

**SPECIFICATIONS AND CONTRACT DOCUMENTS**

**FOR**

**Pickleweed Park Enhancement Project**

**May 2024**

**BID OPENING: June 21, 2024**

**CITY PROJECT # 11376**

**CITY FILE # 06.07.11**





# DEPARTMENT OF PUBLIC WORKS

## Pickleweed Park Enhancement Project City Project No. 11376

ACCEPTED BY CITY OF SAN RAFAEL:

*Joanna Kwok*

Joanna Kwok  
Assistant Public Works Director/City Engineer

06/07/2024

Date



# DEPARTMENT OF PUBLIC WORKS

May 2024

## INVITATION FOR BIDS

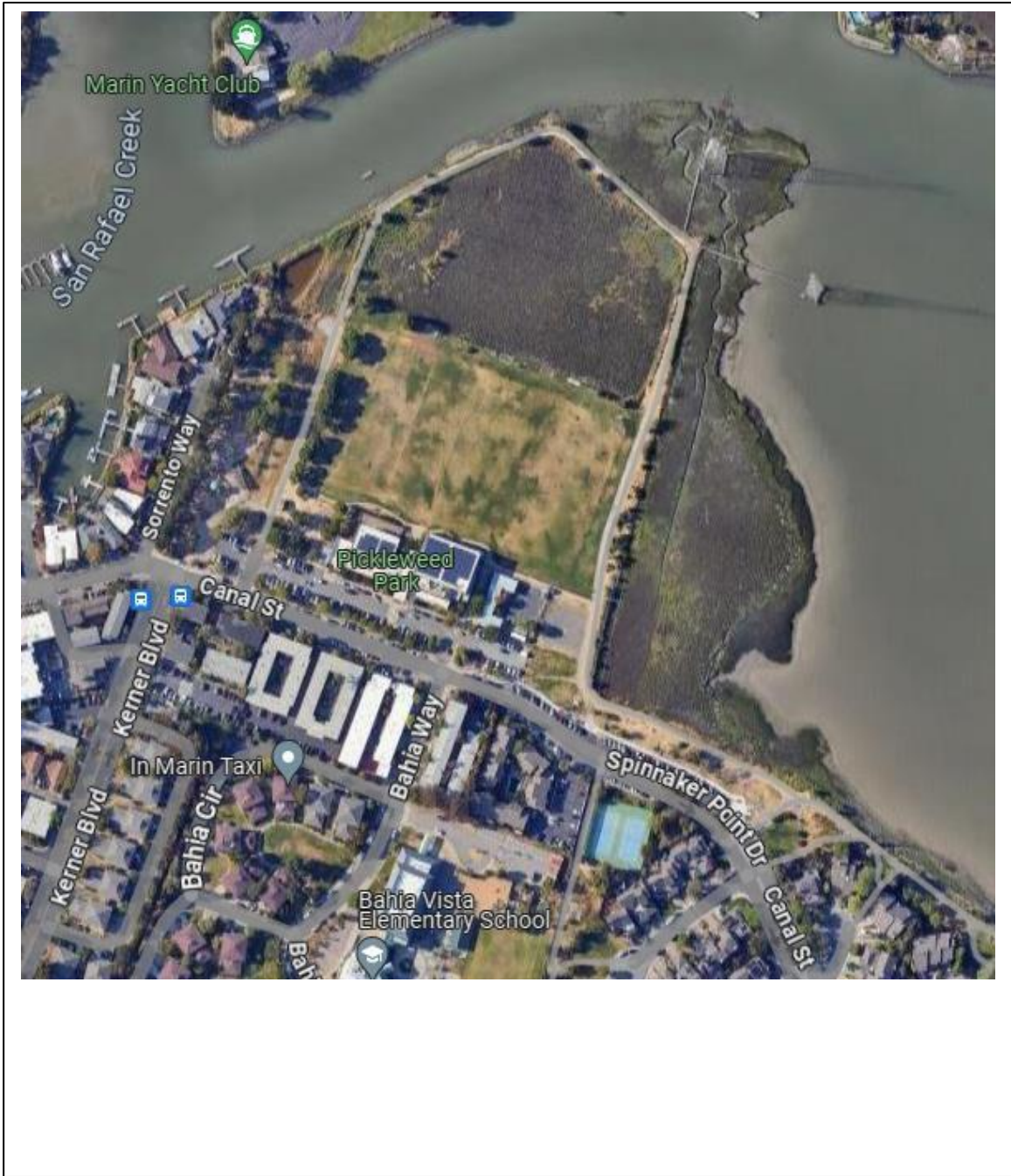
Electronic bids for the Construction of the Project Entitled:

### **Pickleweed Park Enhancement Project**

**City Project No. 11376**

Electronic bids must be received by June 21, 2024 at 1:00PM at:

<https://www.bidexpress.com/businesses/39341/home>



LOCATION MAP

City of San Rafael

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## Notice Inviting Bids

- 1. Bid Submission.** The City of San Rafael ("City") will accept electronic bid submittals for its Pickleweed Park Enhancement Project ("Project"), by or before **June 21, 2024, at 1:00PM** at which time the bids will be publicly opened and read aloud on a Teams meeting (see below). Information including the project documents and a how-to guide for first-time Bid Express users can be found on the San Rafael Bid Express home page at <https://www.bidexpress.com/businesses/39341/home>. Please note that you will have to register for a free Bid Express account to view project solicitations and download documents.

## Microsoft Teams [Need help?](#)

### [Join the meeting now](#)

Meeting ID: 226 126 408 854

Passcode: AX2q5f

### Dial in by phone

[+1 209-215-5196,,888318472#](tel:+12092155196888318472) United States, Stockton

[Find a local number](#)

Phone conference ID: 888 318 472#

## 2. Project Information.

- 2.1 Location and Description.** The Project is located at the Pickleweed Park at 50 Canal St. within the City of San Rafael and is described as follows:  
The project will install park enhancements to the soccer fields, public park, and surrounding community center. The project proposes to add several park amenities, including a synthetic turf field, basketball/sport court, playground structure for children under five, fitness equipment for adults, shaded seating, and a gazebo.
- 2.2 Time for Final Completion.** The Project must be fully completed within 210 working days from the start date set forth in the Notice to Proceed. City anticipates that the Work will begin on or about September 3, 2024, but the anticipated start date is provided solely for convenience and is neither certain nor binding.

## 3. License and Registration Requirements.

- 3.1 License.** This Project requires a valid California contractor's license for the following classification(s): (A) General Engineering Contractor & (B) General Building Contractor
- 3.2 DIR Registration.** City may not accept a Bid Proposal from or enter into the Contract with a bidder, without proof that the bidder is registered with the California Department of Industrial Relations ("DIR") to perform public work pursuant to Labor Code § 1725.5, subject to limited legal exceptions.

- 4. Contract Documents.** The plans, specifications, bid forms, and contract documents for the Project, and any addenda thereto ("Contract Documents") can be found on the Bid Express San Rafael home page at <https://www.bidexpress.com/businesses/39341/home> under the project solicitation's Attachment List. A how-to guide for first time Bid Express users can also be found on the home page. Please note that you will have to register for a



free Bid Express account to view project solicitations and download documents. Copies of the Contract Documents are not available from the City.

