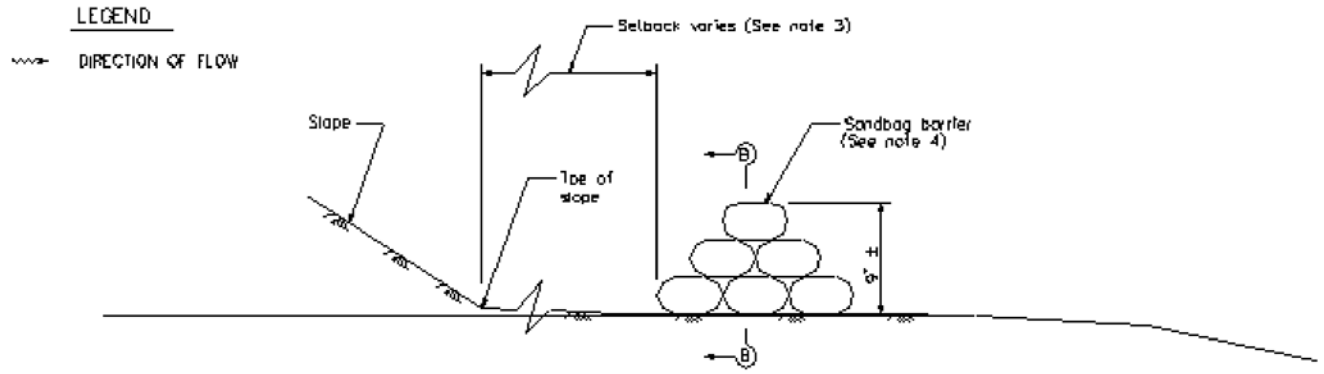
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



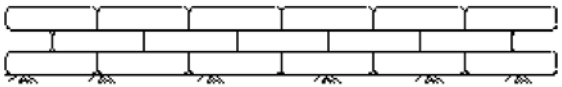
SANDBAG BARRIER

NOTES

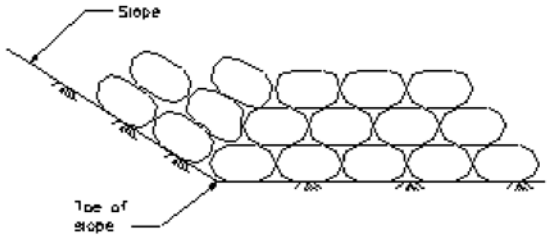
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.



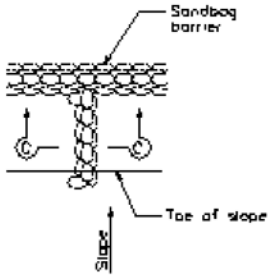
SECTION A–A



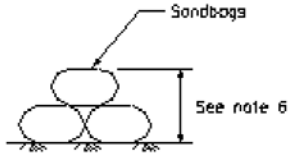
SECTION B–B



END DETAIL

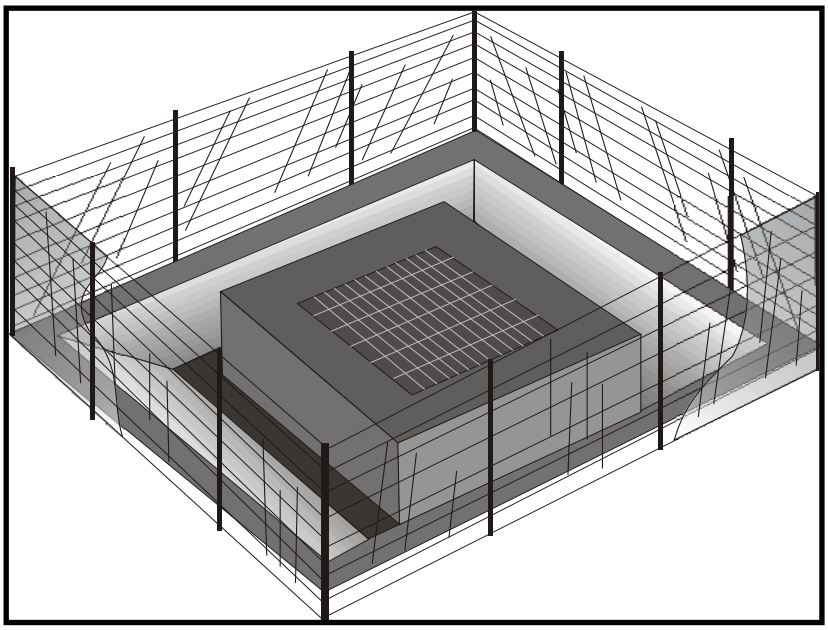


CROSS BARRIER DETAIL



SECTION C–C

Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

SE-13 Compost Socks and Berms

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Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

- Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use

other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.
- Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.

- Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.

- Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).

- Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.

- Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.

- Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.

- Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.

- Compost Socks: Allow filtered run-off to pass through the compost while retaining sediment and potentially other pollutants (SE-13). Appropriate for flows under 1.0 cfs.

- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.

- Provide area around the inlet for water to pond without flooding structures and property.

- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.

- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence -*** Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.

  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.

  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.

  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.

  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap -*** Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag -*** Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.

  2. Leave room upstream of barrier for water to pond and sediment to settle.

  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.

  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10-year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter -*** Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.

  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.

  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary) –*** Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable, and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

    1. Construct in a gently sloping area.
    2. Biofilter bags should be placed around inlets to intercept runoff flows.
    3. All bag joints should overlap by 6 in.
    4. Leave room upstream for water to pond and for sediment to settle out.
    5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

- ***DI Protection Type 7 – Compost Socks*** – A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence). Compost socks should conform to specification detailed in SE-13, Compost Socks and Berms.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one-year useful life) is $200 per inlet.
- Temporary geotextile inserts are proprietary, and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.
- See SE-13 for Compost Sock cost information.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

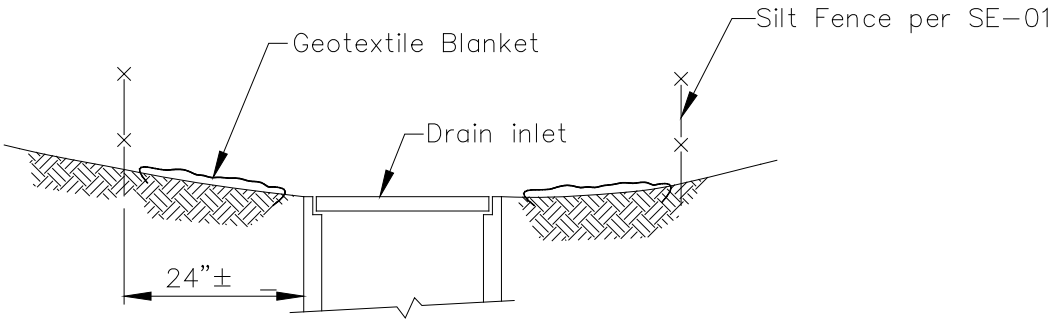
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.
    - Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

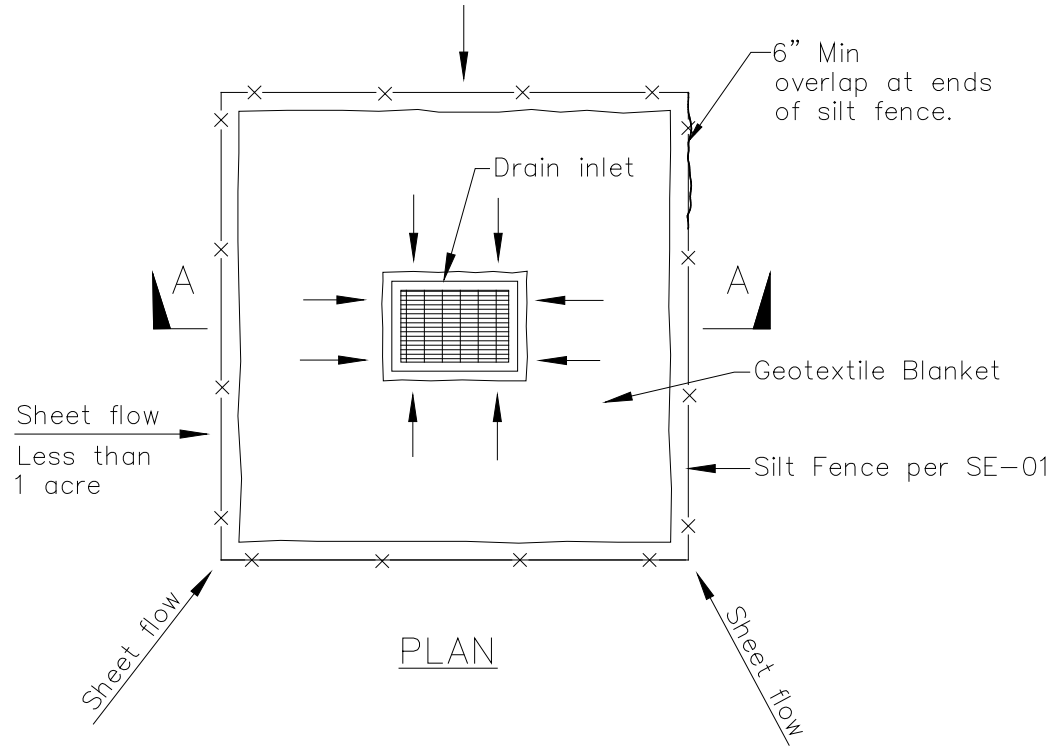
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



SECTION A–A

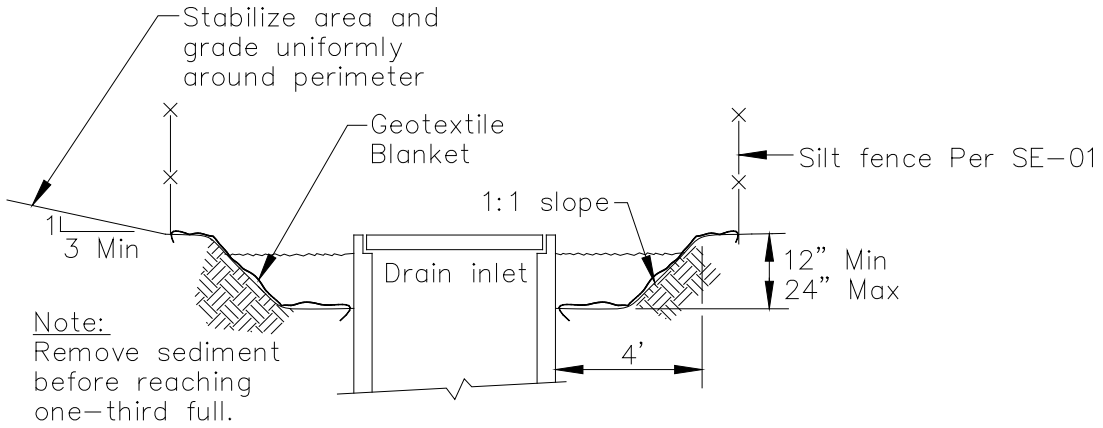


PLAN

DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



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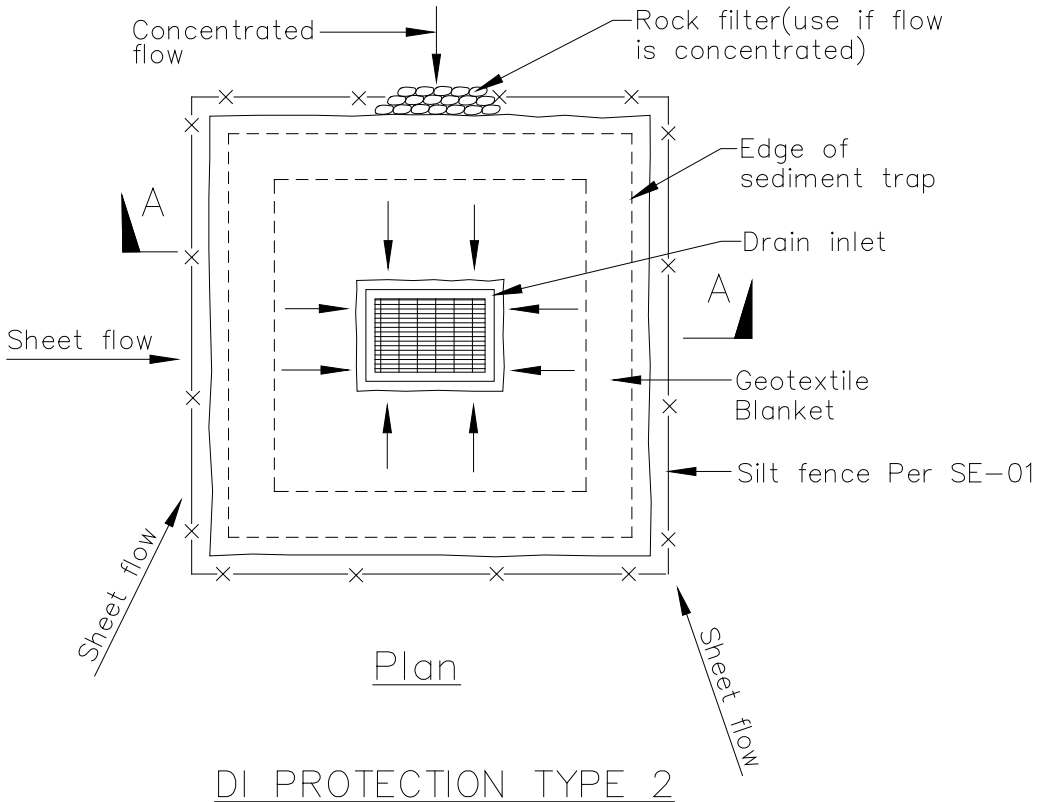
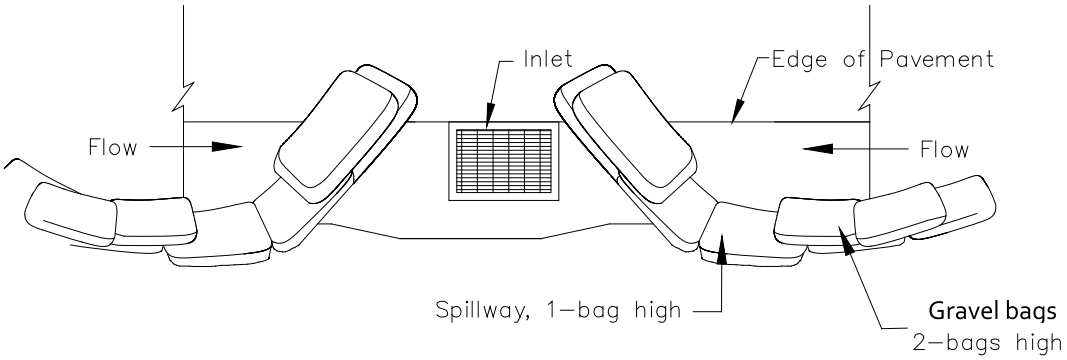