5. **Bid Security.** The Bid Proposal must be accompanied by bid security of ten percent of the maximum bid amount, in the form of a cashier's or certified check made payable to City, or a bid bond executed by a surety licensed to do business in the State of California on the Bid Bond form included with the Contract Documents. The bid security must guarantee that within ten days after City issues the Notice of Potential Award, the successful bidder will execute the Contract and submit the payment and performance bonds, insurance certificates and endorsements, and any other submittals required by the Contract Documents and as specified in the Notice of Potential Award.
6. **Prevailing Wage Requirements.**
  - 6.1 **General.** Pursuant to California Labor Code § 1720 et seq., this Project is subject to the prevailing wage requirements applicable to the locality in which the Work is to be performed for each craft, classification or type of worker needed to perform the Work, including employer payments for health and welfare, pension, vacation, apprenticeship and similar purposes.
  - 6.2 **Rates.** The prevailing rates are on file with the City and are available online at <http://www.dir.ca.gov/DLSR>. Each Contractor and Subcontractor must pay no less than the specified rates to all workers employed to work on the Project. The schedule of per diem wages is based upon a working day of eight hours. The rate for holiday and overtime work must be at least time and one-half.
  - 6.3 **Compliance.** The Contract will be subject to compliance monitoring and enforcement by the DIR, under Labor Code § 1771.4.
7. **Performance and Payment Bonds.** The successful bidder will be required to provide performance and payment bonds, each for 100% of the Contract Price, as further specified in the Contract Documents.
8. **Substitution of Securities.** Substitution of appropriate securities in lieu of retention amounts from progress payments is permitted under Public Contract Code § 22300.
9. **Subcontractor List.** Each Subcontractor must be registered with the DIR to perform work on public projects. Each bidder must submit a completed Subcontractor List form with its Bid Proposal, including the name, location of the place of business, California contractor license number, DIR registration number, and percentage of the Work to be performed (based on the base bid price) for each Subcontractor that will perform Work or service or fabricate or install Work for the prime contractor in excess of one-half of 1% of the bid price, using the Subcontractor List form included with the Contract Documents.
10. **Instructions to Bidders.** All bidders should carefully review the Instructions to Bidders for more detailed information before submitting a Bid Proposal. The definitions provided in Article 1 of the General Conditions apply to all of the Contract Documents, as defined therein, including this Notice Inviting Bids.
11. **Estimated Cost.** The estimated construction cost without alternatives is \$7.7 million. The estimated construction cost with alternatives is \$8.4 million.

By: 

Theo Sanchez, Associate Civil Engineer

Publication Date: May 24, 2024

END OF NOTICE INVITING BIDS

## Instructions to Bidders

Each Bid Proposal submitted to the City of San Rafael ("City") for its Pickleweed Park Enhancement Project ("Project") must be submitted in accordance with the following instructions and requirements:

### 1. Bid Submission.

- 1.1 General.** Each Bid Proposal must be signed and submitted to City, using BidExpress, by or before the date and time set forth in Section 1 of the Notice Inviting Bids, or as amended by subsequent addendum. Late submissions will be returned unopened. City reserves the right to postpone the date or time for receiving or opening bids. Each bidder is solely responsible for all of its costs to prepare and submit its bid and by submitting a bid waives any right to recover those costs from City. The bid price(s) must include all costs to perform the Work as specified, including all labor, material, supplies, and equipment and all other direct or indirect costs such as applicable taxes, insurance and overhead.

**All bids must be submitted electronically using the BidExpress platform. This supersedes any language in the contract documents that may be interpreted as the City requiring paper bid submittals.**

- 1.2 Electronic Submission using Bid Express.** The Bid Express San Rafael home page can be found at <https://www.bidexpress.com/businesses/39341/home>. Project solicitations and a how-to guide for first-time users can be found on this home page. Please note that you will have to register for a free Bid Express account to view project solicitations and download documents.
- 1.3 DIR Registration.** Subject to limited legal exceptions for joint venture bids and federally-funded projects, City may not accept a Bid Proposal from a bidder without proof that the bidder is registered with the DIR to perform public work under Labor Code § 1725.5. If City is unable to confirm that the bidder is currently registered with the DIR, City may disqualify the bidder and return its bid unopened. (Labor Code §§ 1725.5 and 1771.1(a).)

- 2. Bid Proposal Form and Enclosures.** Each Bid Proposal must be completed using the Bid Proposal form included within the BidExpress solicitation for this project. Each Bid Proposal must be accompanied by bid security, as set forth in Section 4 below, and by a completed Subcontractor List and Non-Collusion Declaration using the forms included with the Contract Documents.
- 3. Authorization and Execution.** Each Bid Proposal must be signed by the bidder's authorized representative. A Bid Proposal submitted by a partnership must be signed in the partnership name by a general partner with authority to bind the partnership. A Bid Proposal submitted by a corporation must be signed with the legal name of the corporation, followed by the signature and title of two officers of the corporation with full authority to bind the corporation to the terms of the Bid Proposal, under California Corporations Code § 313.
- 4. Bid Security.** Each Bid Proposal must be accompanied by bid security of ten percent of the maximum bid amount, in the form of a cashier's check or certified check, made payable to the City, or bid bond using the form included in the Contract Documents and executed by a surety licensed to do business in the State of California. The bid security must guarantee that, within ten days after issuance of the Notice of Potential Award, the bidder will: execute and submit the enclosed Contract for the bid price; submit payment and performance

bonds for 100% of the maximum Contract Price; and submit the insurance certificates and endorsements and any other submittals, if any, required by the Contract Documents or the Notice of Potential Award. A Bid Proposal may not be withdrawn for a period of 60 days after the bid opening without forfeiture of the bid security, except as authorized for material error under Public Contract Code § 5100 et seq.

A scanned copy or electronic copy of the bond forms should be uploaded to the BidExpress website. Only the apparent low bidder will be required to mail the original forms to the Public Works Department.

5. **Requests for Information.** Questions or requests for clarifications regarding the Project, the bid procedures, or any of the Contract Documents must be submitted using the BidExpress platform. Oral responses are not authorized and are not binding on the City. Bidders should submit any such written inquiries at least five Working Days before the scheduled bid opening. Questions received any later might not be addressed before the bid deadline. An interpretation or clarification by City in response to a written inquiry will be issued in an addendum.
6. **Pre-Bid Investigation.**
  - 6.1 **General.** Each bidder is solely responsible at its sole expense for diligent and thorough review of the Contract Documents, examination of the Project site, and reasonable and prudent inquiry concerning known and potential site and area conditions prior to submitting a Bid Proposal. Each bidder is responsible for knowledge of conditions and requirements which reasonable review and investigation would have disclosed. However, except for any areas that are open to the public at large, bidders may not enter property owned or leased by the City or the Project site without prior written authorization from City.
  - 6.2 **Document Review.** Each bidder is responsible for review of the Contract Documents and any informational documents provided "For Reference Only," e.g., as-builts, technical reports, test data, and the like. A bidder is responsible for notifying City of any errors, omissions, inconsistencies, or conflicts it discovers in the Contract Documents, acting solely in its capacity as a contractor and subject to the limitations of Public Contract Code § 1104. Notification of any such errors, omissions, inconsistencies, or conflicts must be submitted in writing to the City no later than five Working Days before the scheduled bid opening. (See Section 5, above.) City expressly disclaims responsibility for assumptions a bidder might draw from the presence or absence of information provided by City.
  - 6.3 **Project Site.** Questions regarding the availability of soil test data, water table elevations, and the like should be submitted to the City in writing, as specified in Section 5, above. Any subsurface exploration at the Project site must be done at the bidder's expense, but only with prior written authorization from City. All soil data and analyses available for inspection or provided in the Contract Documents apply only to the test hole locations. Any water table elevation indicated by a soil test report existed on the date the test hole was drilled. The bidder is responsible for determining and allowing for any differing soil or water table conditions during construction. Because groundwater levels may fluctuate, difference(s) in elevation between ground water shown in soil boring logs and ground water actually encountered during Project construction will not be considered changed Project site conditions. Actual locations and depths must be determined by bidder's field investigation. The bidder may request access to underlying or background information on the Project site in City's possession that is necessary for the bidder

to form its own conclusions, including, if available, record drawings or other documents indicating the location of subsurface lines, utilities, or other structures.