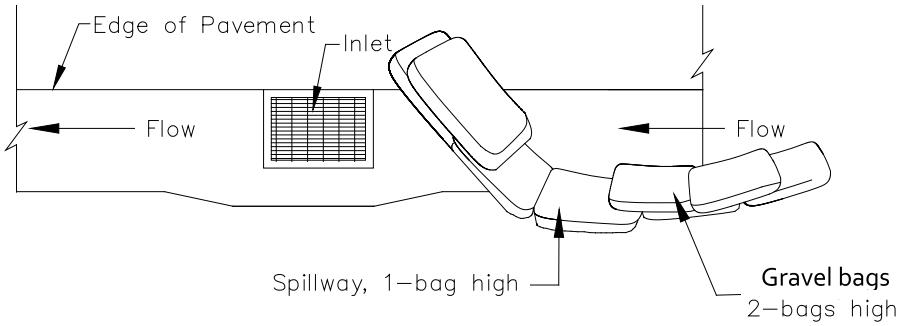
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

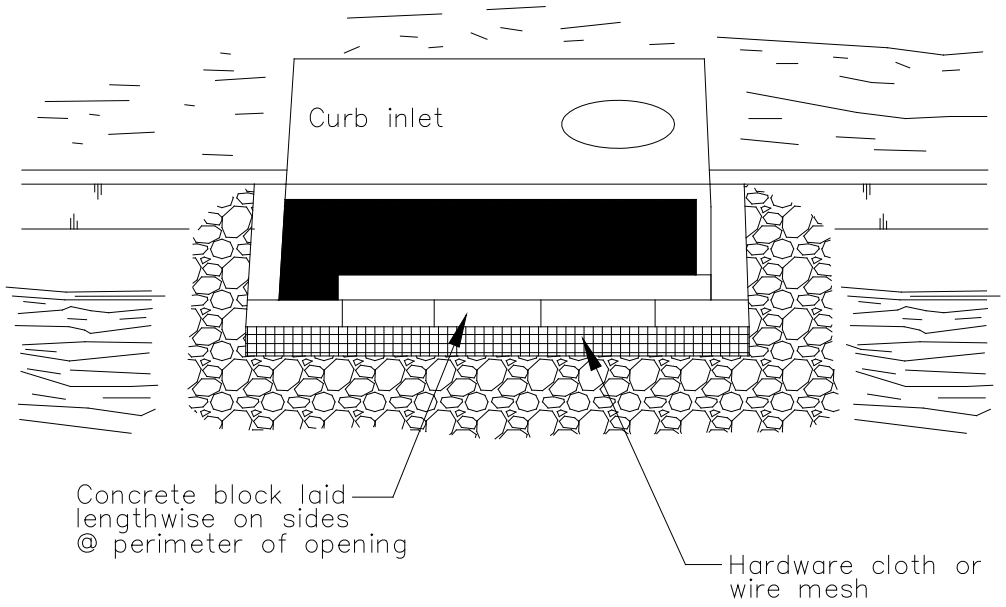


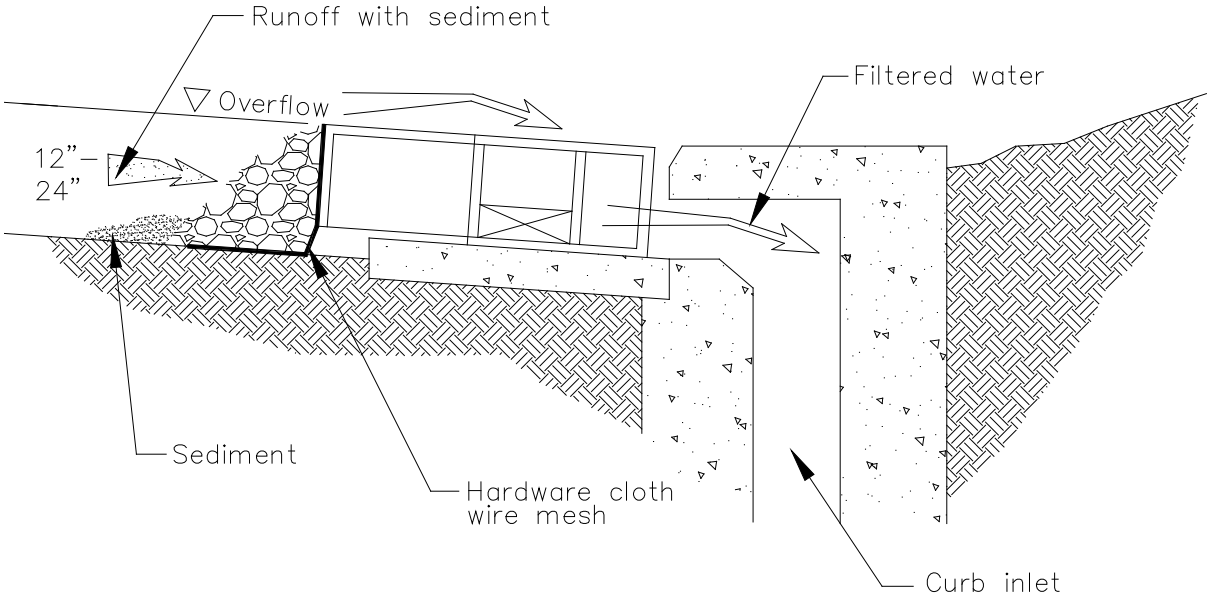
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short–term use.
2. Use to inhibit non–storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.

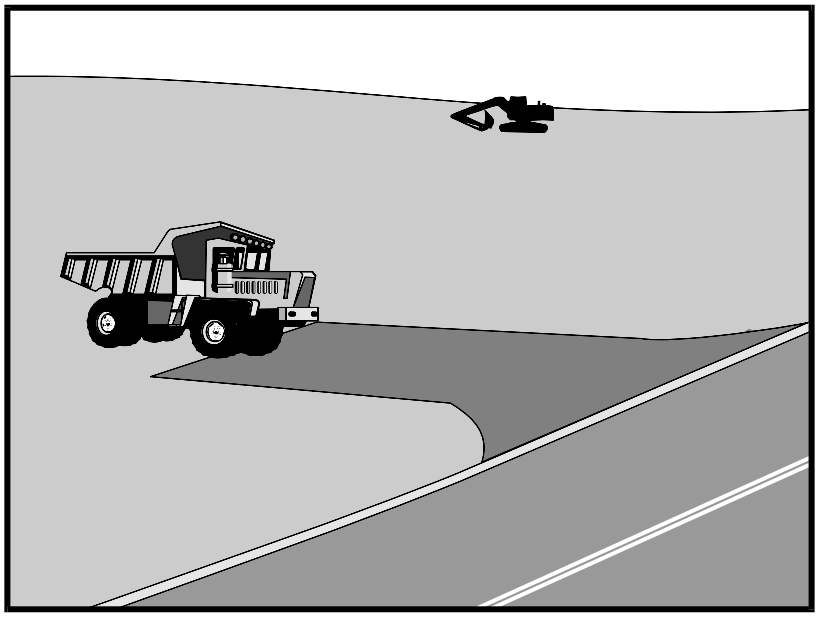
DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4
NOT TO SCALE

Stabilized Construction Entrance/Exit TC-1



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,500 to $6,100 each, averaging $3,100 per entrance. Costs will increase with addition of washing rack and sediment trap. With wash rack, costs range from $1,500 - $7,700 each, averaging $4,600 per entrance (All costs adjusted for inflation, 2016 dollars, by Tetra Tech Inc.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

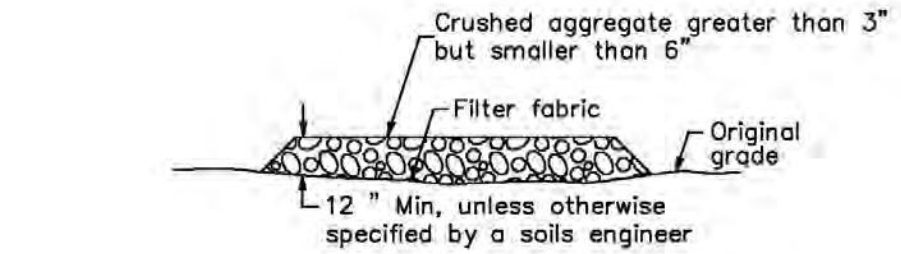
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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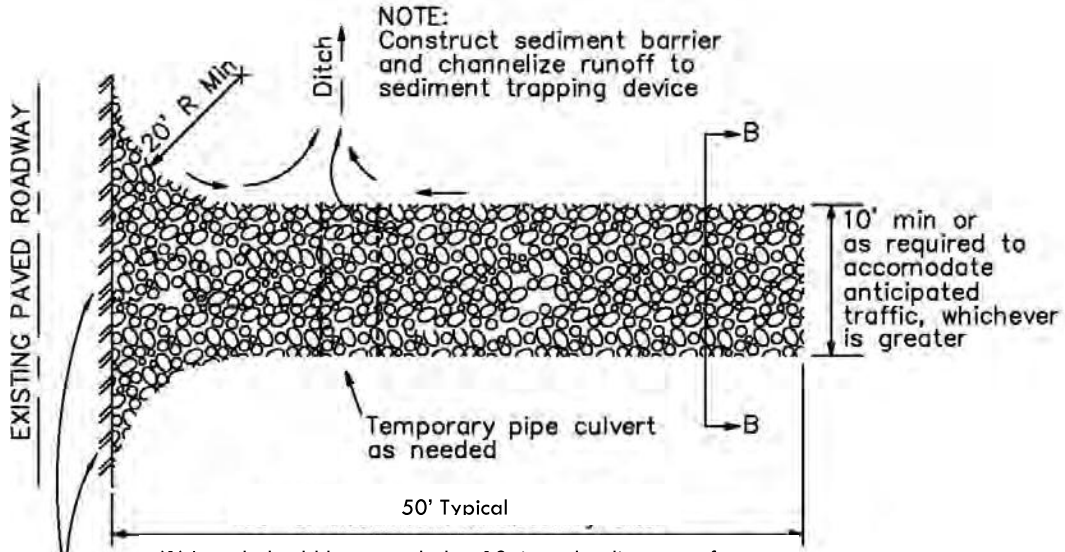
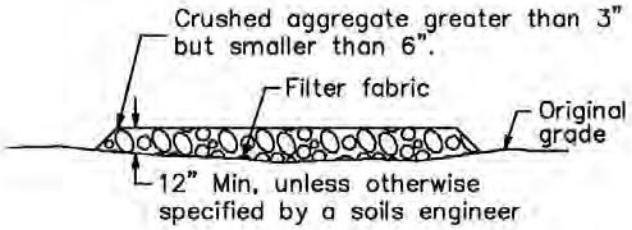


(1) Length should be extended to 12 times the diameter of the largest construction vehicle tire.
(2) On small sites length should be the maximum allowed by site.