- 6.4 Utility Company Standards.** The Project must be completed in a manner that satisfies the standards and requirements of any affected utility companies or agencies (collectively, “utility owners”). The successful bidder may be required by the third party utility owners to provide detailed plans prepared by a California registered civil engineer showing the necessary temporary support of the utilities during coordinated construction work. Bidders are directed to contact the affected third party utility owners about their requirements before submitting a Bid Proposal.
- 7. Bidders Interested in More Than One Bid.** No person, firm, or corporation may submit or be a party to more than one Bid Proposal unless alternate bids are specifically called for. However, a person, firm, or corporation that has submitted a subcontract proposal or quote to a bidder may submit subcontract proposals or quotes to other bidders.
- 8. Addenda.** Any addenda issued prior to the bid opening are part of the Contract Documents. Subject to the limitations of Public Contract Code § 4104.5, City reserves the right to issue addenda prior to bid time. Each bidder is solely responsible for ensuring it has received and reviewed all addenda prior to submitting its bid. Addenda will be located on the BidExpress website with the other contract documents for this solicitation.
- 9. Brand Designations and “Or Equal” Substitutions.** Any specification designating a material, product, thing, or service by specific brand or trade name, followed by the words “or equal,” is intended only to indicate quality and type of item desired, and bidders may request use of any equal material, product, thing, or service. All data substantiating the proposed substitute as an equal item must be submitted with the written request for substitution. A request for substitution must be submitted within 35 days after Notice of Potential Award unless otherwise provided in the Contract Documents. This provision does not apply to materials, products, things, or services that may lawfully be designated by a specific brand or trade name under Public Contract Code § 3400(c).
- 10. Bid Protest.** Any bid protest against another bidder must be submitted in writing and received by City at its Department of Public Works at 111 Morphew Street, San Rafael, California 94901, ATTN: Associate Civil Engineer, Theo Sanchez, or sent via email at Theo.Sanchez@cityofsanrafael.org before 5:00 p.m. no later than two Working Days following bid opening (“Bid Protest Deadline”) and must comply with the following requirements:
- 10.1 General.** Only a bidder who has actually submitted a Bid Proposal is eligible to submit a bid protest against another bidder. Subcontractors are not eligible to submit bid protests. A bidder may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest. If required by City, the protesting bidder must submit a non-refundable fee in the amount specified by City, based upon City’s reasonable costs to administer the bid protest. Any such fee must be submitted to City no later than the Bid Protest Deadline, unless otherwise specified. For purposes of this Section 10, a “Working Day” means a day that City is open for normal business, and excludes weekends and holidays observed by City. Pursuant to Public Contract Code § 4104, inadvertent omission of a Subcontractor’s DIR registration number on the Subcontractor List form is not grounds for a bid protest, provided it is corrected within 24 hours of the bid opening or as otherwise provided under Labor Code § 1771.1(b).
- 10.2 Protest Contents.** The bid protest must contain a complete statement of the basis for the protest and must include all supporting documentation. Material submitted

after the Bid Protest Deadline will not be considered. The protest must refer to the *specific* portion or portions of the Contract Documents upon which the protest is based. The protest must include the name, address, email address, and telephone number of the protesting bidder and any person submitting the protest on behalf of or as an authorized representative of the protesting bidder.

- 10.3 Copy to Protested Bidder.** Upon submission of its bid protest to City, the protesting bidder must also concurrently transmit the protest and all supporting documents to the protested bidder, and to any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest, by email or hand delivery to ensure delivery before the Bid Protest Deadline.
- 10.4 Response to Protest.** The protested bidder may submit a written response to the protest, provided the response is received by City before 5:00 p.m., within two Working Days after the Bid Protest Deadline or after actual receipt of the bid protest, whichever is sooner (the "Response Deadline"). The response must attach all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address, email address, and telephone number of the person responding on behalf of or representing the protested bidder if different from the protested bidder.
- 10.5 Copy to Protesting Bidder.** Upon submission of its response to the bid protest to the City, the protested bidder must also concurrently transmit by email or hand delivery, by or before the Response Deadline, a copy of its response and all supporting documents to the protesting bidder and to any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.
- 10.6 Exclusive Remedy.** The procedure and time limits set forth in this Section are mandatory and are the bidder's sole and exclusive remedy in the event of a bid protest. A bidder's failure to comply with these procedures will constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.
- 10.7 Right to Award.** City reserves the right, acting in its sole discretion, to reject any bid protest that it determines lacks merit, to award the Contract to the bidder it has determined to be the responsible bidder submitting the lowest responsive bid, and to issue a Notice to Proceed with the Work notwithstanding any pending or continuing challenge to its determination.
- 11. Reservation of Rights.** City reserves the unfettered right, acting in its sole discretion, to waive or to decline to waive any immaterial bid irregularities; to accept or reject any or all bids; to cancel or reschedule the bid; to postpone or abandon the Project entirely; or to perform all or part of the Work with its own forces. The Contract will be awarded, if at all, within 60 days after opening of bids or as otherwise specified in the Special Conditions, to the responsible bidder that submitted the lowest responsive bid. Any planned start date for the Project represents the City's expectations at the time the Notice Inviting Bids was first issued. City is not bound to issue a Notice to Proceed by or before such planned start date, and it reserves the right to issue the Notice to Proceed when the City determines, in its sole discretion, the appropriate time for commencing the Work. The City expressly disclaims responsibility for any assumptions a bidder might draw from the presence or absence of information provided by the City in any form. Each bidder is solely responsible for its costs to prepare and submit a bid, including site investigation costs.