PLAN
NTS

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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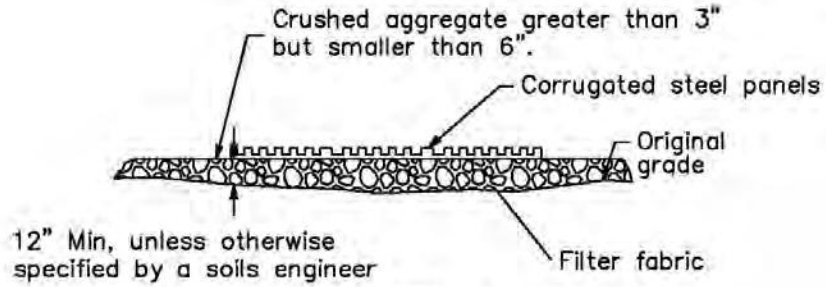
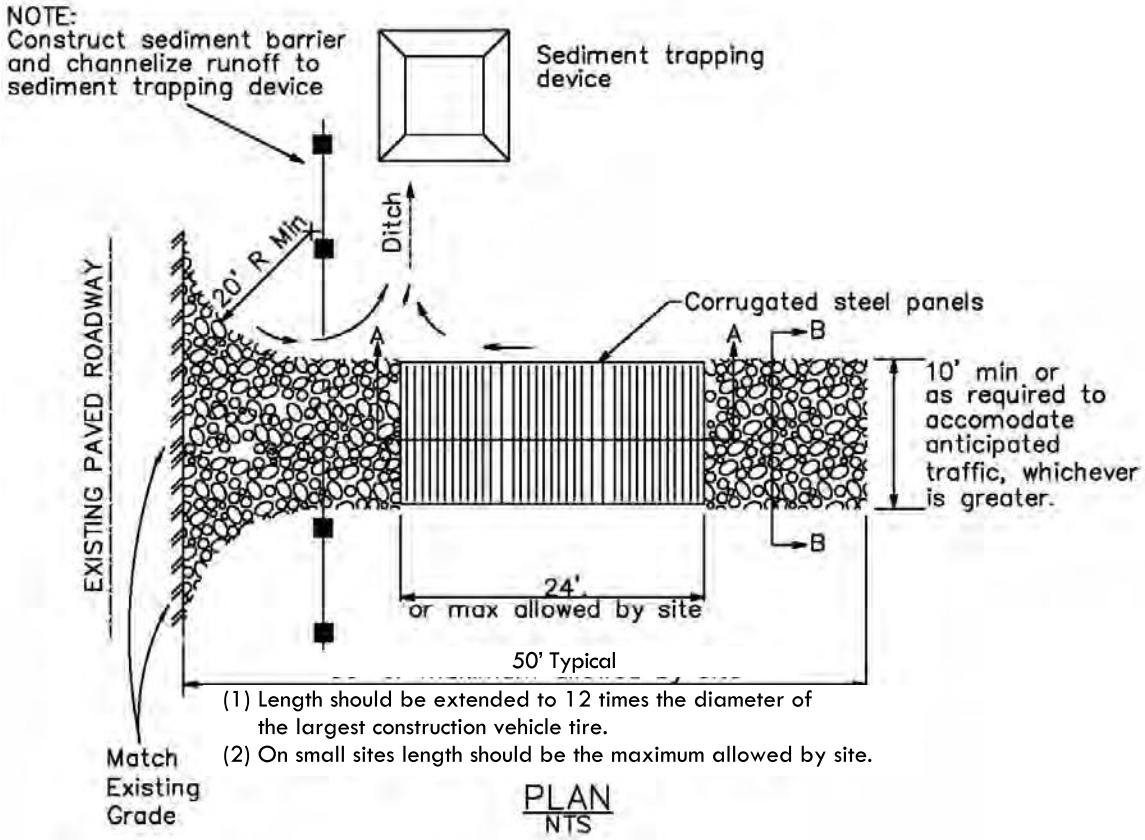


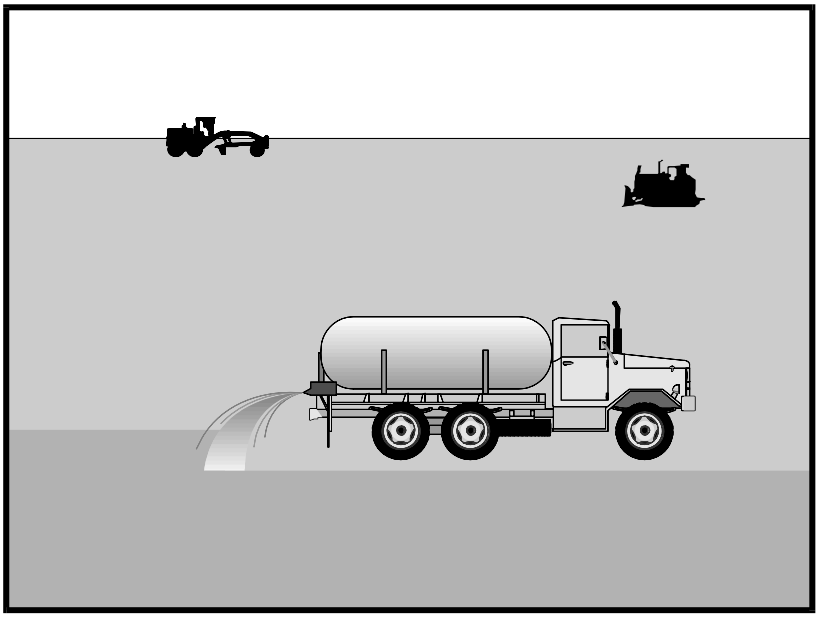
SECTION A–A
NOT TO SCALE



(1) Length should be extended to 12 times the diameter of the largest construction vehicle tire.
(2) On small sites length should be the maximum allowed by site.

PLAN
NTS

Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

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Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking, and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water-based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyl, acrylic), clay additives (e.g. bentonite, montmorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/ Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

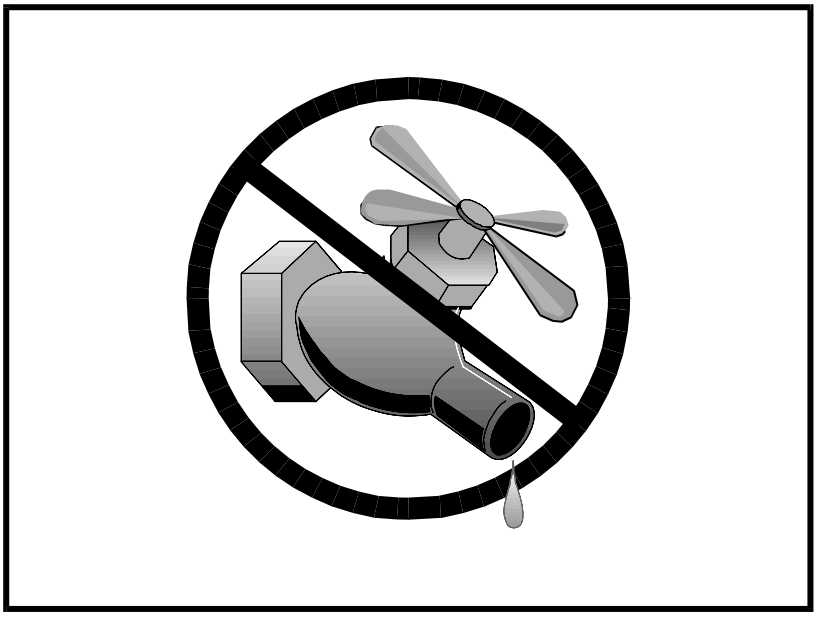
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Water Conservation Practices NS-1



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

- Direct construction water runoff to areas where it can soak into the ground or be collected and used.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

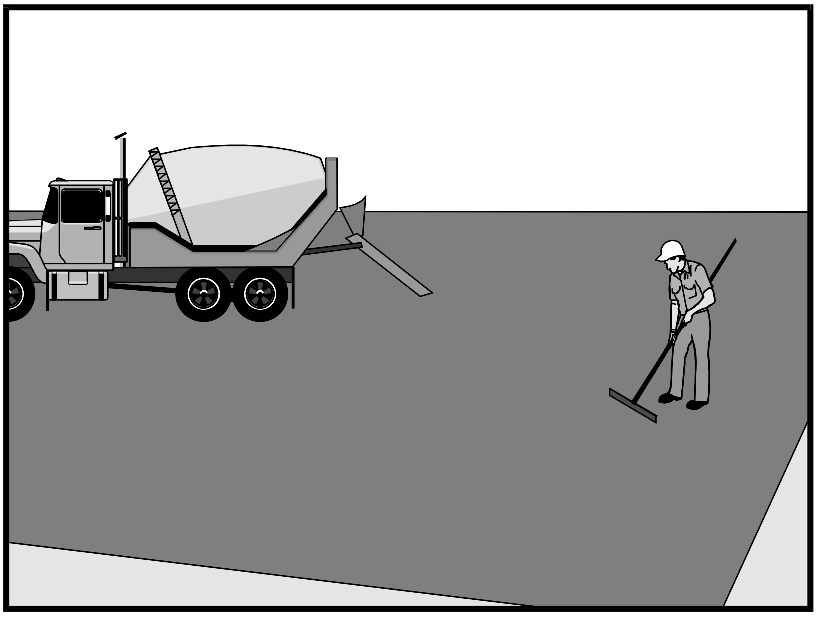
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Paving and Grinding Operations NS-3



Categories		
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Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.

  Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).

- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

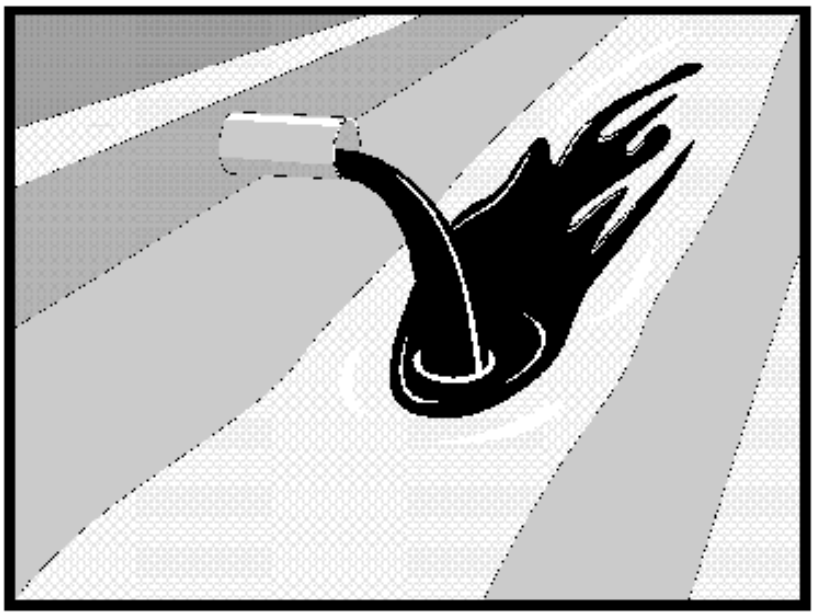
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Illicit Connection/Discharge NS-6



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered, or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

- Inspect site regularly during project execution for evidence of illicit connections, illegal dumping or discharges.
- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General –** unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job-related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

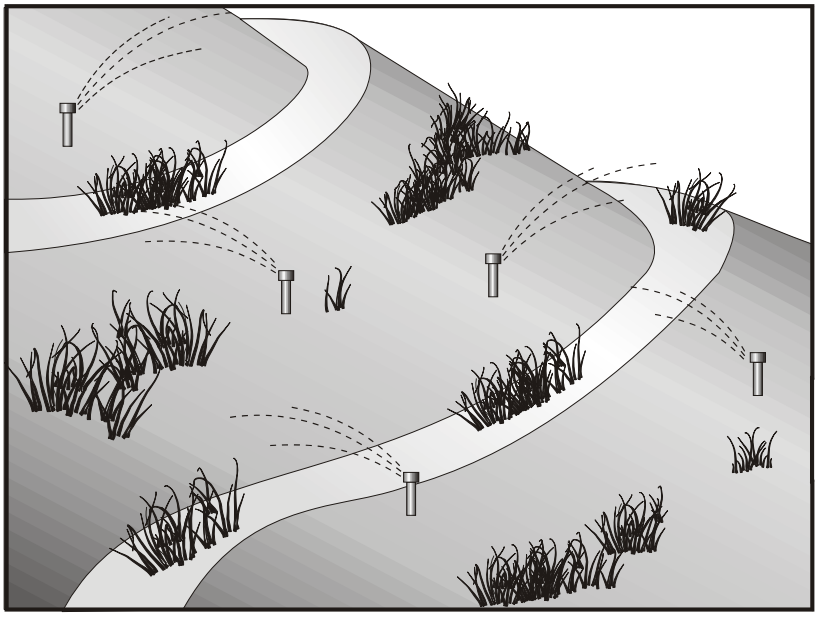
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Potable Water/Irrigation NS-7



Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

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- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Repair broken water lines as soon as possible.

- Inspect irrigated areas regularly for signs of erosion and/or discharge.