12. **Bonds.** Within ten calendar days following City's issuance of the Notice of Potential Award to the apparent low bidder, the bidder must submit payment and performance bonds to City as specified in the Contract Documents using the bond forms included in the Contract Documents. All required bonds must be calculated on the maximum total Contract Price as awarded, including additive alternates, if applicable.
13. **License(s).** The successful bidder and its Subcontractor(s) must possess the California contractor's license(s) in the classification(s) required by law to perform the Work. The successful bidder must also obtain a City business license within 10 days following City's issuance of the Notice of Potential Award. Subcontractors must also obtain a City business license before performing any Work.
14. **Ineligible Subcontractor.** Any Subcontractor who is ineligible to perform work on a public works project under Labor Code §§ 1777.1 or 1777.7 is prohibited from performing work on the Project.
15. **Safety Orders.** If the Project includes construction of a pipeline, sewer, sewage disposal system, boring and jacking pits, or similar trenches or open excavations, which are five feet or deeper, each bid must include a bid item for adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life or limb, which comply with safety orders as required by Labor Code § 6707.

END OF INSTRUCTIONS TO BIDDERS

**Bid Proposal**

Pickleweed Park Enhancement Project

\_\_\_\_\_ (“Bidder”) hereby submits this Bid Proposal to the City of San Rafael (“City”) for the above-referenced project (“Project”) in response to the Notice Inviting Bids and in accordance with the Contract Documents referenced in the Notice.

1. **Base Bid.** Bidder proposes to perform and fully complete the Work for the Project as specified in the Contract Documents, within the time required for full completion of the Work, including all labor, materials, supplies, and equipment and all other direct or indirect costs including, but not limited to, taxes, insurance and all overhead for the following price (“Base Bid”):  
\$ \_\_\_\_\_.

2. **Addenda.** Bidder agrees that it has confirmed receipt of or access to, and reviewed, all addenda issued for this bid. Bidder waives any claims it might have against the City based on its failure to receive, access, or review any addenda for any reason. Bidder specifically acknowledges receipt of the following addenda:

Addendum:	Date Received:	Addendum:	Date Received:
#01	_____	#05	_____
#02	_____	#06	_____
#03	_____	#07	_____
#04	_____	#08	_____

3. **Bidder’s Certifications and Warranties.** By signing and submitting this Bid Proposal, Bidder certifies and warrants the following:

- 3.1 **Examination of Contract Documents.** Bidder has thoroughly examined the Contract Documents and represents that, to the best of Bidder’s knowledge, there are no errors, omissions, or discrepancies in the Contract Documents, subject to the limitations of Public Contract Code § 1104.
- 3.2 **Examination of Worksite.** Bidder has had the opportunity to examine the Worksite and local conditions at the Project location.
- 3.3 **Bidder Responsibility.** Bidder is a responsible bidder, with the necessary ability, capacity, experience, skill, qualifications, workforce, equipment, and resources to perform or cause the Work to be performed in accordance with the Contract Documents and within the Contract Time.
- 3.4 **Responsibility for Bid.** Bidder has carefully reviewed this Bid Proposal and is solely responsible for any errors or omissions contained in its completed bid. All statements and information provided in this Bid Proposal and enclosures are true and correct to the best of Bidder’s knowledge.
- 3.5 **Nondiscrimination.** In preparing this bid, the Bidder has not engaged in discrimination against any prospective or present employee or Subcontractor on grounds of race, color, ancestry, national origin, ethnicity, religion, sex, sexual orientation, age, disability, or marital status.
- 3.6 **Iran Contracting Act.** If the Contract Price exceeds \$1,000,000, Bidder is not identified on a list created under the Iran Contracting Act, Public Contract Code § 2200 et seq. (the “Act”),

as a person engaging in investment activities in Iran, as defined in the Act, or is otherwise expressly exempt under the Act.