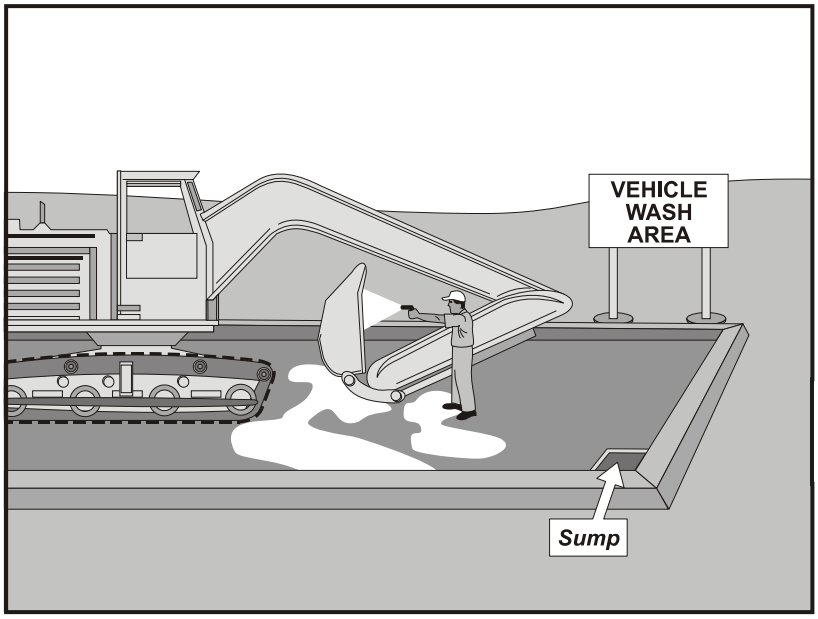
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle and Equipment Cleaning NS-8



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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

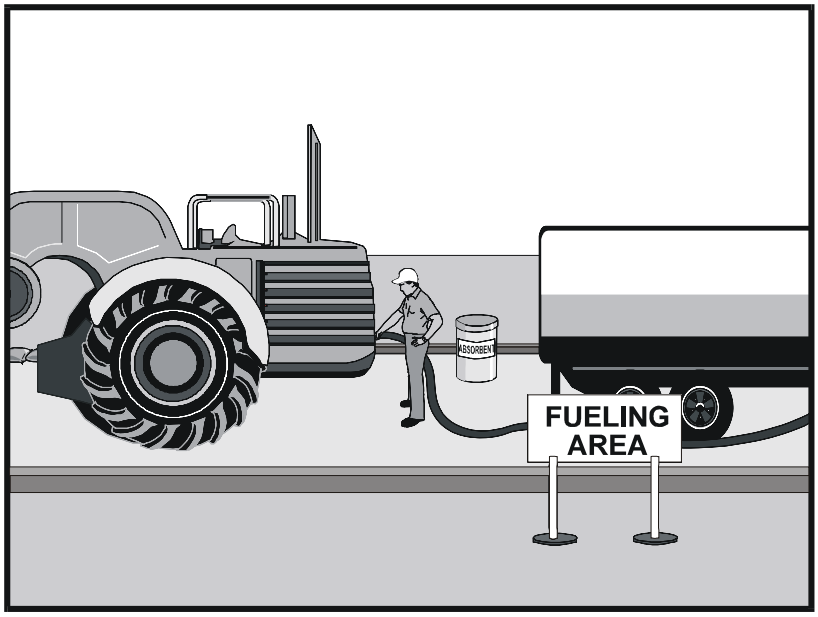
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories

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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage “topping-off” of fuel tanks.

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately, or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

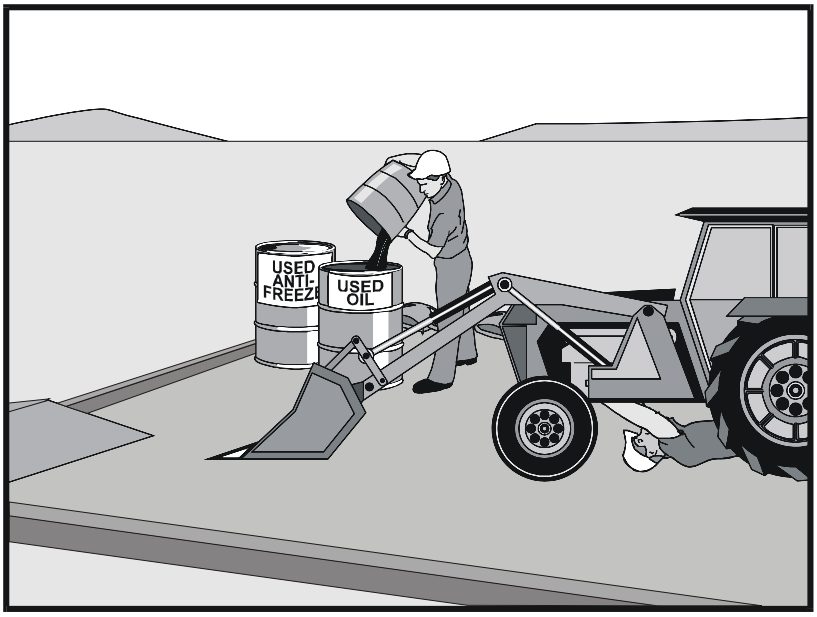
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8,

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Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately, or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

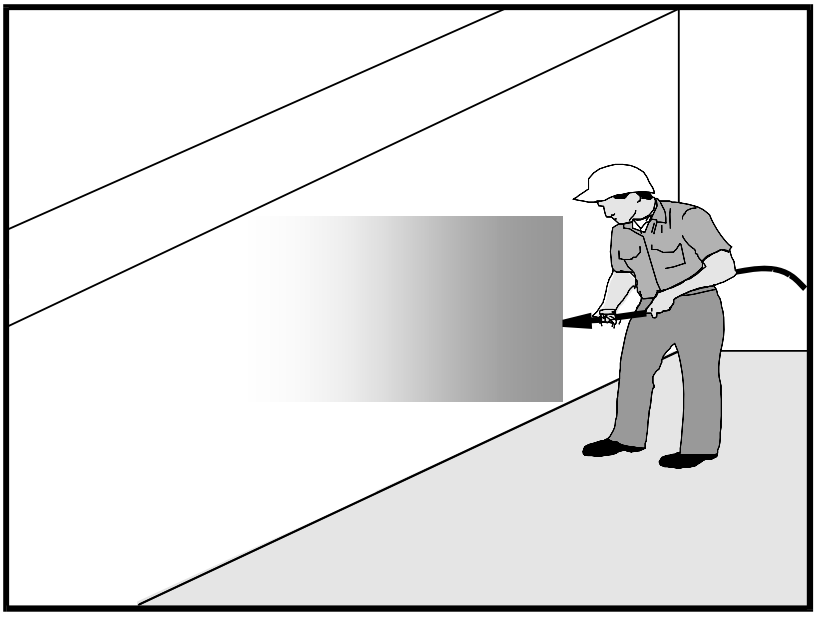
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Concrete Curing NS-12



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.

- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

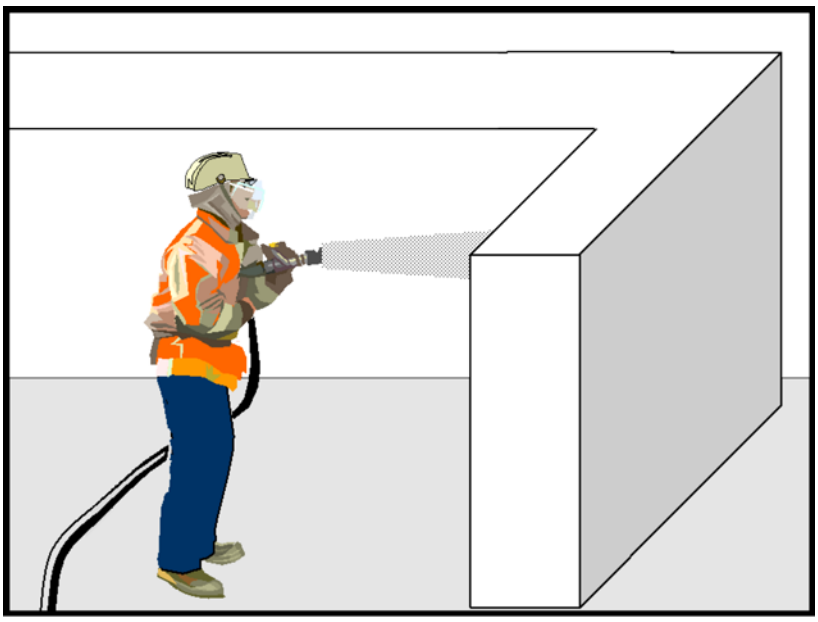
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non-Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing NS-13



Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high-pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

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Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

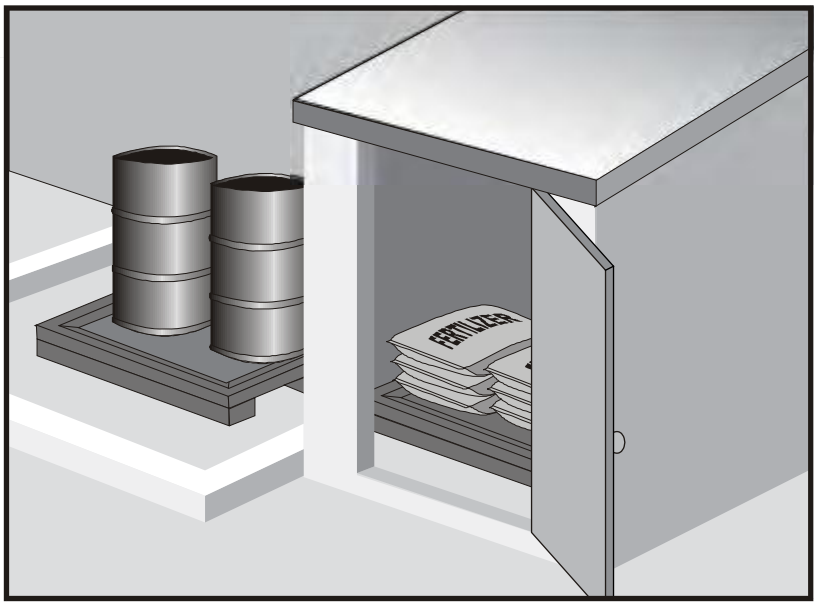
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Material Delivery and Storage WM-1



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
    - Avoid transport near drainage paths or waterways.
    - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
    - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25-year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

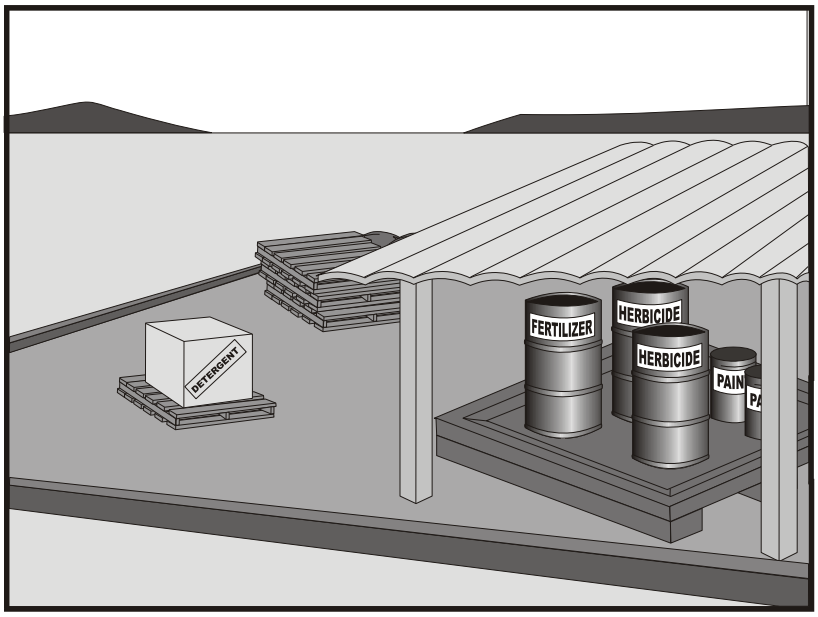
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use WM-2



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

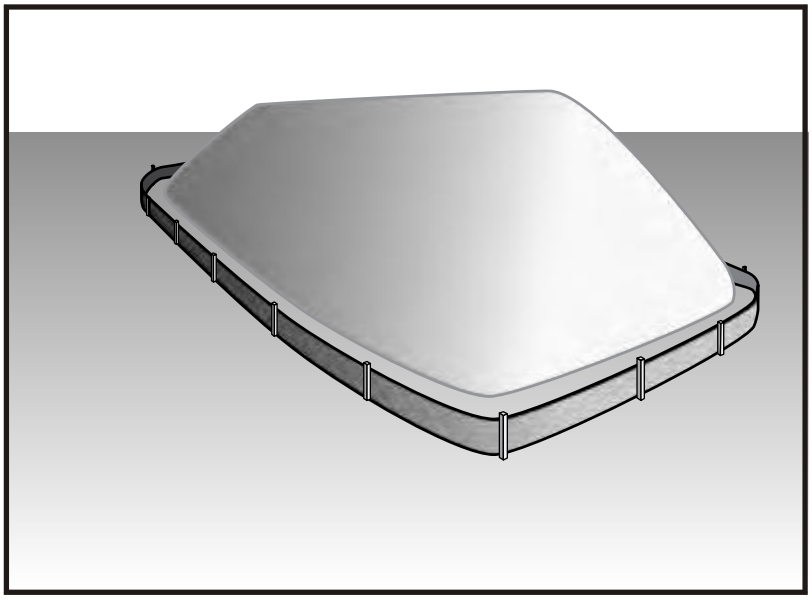
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Treat Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as Portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives
None

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- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- After 14 days of inactivity, a stockpile is non-active and requires further protection described below. All stockpiles are required to be protected as non-active stockpiles immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater run-on using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

A stockpile is considered non-active if it either is not used for 14 days or if it is scheduled not to be used for 14 days or more. Stockpiles need to be protected immediately if they are not scheduled to be used within 14 days. Non-active stockpiles of the identified materials should be protected as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of treated wood

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

A stockpile is active when it is being used or is scheduled to be used within 14 days of the previous use. Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

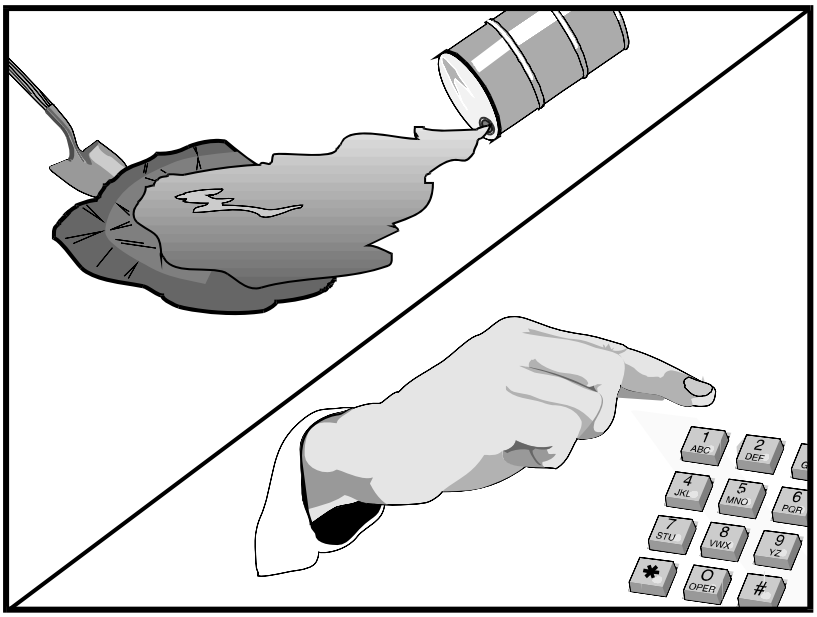
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases, it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spill's contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

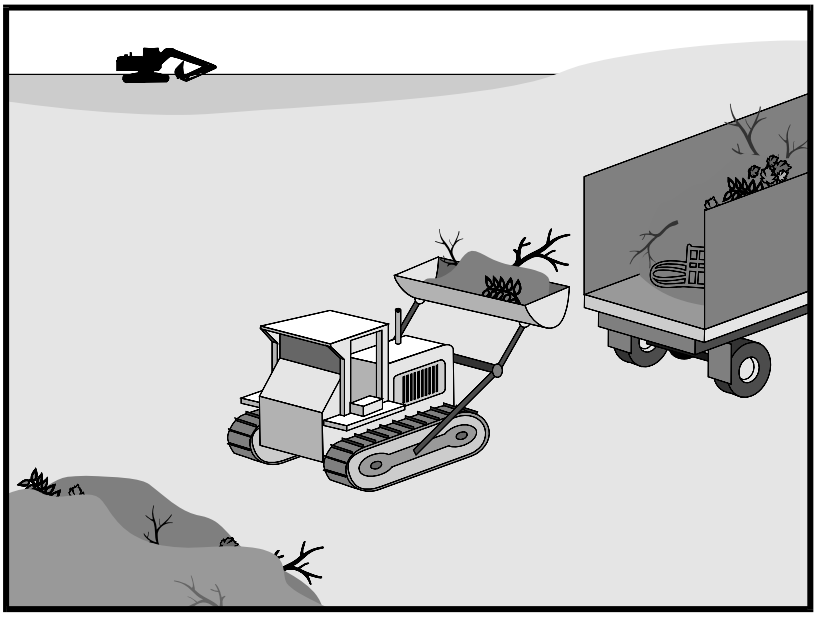
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

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- Highway planting wastes, including vegetative material, plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

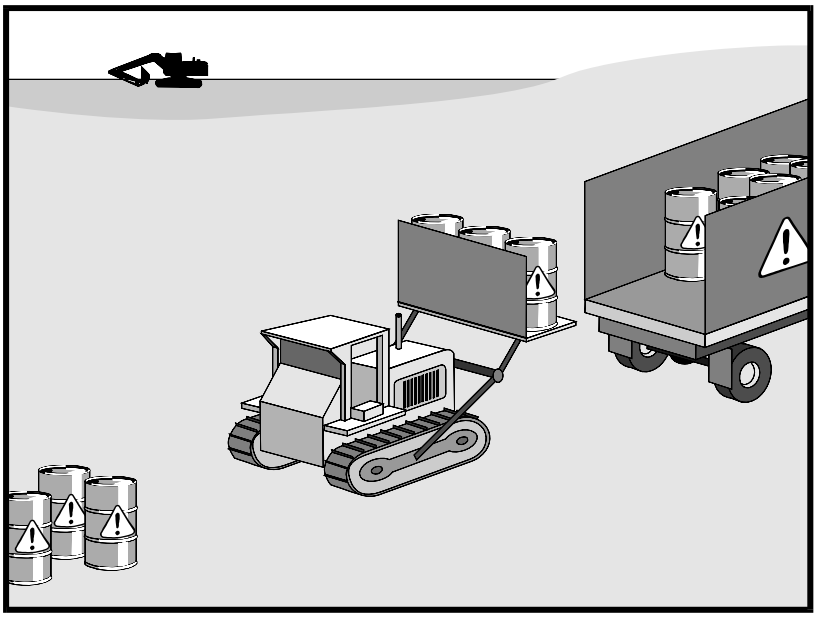
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management WM-6



Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25-year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled, and wastes should not be mixed.

- Unless watertight, containers of dry waste should be stored on pallets.

- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

- Paint brushes and equipment for water and oil-based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. “Paint out” brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

- The following actions should be taken with respect to temporary contaminant:

  - Ensure that adequate hazardous waste storage volume is available.

  - Ensure that hazardous waste collection containers are conveniently located.

  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

  - Minimize production or generation of hazardous materials and hazardous waste on the job site.

  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.

  - Segregate potentially hazardous waste from non-hazardous construction site debris.

  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

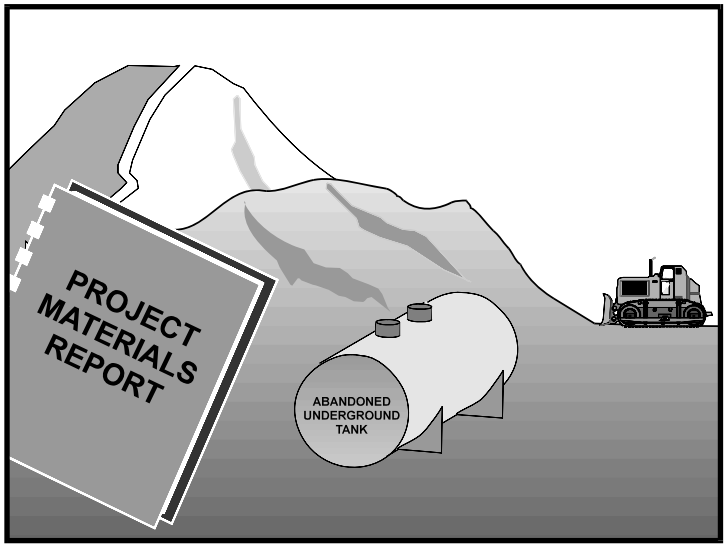
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Contaminated Soil Management WM-7



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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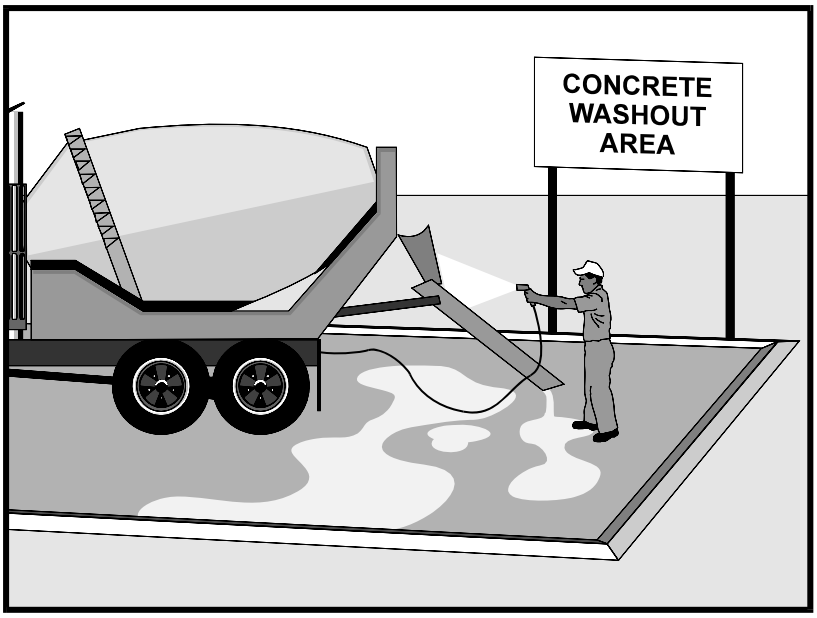
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Concrete Waste Management WM-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing Portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.
- Concrete trucks and other concrete-coated equipment are washed onsite.

- Mortar-mixing stations exist.
- Stucco mixing and spraying.
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
    - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
    - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
    - Washouts shall be implemented in a manner that prevents leaching to underlying soils. Washout containers must be water tight and washouts on or in the ground must be lined with a suitable impervious liner, typically a plastic type material.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
    - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
    - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
    - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
    - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a “roll-off”; this concrete washout facility should be properly sealed to prevent leakage and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
    - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
    - Lath and flagging should be commercial type.
    - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations.

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

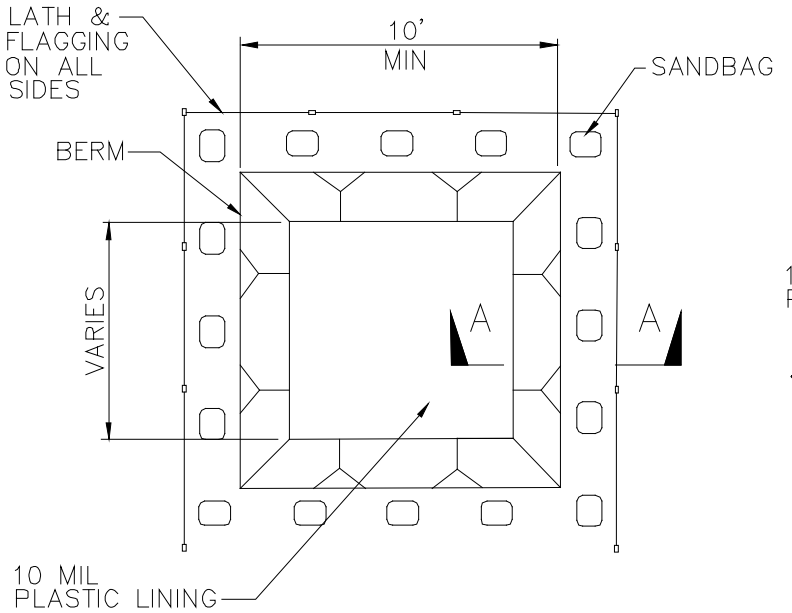
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

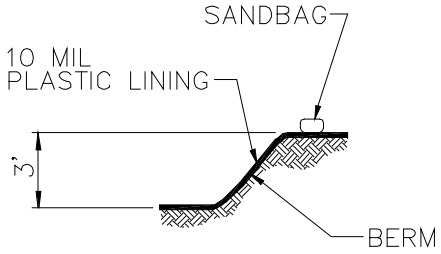
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

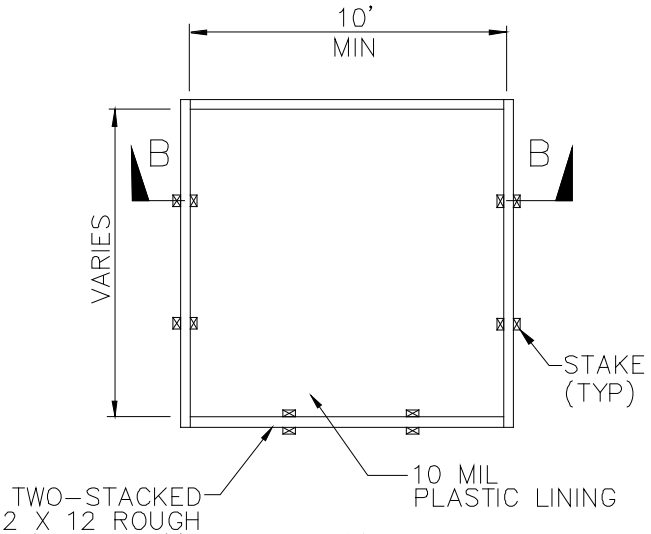
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



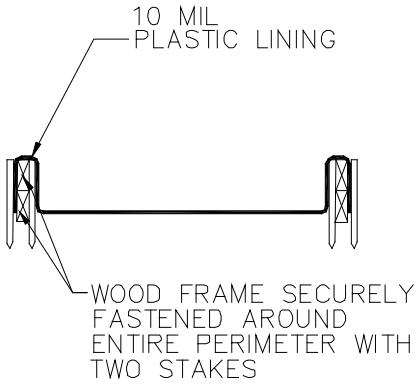
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



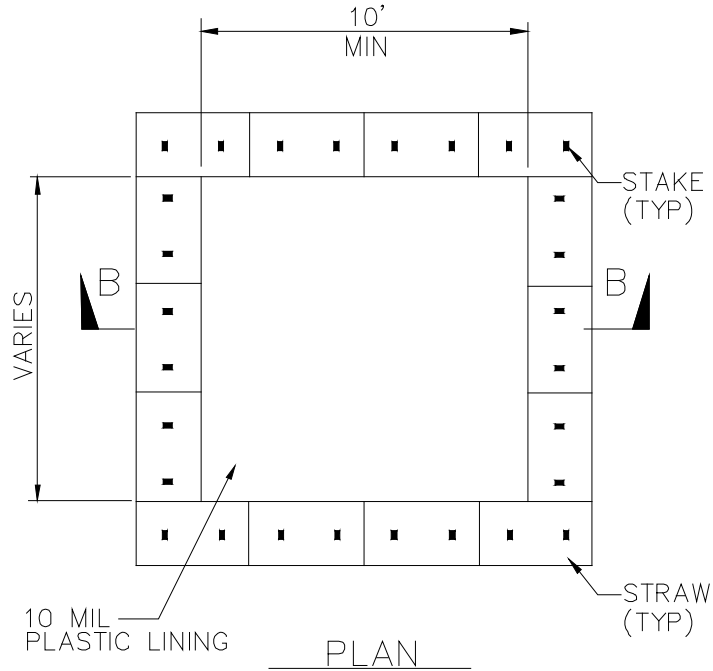
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