4. **Award of Contract.** By signing and submitting this Bid Proposal, Bidder agrees that if Bidder is awarded the Contract for the Project, within ten days following issuance of the Notice of Potential Award to Bidder, Bidder will do all of the following:
- 4.1 **Execute Contract.** Enter into the Contract with City in accordance with the terms of this Bid Proposal, by signing and submitting to City the Contract prepared by City using the form included with the Contract Documents;
  - 4.2 **Submit Required Bonds.** Submit to City a payment bond and a performance bond, each for 100% of the Contract Price, using the bond forms provided and in accordance with the requirements of the Contract Documents; and
  - 4.3 **Insurance Requirements.** Submit to City the insurance certificate(s) and endorsement(s) as required by the Contract Documents.
5. **Bid Security.** As a guarantee that, if awarded the Contract, Bidder will perform its obligations under Section 4 above, Bidder is enclosing bid security in the amount of ten percent of its maximum bid amount in one of the following forms (check one):

\_\_\_\_\_ A cashier's check or certified check payable to City and issued by \_\_\_\_\_ [Bank name] in the amount of \$\_\_\_\_\_.

\_\_\_\_\_ A bid bond, using the Bid Bond form included with the Contract Documents, payable to City and executed by a surety licensed to do business in the State of California.

This Bid Proposal is hereby submitted on \_\_\_\_\_, 20\_\_.

s/ \_\_\_\_\_

\_\_\_\_\_  
Name and Title

s/ \_\_\_\_\_  
[See Section 3 of Instructions to Bidders]

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
License #, Expiration Date, and Classification

\_\_\_\_\_  
Address

\_\_\_\_\_  
DIR Registration #

\_\_\_\_\_  
City, State, Zip

\_\_\_\_\_  
Phone

\_\_\_\_\_  
Contact Name

\_\_\_\_\_  
Contact Email

END OF BID PROPOSAL



### Bid Schedule

This Bid Schedule must be completed electronically and included with the Electronic Bid Proposal. Pricing must be provided for each Bid Item as indicated. The lump sum or unit cost for each item must be inclusive of all costs, whether direct or indirect, including profit and overhead. The sum of all amounts entered in the "Extended Total Amount" column must be identical to the Base Bid price entered in Section 1 of the Bid Proposal form.

AL = Allowance      CF = Cubic Feet      CY = Cubic Yard      EA = Each      LB = Pounds  
 LF = Linear Foot      LS = Lump Sum      SF = Square Feet      TON = Ton (2000 lbs)

BID ITEM NO.	ITEM DESCRIPTION	EST. QTY.	UNIT	UNIT COST	EXTENDED TOTAL AMOUNT
1	Traffic Control	1	LS		
2	Erosion Control	1	LS		
3	SWPPP	1	LS		
4	Tree Protection and Removal	1	LS		
5	Clear & Grub	201,300	SF		
6	Remove & Dispose of Storm Drain Structures	20	EA		
7	Pipe Abandonment (6" SD)	35	LF		
8	Pipe Abandonment (8" SD)	1,530	LF		
9	Pipe Abandonment (10" SD)	85	LF		
10	Pipe Abandonment (12" SD)	590	LF		
11	Remove & Dispose of Asphalt Pavement	5,300	SF		
12	Remove & Dispose of Concrete Sidewalk	4,610	SF		
13	Remove & Dispose of Fence	760	LF		
14	Remove & Dispose of Baseball Backstops	1	LS		
15	Remove & Dispose of Existing Restroom	1	LS		
16	Earthwork and Excavation (Rough Grading)	3,500	CY		
17	15" Storm Drain Pipe	11	LF		
18	12" Storm Drain Pipe	850	LF		
19	8" Storm Drain Pipe	375	LF		
20	6" Storm Drain Pipe	185	LF		
21	4" Storm Drain Pipe	100	LF		
22	Perforated 4" Drainline	205	LF		
23	Perforated 6" Drainline	1,600	LF		