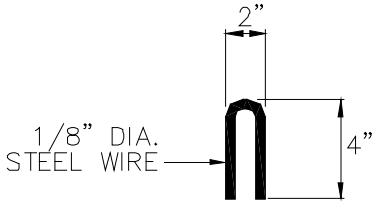
SECTION B–B
NOT TO SCALE

NOTES

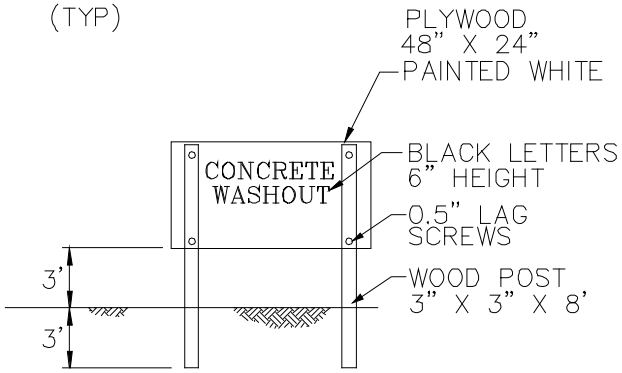
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



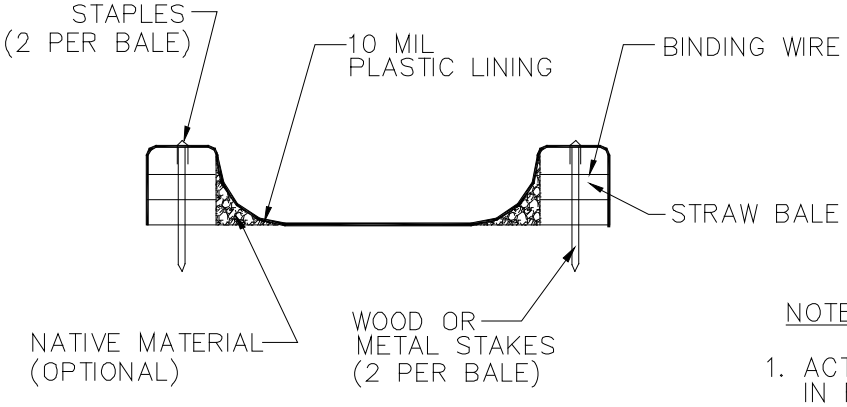
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

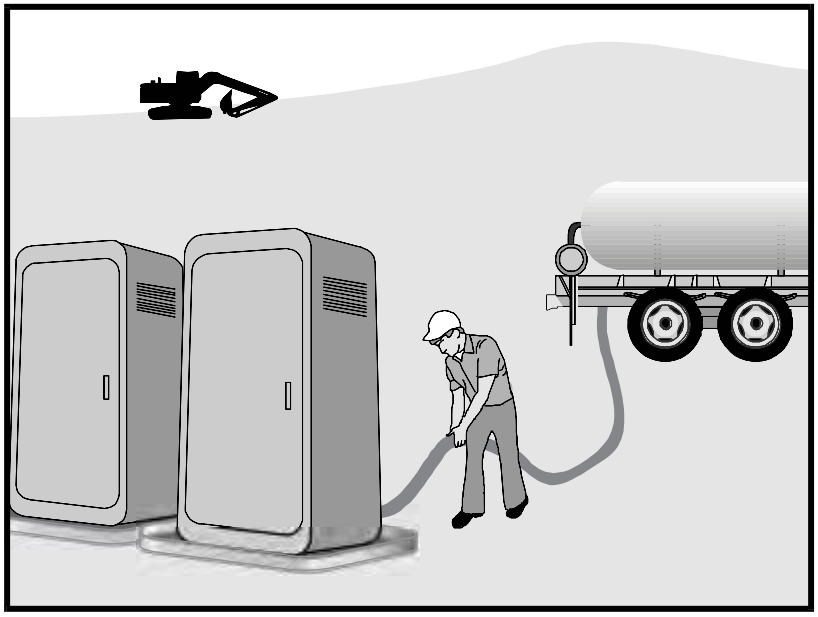


SECTION B–B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

APPENDIX I
CONSTRUCTION SITE INSPECTION REPORT FORMS

Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***					
Date and Time of Inspection:				Report Date:	
Inspection Type:	☐ Weekly	☐ Pre Qualifying Precipitation Event (QPE)	☐ During QPE	☐ Post QPE	☐ Dewatering Discharge
Site Information					
Construction Site Name:					
Construction stage and completed activities:				Approximate area of exposed site:	
Weather and Observations					
Date Rain Predicted to Occur:			Predicted % chance of precipitation (PoP): Predicted quantity of precipitation (QPF):		
Estimate storm beginning: _____ (date and time)		Estimate storm duration:_____ (hours)	Estimate time since last storm: _____ (days or hours)	Rain gauge reading:_____ (inches)	
Observations: If yes identify location					
Odors	Yes ☐	No ☐			
Floating material	Yes ☐	No ☐			
Suspended Material	Yes ☐	No ☐			
Sheen	Yes ☐	No ☐			
Discolorations	Yes ☐	No ☐			
Turbidity	Yes ☐	No ☐			
Site Inspections					
Outfalls or BMPs Evaluated			**Deficiencies Noted**		
(add additional sheets or attached detailed BMP Inspection Checklists)					
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:		
Corrective Actions Identified (note if SWPPP/REAP change is needed)					
Inspector Information					
Inspector Name:			Inspector Title:		
Signature:				Date:	

APPENDIX J
TRAINING AND REPORTING DOCUMENTATION

Contractor Personnel Training Log

Stormwater Management Training Log and Documentation

Project Name: _____

WDID #: _____

Stormwater Management Topic: (check as appropriate)

☐ Good Housekeeping BMPs ☐ Erosion Control BMPs

☐ Sediment Control BMPs ☐ Tracking Control

☐ Non-Stormwater Management BMPs ☐ Waste Management & Pollution Control BMPs

☐ BMP Implementation Activities ☐ Advanced BMPs

☐ Identification of QSPs and QSP Delegates

Training Objective: _____

Date: _____ Instructor: _____

Training Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

QSP Delegate Training Log

Stormwater Management Training Log and Documentation

Project Name: _____

WDID #: _____

QSP Delegate Name: _____

Delegated Responsibilities:

☐ Stormwater Visual Inspections

☐ Sampling

☐ BMP Inspections

☐ BMP Maintenance and Repair

Foundational Training

Topic	Date Completed	QSP Trainer
☐ Roles and Responsibilities		
☐ Forecast Information		
☐ Documentation and Reporting Procedures		

Site-Specific Training

Topic	Date Completed	QSP Trainer
☐ Visual Inspections		
☐ Sample Collection Procedures		
☐ Sample Reporting Procedures		
☐ BMP Implementation		

As needed, attach proof of external training (e.g., course completion certificates, credentials for the QSP Delegate).

APPENDIX K
RESPONSIBLE PARTIES

Qualified SWPPP Developer, QSD:
Lane Engineers, Inc.
979 North Blackstone Street
Tulare, CA 93274
Phone: 559-688-5263
Wa Vang, PE,QSD

Qualified SWPPP Practitioner, QSP:

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)
AND
QUALIFIED SWPPP PRACTITIONER (QSP)

Wa Vang

Jan 22, 2024 - Jan 29, 2026

Certificate # 22309

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

California Stormwater Quality Association and
California Construction General Permit Training Team

APPENDIX L
LIST OF CONTRACTORS AND SUBCONTRACTORS

APPENDIX M
EXAMPLE STORM EVENT MONITORING FORMS

Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***					
Date and Time of Inspection:				Report Date:	
Inspection Type:	☐ Weekly	☐ Pre Qualifying Precipitation Event (QPE)	☐ During QPE	☐ Post QPE	☐ Dewatering Discharge
Site Information					
Construction Site Name:					
Construction stage and completed activities:				Approximate area of exposed site:	
Weather and Observations					
Date Rain Predicted to Occur:			Predicted % chance of precipitation (PoP): Predicted quantity of precipitation (QPF):		
Estimate storm beginning: _____ (date and time)		Estimate storm duration:_____ (hours)	Estimate time since last storm: _____ (days or hours)	Rain gauge reading:_____ (inches)	
Observations: If yes identify location					
Odors	Yes ☐	No ☐			
Floating material	Yes ☐	No ☐			
Suspended Material	Yes ☐	No ☐			
Sheen	Yes ☐	No ☐			
Discolorations	Yes ☐	No ☐			
Turbidity	Yes ☐	No ☐			
Site Inspections					
Outfalls or BMPs Evaluated			**Deficiencies Noted**		
(add additional sheets or attached detailed BMP Inspection Checklists)					
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:		
Corrective Actions Identified (note if SWPPP/REAP change is needed)					
Inspector Information					
Inspector Name:			Inspector Title:		
Signature:				Date:	

Risk Level 1, 2, 3 ***Effluent Sampling Field Log Sheets***			
Construction Site Name:		Date:	Time Start:
Sampler:			
Sampling Event Type:	☐ Stormwater	☐ Dewatering Discharge	☐ Non-visible pollutant

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements			
Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected		
Discharge Location Description	Sample Type	Time

Additional Sampling Notes:
Time End:

APPENDIX N
ATTACHMENT D: TRADITIONAL CONSTRUCTION RISK LEVEL REQUIREMENTS

ATTACHMENT D

TRADITIONAL CONSTRUCTION RISK LEVEL REQUIREMENTS

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR STORMWATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES
(GENERAL PERMIT)

I. GENERAL REQUIREMENTS

Risk Level 1, 2, and 3 dischargers shall implement the following minimum best management practices (BMPs) to reduce or prevent pollutants in construction stormwater discharges, monitoring requirements, and reporting requirements. If a requirement in this attachment does not specify a specific Risk Level, then the requirement applies to Risk Level 1, 2, and 3 dischargers.

II. MINIMUM BEST MANAGEMENT PRACTICES

II.A. Good Site Management "Housekeeping"

II.A.1. Dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged or exposed to stormwater. At a minimum, dischargers shall implement the following good housekeeping measures:

a. Identify and protect the products used and/or expected to be used and the end products that are produced and/or expected to be produced from exposure to stormwater. Products do not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (e.g., poles, equipment pads, cabinets, conductors, insulators, bricks, roofing, and siding);

b. Apply BMPs to erodible stockpiled construction materials (e.g., soil, spoils, fly-ash, stucco, hydrated lime) to prevent erosion and pollutant transport;

c. Store chemicals in watertight containers with secondary containment to prevent any spillage or leakage or store in a completely enclosed storage area;

d. Minimize exposure of construction materials to precipitation. Construction materials do not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (e.g., poles, equipment pads, cabinets, conductors, insulators, bricks);

e. Implement BMPs to control the off-site tracking of sediment and loose construction and landscape materials; and

f. Implement BMPs to control the discharge of plastic materials and limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Dischargers shall consider the use of plastic materials resistant to solar degradation where plastic materials are deemed necessary.

II.A.2. Dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, masonry wash waters, and other wash waters. Wash waters shall be captured and treated prior to discharge, or disposed of at a permitted facility that can accept that waste, to mitigate impacts to water quality;

b. Provide containment (e.g., secondary containment) of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the stormwater drainage system or receiving water;

c. Clean or replace sanitation facilities and inspect them regularly for leaks and spills;

d. Keep debris or trash in waste containers if it is subject to transport from the site by wind or runoff;

e. Cover waste disposal containers at the end of every business day and during a precipitation event;

f. Prevent discharges from waste disposal containers to the stormwater drainage system or receiving water (e.g., containers with solid bottoms and regular maintenance);

g. Contain and securely protect stockpiled waste material from wind and precipitation unless actively being used; and

h. Secure and contain concrete washout areas and other washout areas that may contain additional pollutants to minimize discharge into the underlying soil and onto surrounding areas. Washout areas shall be covered prior to and during a precipitation event.

II.A.3. Dischargers shall implement good housekeeping for vehicle/equipment storage and maintenance, which shall consist of the following:

a. Contain fuel, grease, and oil to prevent them from leaking into ground, storm drains, or surface waters;

b. Place all equipment or vehicles, which are to be fueled, maintained, and/or stored in a designated area with BMPs installed; and

c. Clean leaks immediately and dispose of leaked materials properly in accordance with the law.

II.A.4. Dischargers shall implement good housekeeping for landscape materials, which shall consist of the following:

a. Contain and protect stockpiled materials such as mulches and topsoil, or other erodible landscape materials, from wind and precipitation unless being actively used;

b. Contain packaged landscape materials (e.g., fertilizers) when they are not being actively used;

c. Discontinue the application of any erodible landscape material at least 2 days before a forecasted precipitation event as defined in Attachment B or during periods of precipitation; and

d. Apply erodible landscape material at quantities and rates in accordance with manufacturer recommendations or based on written specifications by knowledgeable and experienced field personnel;

II.A.5. Dischargers shall implement good housekeeping measures on the construction site to control the aerial deposition of site materials and from site operations. Such particulates can include, but are not limited to, metals, nutrients, organics, sediment, other particulates, and trash.

II.A.6. Dischargers shall document all housekeeping BMPs in the SWPPP that correspond to the nature and phase of the construction activities. Construction phases at traditional land development projects include demolition and pre-development site preparation phase, grading and land development phase, streets and utilities phase, vertical construction phase, and final landscaping and site stabilization phase.

II.B. Non-Stormwater Management

II.B.1. Dischargers shall implement the following measures to control all non-stormwater discharges during construction:

a. Wash vehicles in such a manner as to prevent non-stormwater discharges to surface waters or municipal separate sewer system drainage systems;

b. Clean streets in such a manner as to prevent unauthorized non-stormwater discharges from reaching surface water or municipal separate sewer system drainage systems; and

c. Eliminate any non-stormwater discharges not authorized in Section IV.A of this General Permit's Order.

II.C. Preserve Existing Topsoil

II.C.1. Dischargers shall preserve existing topsoil, unless infeasible, through the following practices:

a. Stockpiling existing topsoil, or transferring topsoil to other locations, to deploy and reestablish vegetation prior to termination of coverage; and

b. Stabilizing disturbed topsoil during construction.

Preserving existing topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.[1]

1 Examples may include the removal of topsoil containing invasive seedbanks, lack of space to stockpile topsoil, and sites that are designed to be highly impervious after construction with little to no vegetation intended to remain.

II.D. Erosion Control

II.D.1. Dischargers shall implement the following practices to eliminate or minimize site erosion. Erosion control BMPs (except for sprayed products) shall be available on-site or at a nearby location (e.g., common lay-down yard), year-round with trained persons able to deploy the product under the direction of the Qualified SWPPP Practitioner:

a. Implement effective wind erosion control;

b. Preserve existing vegetation;

c. Minimize the amount of soil exposed during construction activity;

d. Minimize the disturbance of steep slopes;

e. Schedule earthwork to minimize the amount of disturbed area when feasible;

f. Immediately initiate stabilization for disturbed areas whenever earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days;[2]

g. Minimize soil compaction in areas other than where the intended function of a specific area dictates that it be compacted;

h. Reestablish vegetation or non-vegetative erosion controls as soon as practicable;

i. If feasible, divert up gradient run-on water from contacting areas of exposed soils disturbed by construction activities or convey run-on through the site in a manner that prevents erosion from areas of construction and does not compromise the effectiveness of erosion, sediment, and perimeter controls;

j. Run-on water flowing onto a site from off-site areas may be separated from a site's stormwater discharge to eliminate commingled contribution. Run-on diversion shall occur prior to entering an area affected by construction activity. Run-on flow diversion shall be conveyed through or around the construction activity in plastic pipe or an engineered conveyance channel in a manner that will not cause erosion due to flow diversion. Run-on combined with a site's stormwater discharge is considered a stormwater discharge.

k. Limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the

2 In arid, semiarid, and drought-stricken areas where initiating vegetative stabilization measures immediately is infeasible, alternative stabilization measures shall be employed as specified by the Regional Water Board. Stabilization shall be completed within a period of time determined by the Regional Water Board. In limited circumstances stabilization may not be required if the intended function of a specific area of the site necessitates that it remains disturbed.

discharger shall consider the use of plastic materials resistant to solar degradation;

l. Control stormwater and non-stormwater discharges to minimize downstream channel and bank erosion; and

m. Control peak flowrates and total volume of stormwater and authorized non-stormwater discharges to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points.

II.D.2. Dischargers that stabilize soil using bonded-fiber matrices, hydromulches, spray tackifiers, or other land-applied products shall:

a. Apply the product according to the manufacturer's instructions and guidance; and

b. Apply the product according to the manufacturer's guidance to allow for ample cure time and to prevent treatment chemicals from being transported by runoff.

II.E. Sediment Controls

II.E.1. Dischargers shall implement the following site sediment controls:

a. Establish and maintain effective perimeter controls;

b. Stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site; and

c. Design, install, and maintain effective sediment controls to minimize the discharge of pollutants utilizing site-specific BMPs.

At a minimum, design sediment basins and impoundments according to the method provided in the California Stormwater Quality Association Construction BMP Handbook[3] and utilize outlet structures that withdraw water from the surface. Dischargers utilizing sediment basins shall complete installation prior to other land disturbance activities.

II.F. Additional Risk Level 2 and 3 Requirements:

II.F.1. Risk Level 2 and 3 dischargers shall implement the following additional erosion and sediment control BMPs for areas under active[4] construction:

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3 California Stormwater Quality Association (CASQA), Construction BMP Handbook (January 2015), <https://www.casqa.org/sites/default/files/casqa-handbook-construction/master_hanbook_file_2015_sec.pdf> [as of May 20, 2021] (CASQA Construction BMP Handbook)

4 Active areas of construction are areas undergoing land surface disturbance and associated site areas. This includes construction activity during the preliminary phase, mass grading phase, streets and utilities phase, and the vertical construction phase.

a. Design and construct cut and fill slopes in a manner to ensure slope stability and to minimize erosion including, but not limited to, these practices:

   i. Reduce continuous slope length using terracing and diversions;

   ii. Reduce slope steepness; and

   iii. Roughen slope surfaces with large cobble or track walking.

b. Install linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes according to sheet flow lengths as shown in Table 1 until the slope has reached Notice of Termination conditions for erosion protection. When infeasible to comply with Table 1 due to site-specific geology or topography, the QSD shall include in the SWPPP a justification for the use of an alternative method to protect slopes from erosion and sediment loss.

Table 1 - Critical Slope and Sheet Flow Length Combinations for Linear Sediment Reduction Barrier

Slope Ratio (Vertical to Horizontal)	Sheet flow length not to exceed
≤ 1:20	Per QSD's specification.
> 1:20 to ≤ 1:4	35 feet
> 1:4 to ≤ 1:3	20 feet
> 1:3 to ≤ 1:2	15 feet
> 1:2	10 feet

II.F.2. Limit construction activity traffic to and from the project to entrances and exits that employ effective controls to prevent off-site tracking of sediment.

II.F.3. Maintain and protect all storm drain inlets, perimeter controls, and BMPs at entrances and exits (e.g., tire wash off locations).

II.F.4. Remove any excess sediment or other construction activity-related materials that are deposited on the impervious roads by vacuuming or sweeping prior to any precipitation event.

II.F.5. Implement additional site-specific sediment controls upon written request by the Regional Water Boards when the implementation of the other requirements in this Section are determined to inadequately protect the site's receiving water(s).

II.G. Surface Water Buffer[5]

II.G.1. Dischargers shall provide and maintain natural buffers and/or equivalent erosion and sediment controls when a water of the U.S. is located within 50 feet of the site's earth disturbances, unless infeasible.

II.G.2. Dischargers shall comply with one of the following alternatives for any discharges to waters of the U.S. located within 50 feet of a site's earth disturbances:

a. Provide and maintain a 50-foot undisturbed natural buffer from the edge of the disturbed area to the top of bank;

b. Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve, in combination, the sediment load reduction equivalent to a 50-foot undisturbed natural buffer. The equivalent sediment load may be calculated using RUSLE2 or another method approved by the Regional Water Board; or

c. Implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer when infeasible to provide and maintain an undisturbed natural buffer of any size. The equivalent sediment load may be calculated using RUSLE2 or another method approved by the Regional Water Board.

II.H. Pesticide Application

Dischargers shall only apply pesticides that have been authorized for use through California Department of Pesticide Regulation. The application of pesticides shall follow manufacturer's guidance.

II.I. Demolition of Existing Structure

Dischargers shall prevent exposing demolition materials to precipitation. Demolition materials should be covered with an impermeable barrier such as, but not limited to, plastic sheeting prior to precipitation to prevent known contaminants from being mobilized. Dischargers unable to cover demolished material that were not previously investigated or found to be absent of applicable pollutants in reportable quantities shall sample for any non-visible pollutants that may be in stormwater

5 The surface water buffer requirements apply to work above the top-of-bank or high-water level of waters of the United States. Work within a channel or streambed (water body-dependent construction), Clean Water Act § 404 projects with a § 401 certification, and projects where no natural surface buffer exists (e.g., concrete channelization) are exempt from the requirements. All types of in-channel work may be regulated under § 401 (Clean Water Act - Regional Boards), § 404 (Clean Water Act - Army Corps of Engineers), or §1602 (California Fish and Game Code).

discharges such as, but not limited to, asbestos, leaded paint, or Poly Chlorinated Biphenyls (PCBs)[6].

II.J. Maintenance and Repair

II.J.1. Dischargers shall begin maintaining, repairing, and/or implementing design changes (reviewing alternatives that have not been used yet) to BMPs within 72 hours of identification of failures or other shortcomings and complete the changes as soon as possible, prior to the next forecasted precipitation event.

II.J.2. Dischargers shall have a Qualified SWPPP Practitioner (QSP) verify all BMP maintenance and repairs were appropriately implemented during the next visual inspection following completion. The QSP may delegate BMP maintenance and repair verification to an appropriately trained delegate.

III. MONITORING REQUIREMENTS

III.A. General Requirements

The monitoring requirements of this Section are issued pursuant to Water Code § 13383 and specifies monitoring requirements for dischargers subject to this Order.

All dischargers shall implement the Construction Site Monitoring Program in compliance with this Section at the time of the commencement of construction activity and shall continue implementation until the project is complete and the project site is stabilized as defined in Section III.H in the Order.

III.B. Monitoring Exceptions

III.B.1. Dischargers shall conduct visual inspections and collect samples to meet the requirements of this Attachment. Dischargers are not required to physically conduct visual inspections or collect samples under the following conditions:

a. During dangerous weather conditions such as electrical storms, flooding, and high winds above 40 miles per hour;

b. Outside of scheduled site operating hours; or

c. When the site is not accessible to personnel.

III.B.2. For inactive projects, dischargers may reduce the visual inspection frequency and suspend sampling per Section III.G of the Order. Dischargers shall provide an explanation with supporting information for all missed visual inspections or sampling required by this Attachment, to be included in the Annual Report.

---

6 PCBs were used between January 1, 1950 and January 1, 1980 and should be considered to be potentially present in structures built during that timeframe. “Structure”, in this instance, shall have been constructed with floor space (such as a building).

III.C. Visual Inspection Requirements

III.C.1. Dischargers shall perform visual inspections, based on their Risk Level, in accordance with Table 2 below. The purpose of visual inspections is, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Except as specified in Section III.C.3 below, inspectors shall be the Qualified SWPPP Developer, Qualified SWPPP Practitioner, or be trained by the Qualified SWPPP Practitioner.

Table 2 – Visual Inspection Schedule[7]

Risk Level	Weekly	Pre-Qualifying Precipitation Event	During Qualifying Precipitation Event	Post-Qualifying Precipitation Event
1	X	X	X	X
2	X	X	X	X
3	X	X	X	X

III.C.2. Dischargers shall conduct weekly visual inspections to ensure that BMPs are properly installed and maintained. A pre-, during, or post-qualifying precipitation event inspection also satisfies the weekly visual inspection requirement.

III.C.3. Dischargers shall have a QSP conduct a pre-Qualifying Precipitation Event inspection within 72 hours prior to any weather pattern that is forecasted to have a 50 percent or greater chance of 0.5 inches or more in a 24-hour period. Precipitation forecast information shall be obtained from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at https://www.weather.gov/) and shall be included as part of the inspection checklist weather information. If extended forecast precipitation data (greater than three days) is available from the National Weather Service, the pre-precipitation event inspection may be done up to 120 hours in advance. The pre-Qualifying Precipitation Event inspection shall include an inspection of the following:

a. All stormwater drainage areas to identify leaks, spills, or uncontrolled pollutant sources and when necessary, implement appropriate corrective actions to control pollutant sources.

b. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP, and when necessary, implement appropriate corrective actions to control pollutant sources.

c. All stormwater storage and containment areas to detect leaks and check for available capacity to prevent overflow.

III.C.4. Dischargers shall conduct visual inspections at least once every 24-hour period during Qualifying Precipitation Events. Qualifying Precipitation Events are

7 This table is limited to routine weekly inspections and Qualifying Precipitation Event related inspections. Other visual inspections may be required under this Permit and are described in the applicable sections.

extended for each subsequent 24-hour period forecast to have at least 0.25 inches of precipitation.

III.C.5. Dischargers shall conduct post-Qualifying Precipitation Event visual inspections within 96 hours after each Qualifying Precipitation Event if 0.5 inches or more precipitation is measured during the duration of the Qualifying Precipitation Event using the onsite rain gauge. The inspection is to:

a. Identify if BMPs were adequately designed, implemented, and effective;

b. Identify BMPs that require repair or replacement due to damage; and

c. Identify additional BMPs that need to be implemented and revise the SWPPP accordingly.

III.C.6. Dischargers shall conduct visual inspections during scheduled site operating hours.

III.C.7. For each required inspection, dischargers shall develop and complete an inspection checklist that, at a minimum includes:

a. Inspection type (weekly, pre-precipitation, daily precipitation, or post-precipitation event);

b. Inspection date and time the inspection was conducted;

c. Weather information, including the presence or absence of precipitation, an estimate of the beginning of the Qualifying Precipitation Event, duration of the event, date of the end of the Qualifying Precipitation Event, and the amount of precipitation in inches;

d. Site information, including stage of construction, activities completed since last inspection, and approximate area of the site exposed;

e. A description of any BMPs evaluated and any deficiencies noted, including those that may have resulted in the release of non-visible pollutants;

f. A list of BMPs inspected, including erosion controls, sediment controls, chemical and waste controls, and non-stormwater controls;

g. Report of the presence of any floating and suspended materials, odors, discolorations, visible sheens, and any sources of pollutants in discharges and contained stormwater;

h. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates;

i. Photographs of areas of concern and the QSP's description of the problem, if any; and

j. Inspector's name, title, and certification, if any.

III.D. Water Quality Monitoring Requirements

Dischargers shall collect samples of discharges, based on their Risk Level in accordance with Table 3 and the requirements below, to monitor water quality and

assess compliance with the requirements of this General Permit. Samplers shall be the QSD, QSP, or be trained by the QSP.

Table 3 – Sample Collection Schedule

Risk Level	Stormwater Discharge Sample Collection (as applicable)	Receiving Water Sample Collection (as applicable)	Non-Visible Sample Collection (as applicable)
1	Not Applicable	Not Applicable	X
2	X	Not Applicable	X
3	X	X (Post-exceedance)	X

III.D.1. Risk Level 2 and 3 Stormwater Discharge Monitoring Requirements

III.D.1.a. Risk Level 2 and 3 dischargers shall collect stormwater grab samples, from all discharge locations incorporating runoff from project construction sites[8], during discharge and within site operating hours. The grab samples shall be representative of the discharge flow and characteristics.

III.D.1.b. Risk Level 2 and 3 dischargers shall obtain one sample from each discharge location per 24-hour period of each Qualifying Precipitation Event, during active discharge.

III.D.1.c. Risk Level 2 and 3 dischargers shall collect samples of stored or contained stormwater during discharge from the impoundment, in accordance with Attachment J.

III.D.1.d. Risk Level 2 and 3 dischargers shall analyze all samples for:

i. pH and turbidity (refer to Order, Section IV.C.3.c and d); and

ii. Any additional parameter required by the Regional Water Board.

III.D.1.e. Risk Level 2 and 3 dischargers may sample run-on from surrounding areas if there is reason to believe run-on may contribute to exceedance of numeric action levels and/or numeric effluent limitations.

III.D.2. Risk Level 3 Receiving Water Monitoring Requirements

III.D.2.a. Risk Level 3 dischargers who discharge directly into receiving waters are also required to monitor that receiving water if sampling results from the discharge monitoring location meets either of the following conditions:

i. pH value falls outside of the range of 6.0 and 9.0 pH units; or

ii. Turbidity exceeds 500 NTU.

8 The Glossary definition of ‘site’ applies here, i.e., *The area where the construction activity is physically located or conducted, including staging, storage, and access areas.*

III.D.2.b. Receiving water monitoring does not apply if run-on from a forest fire or any other natural disaster caused the stormwater results to fall outside the pH range or exceed the turbidity value.

III.D.2.c. Risk Level 3 dischargers required to conduct receiving water monitoring shall collect samples as follows:

i. Collect, at minimum, one upstream receiving water sample from an accessible and safe location that is:

1. Representative of the receiving water;
2. As close as possible to the discharge location; and
3. Upstream from the discharge location.

ii. Collect, at minimum, one downstream receiving water sample from an accessible and safe location that is:

1. Representative of the receiving water;
2. As close as possible to the discharge location; and
3. Downstream from the discharge location.

III.D.2.d. Risk Level 3 dischargers shall analyze the samples for the parameter that triggered this monitoring (either pH or turbidity, or both).

III.D.2.e. Risk Level 3 dischargers shall collect the samples once every 24-hour period of the Qualifying Precipitation Event.

III.D.2.f. Risk Level 3 dischargers shall specify the specific locations where samples were collected, date and time of sample collection, as well as constituents analyzed.

III.D.2.g. The Regional Water Board delegate may require, in writing, that the Risk Level 3 discharger continue to sample the receiving water for the parameter that required this monitoring (pH and/or turbidity) after the Qualifying Precipitation Event ends.

III.D.3. Non-Visible Pollutant Monitoring Requirements

III.D.3.a. Dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants when there is:

i. Evidence of pollutant releases that are not visually detectable in stormwater discharges; and

ii. Releases of substances which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

III.D.3.b. Dischargers are required to conduct sampling and analysis for non-visible pollutants identified in the SWPPP or otherwise known to be on site, only when the pollutants may be discharged due to failure to implement BMPs, a container spill or leak, or a BMP breach, failure, or malfunction.

III.D.3.c. Dischargers shall collect at least one sample, within 8 hours, from each discharge location hydraulically down-gradient from the observed triggering event or condition.

III.D.3.d. Dischargers shall continue to collect at least one sample per applicable discharge location for each 24-hour period that there is discharge, until the necessary corrective actions are completed to control further discharge of the pollutant.

III.D.3.e. Dischargers are not required to sample if one of the conditions described in Section III.D.3.b above (e.g., breach or spill) occurs and, prior to discharge, the material containing the pollutant is fully remediated or removed; and BMPs to control the pollutant are implemented, maintained, or replaced as necessary.

III.D.3.f. Dischargers shall analyze samples in the field or submit them to a laboratory as specified in Section III.F of this Attachment for analysis of all non-visible pollutants suspected to be present in the discharge, including applicable TMDL-specific pollutants listed in Table H-2 in Attachment H.

III.E. Sample Collection and Handling Instructions

III.E.1. Dischargers shall:

a. Identify applicable parameters that require laboratory analysis for each stormwater discharge location (pH and turbidity are typically analyzed with field meters).

b. Request the laboratory provide the appropriate number of sample containers, types of containers, sample container labels, blank Chain of Custody forms, and sample preservation instructions.

c. Use the appropriate sample shipping method to the laboratory. The laboratory should receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory to meet all method hold times). The options are to either deliver the samples to the laboratory, arrange to have the laboratory pick them up, or ship them overnight to the laboratory.

d. Use only the sample containers provided/specified by the laboratory to collect and store samples. Use of any other type of containers could cause sample contamination.

e. Prevent sample contamination by not touching or putting anything into the sample containers before collecting stormwater samples.

f. Not overfill sample containers. Overfilling can change the analytical results.

g. Secure each sample container cap without stripping the cap threads.

h. Label each sample container. The label shall identify the date and time of sample collection, the person taking the sample, and the sample collection location or discharge point. The label should also identify any sample containers that have been preserved.

i. Carefully pack the sample container into an ice chest or refrigerator to prevent breakage and maintain temperature during shipment; frozen ice packs or ice is placed into the shipping container to keep the sample close to 4° C (39° F) until arriving at the laboratory (do not freeze samples).

j. Complete a Chain of Custody form with each set of samples. The Chain of Custody form shall include the discharger's name, address, and phone number, identification of each sample container and sample collection point, person collecting the samples, the date and time each sample container was filled, the analysis that is required for each sample container, and both the signatures of the persons relinquishing and receiving the sample containers.

III.E.2. The Discharger shall designate and train personnel for the collection, maintenance, and shipment of samples in accordance with the above sample protocols and laboratory-specific practices.

III.E.3. Dischargers shall perform all sampling and preservation protocols in accordance with the 40 Code of Federal Regulations Part 136 and the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association).[9]

III.E.4. Dischargers may refer to the Surface Water Ambient Monitoring Program's (SWAMP) Quality Assurance Program Plan (QAPrP) for more information on sampling collection and analysis.[10]

III.F. Analytical Methods Requirements

III.F.1. Dischargers shall refer to Table 4 for applicable test methods, detection limits, and reporting units.

9 Unless other test procedures have been specified in this General Permit or by the Water Boards.

10 Additional information regarding the SWAMP QAPrP can be found at: <https://www.waterboards.ca.gov/water_issues/programs/swamp/quality_assurance.html#qaprp>. [as of October 20, 2020]

Table 4 - Test Methods, Detection Limits and Reporting Units

Parameter	Test Method	Discharger Type	Method Detection Limit	Reporting Units
pH	Field test with calibrated portable instrument using U.S. EPA approved procedures	Risk Level 2 and 3	0.2	pH units
Turbidity	U.S. EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2 and 3	1	NTU
Non-Visible Pollutant Parameter(s)	U.S. EPA-approved test method for the specific pollutant parameter	All Risk Levels	Dependent on the test method	Dependent on the test method

III.F.2. All monitoring instruments and equipment shall be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Additionally, records of calibration shall be retained for at least three years and made available upon request.

III.F.3. Risk Level 2 and 3 dischargers shall perform pH analysis on-site with a calibrated pH meter using a U.S. EPA acceptable test method.

III.F.4. Risk Level 2 and 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at a State Water Board Environmental Laboratory Accreditation Program (ELAP)-accredited laboratory. Acceptable test methods include Standard Method 2130 B or U.S. EPA Method 180.1.

III.F.5. All analyses of laboratory-analyzed parameters shall be sent to and conducted at a laboratory recognized by the State Water Board Environmental Laboratory Accreditation Program (ELAP), with the exception of field analysis conducted by the discharger for turbidity and pH.

III.F.6. All dischargers shall assign a value of zero (0) for all non-visible pollutant analytical results less than the minimum level (reporting limit), as reported by the laboratory, used in calculations required by this permit (e.g., numeric action level and numeric effluent limitation exceedance determinations), so long as a sufficiently sensitive test method was used as evidenced by the reported method detection limit and minimum level.

III.G. Exceedance Response Requirements[11]

III.G.1. Dischargers are subject to the applicable numeric action levels and/or numeric effluent limitations based on their Risk Level as shown in Table 5 below.

11 Terms including, but not limited to, numeric action level, numeric effluent limitation, and exceedances are defined in Attachment B of this General Permit.

Table 5 - Numeric Action Levels and Numeric Effluent Limitations

Parameter	Discharger Type	Numeric Action Level	Numeric Effluent Limitation
pH	Risk Level 2 and 3	Lower = 6.5 Upper = 8.5	Not Applicable
Turbidity	Risk Level 2 and 3	250 NTU	Not Applicable
TMDL-related Pollutant	Responsible Dischargers with a project of any Risk Level	Refer to Table H-2 in Attachment H	Refer to Table H-2 in Attachment H

III.G.2. For pH and turbidity, the discharger shall use the field meter readings obtained from each discharge location per day of discharge to determine if there has been an exceedance of the numeric action levels.

III.G.3. Whenever analytical results indicate that the discharge is below the lower pH value, above the upper pH value, exceeds the turbidity value, or exceeds an applicable TMDL-related numeric action level or numeric effluent limitation, dischargers shall determine the source(s) of the pollutant and immediately implement corrective actions to:

a. Meet Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology requirements in 40 Code of Federal Regulations §§ 450.21 through 450.23[12]; and

b. Reduce or prevent pollutants in stormwater and authorized non-stormwater discharges from causing further exceedances.

III.G.4. Dischargers shall iterate corrective actions until the discharge is in compliance with the applicable numeric action level(s).

III.G.5. The source evaluation shall be kept with the SWPPP and specifically address what corrective actions were taken or will be taken and provide a schedule for their completion.

IV. REPORTING REQUIREMENTS

IV.A. Visual Inspections

Dischargers shall keep all completed inspection checklists and related documentation with the SWPPP on-site or electronically.

12 United States Environmental Protection Agency, Construction and Development Effluent Limitation Guidelines §§ 450.21 through 450.23, <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-N/part-450/subpart-B?toc=1> [as of June 28, 2022].

IV.B. Water Quality Monitoring

IV.B.1. Risk Level 2 and 3 Stormwater Discharge Monitoring Reporting

IV.B.1.a. Risk Level 2 and 3 dischargers shall electronically submit through SMARTS all field sampling results within 30 days of the completion of the precipitation event or within 10 days if the field sampling results demonstrate the exceedance of the pH, and/or turbidity numeric action levels.

IV.B.1.b. Risk Level 2 and 3 dischargers that exceeded the pH and/or turbidity numeric action levels shall prepare a Numeric Action Level Exceedance Report when requested, in writing, from a Regional Water Board delegate and shall submit and certify each Numeric Action Level Exceedance Report through SMARTS within 30 days of receiving the written request, in accordance with Section IV of this General Permit's Order.

IV.B.1.c. The Numeric Action Level Exceedance Report shall include:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) for each parameter;

ii. The date, place, time of sampling, visual inspections, and/or measurements, including precipitation; and

iii. An assessment of the existing BMPs associated with the sample that exceeded the numeric action level, a description of each corrective action taken including photographs, and date of implementation.

IV.B.1.d. Risk Level 2 and 3 dischargers that prepared a Numeric Action Level Exceedance Report shall retain a copy of the report for a minimum of three years after the date the exceedance report is certified and submitted.

IV.B.2. Risk Level 3 Receiving Water Monitoring Reporting

IV.B.2.a. Risk Level 3 dischargers shall electronically submit all receiving water sample results through SMARTS within 10 days of a precipitation event.

IV.B.3. Non-Visible Pollutant Monitoring Reporting

IV.B.3.a. All dischargers that conducted non-visible pollutant monitoring shall electronically submit through SMARTS all field and/or analytical sampling results within 30 days after obtaining the analytical result or within 10 days after if the analytical results demonstrate the exceedance of an applicable TMDL-related numeric action level or numeric effluent limitation or Basin Plan parameter.

IV.B.3.b. All dischargers that exceeded an applicable TMDL-related numeric action level shall prepare a Numeric Action Level Exceedance Report when requested, in writing, from a Regional Water Board delegate and shall submit and certify each Numeric Action Level Exceedance Report through SMARTS within 30 days of receiving the written request, in accordance with Section IV of this General Permit's Order.

IV.B.3.c. The Numeric Action Level Exceedance Report shall include:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) for each parameter;

ii. The date, place, time of sampling, visual inspections, and/or measurements, including precipitation; and

iii. An assessment of the existing BMPs associated with the sample that exceeded the numeric action level, a description of each corrective action taken including photographs, and date of implementation.

IV.B.3.d. All dischargers that prepared a Numeric Action Level Exceedance Report shall retain a copy of the report for a minimum of three years after the date the exceedance report is certified and submitted.

IV.B.3.e. All dischargers that exceed an applicable TMDL-related numeric effluent limitation shall comply with the water quality-based corrective action requirements in Section VI.Q of the Order.

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