BID ITEM NO.	ITEM DESCRIPTION	EST. QTY.	UNIT	UNIT COST	EXTENDED TOTAL AMOUNT
24	Storm Drain Inlet	20	EA		
25	Storm Drain Clean-Out	13	EA		
26	Bioretention	220	CY		
27	Water Service Tie In	1	EA		
28	Sewer Service Tie In	1	EA		
29	4" Concrete Paving (Pedestrian)	9,090	SF		
30	Compacted Aggregate Base	785	CY		
31	Decomposed Granite	4,275	LF		
32	Redwood Header	295	LF		
33	Curb and Gutter	105	LF		
34	Flush Curb	2,200	LF		
35	Rolled Curb	30	LF		
36	Vertical Curb	75	LF		
37	Valley Curb	60	LF		
38	6" Mow band	125	LF		
39	Concrete Building Pads	3,210	SF		
40	Hot Mix Asphalt	375	TON		
41	Striping	400	LF		
42	6' HT Chain Link Single Gate	3	EA		
43	6' HT Chain Link Double Gate	7	EA		
44	6' HT x 12' W Chain Link Rolling Gate	1	EA		
45	6' HT x 20' W Chain Link Rolling Gate	1	EA		
46	8' HT Chain Link Single Gate	2	EA		
47	8' HT x 20' W Chain Link Rolling Gate	1	EA		
48	6' HT Chain Link Fencing (Field)	1,700	LF		
49	8' HT Chain Link Fencing (Basketball & Preschool)	500	LF		
50	Chain Link Backstop	2	EA		
51	Quick Coupler Valve & Gate Valve for Synthetic Turf	10	EA		
52	Irrigation Spray Heads	71	SF		
53	Irrigation Drip	7,672	EA		
54	Irrigation Tree Bubblers	34	EA		

BID ITEM NO.	ITEM DESCRIPTION	EST. QTY.	UNIT	UNIT COST	EXTENDED TOTAL AMOUNT
55	Remote Control Valves	10	EA		
56	Drip Irrigation Remote Control Valve Assembly	7	EA		
57	Irrigation Gate Valves	7	EA		
58	Quick Coupler Valves	7	EA		
59	Irrigation Main Line	2,424	LF		
60	Irrigation Lateral Pipe	1,832	LF		
61	Sleeves 4" & 6"	250	LF		
62	Irrigation Conduit	354	LF		
63	Automatic Control Wire	1	LS		
64	Irrigation Master Valve and Flow Sensor	1	EA		
65	Irrigation Controller	1	EA		
66	Backflow Enclosure & Freeze Cover	1	EA		
67	Gazebo	1	LS		
68	Adult Fitness Equipment	1	LS		
69	Restroom	1	LS		
70	Park Signage	1	LS		
71	Storage Container (16' x 12')	2	EA		
72	Bench	3	EA		
73	Drinking Fountain	2	EA		
74	Bike Racks	6	EA		
75	Trash & Recycle Receptables	9	EA		
76	Synthetic Sports Field Turf w/ Natural Infill and Shock Pad	159,100	SF		
77	Crushed Permeable Stone	4,400	TON		
78	Trex Header @ Synthetic Turf	1,615	LF		
79	Soccer Goal	4	EA		
80	Basketball Court Striping – CoolTop	1	LS		
81	Basketball Standards	2	EA		
82	Restroom Building Conduit and Wiring	400	LF		
83	Site Receptables Conduit and Wiring	400	LF		
84	Site Receptables	1	EA		
85	In-Grade Boxes	17	EA		

<b>BID ITEM NO.</b>	<b>ITEM DESCRIPTION</b>	<b>EST. QTY.</b>	<b>UNIT</b>	<b>UNIT COST</b>	<b>EXTENDED TOTAL AMOUNT</b>
86	Light Pole and Fixtures	6	EA		
87	Light Pole Conduit and Wiring	1,300	LF		
88	Misc Modifications and Programming for E LCPs	2	LS		
89	Misc Site Demo	1	LS		
90	24" Box Trees	15	EA		
91	Shrubs and Groundcovers (1 gal)	1,231	EA		
92	Hydroseed	21,470	SF		
93	Gopher Removal & Maintenance	1	LS		
94	Bark Mulch	300	CY		
95	Gravel Mulch	35	CY		
96	Linear Root Barrier	132	LF		
97	90 Day Plant Establishment Period	1	LS		
98	4" Concrete Paving (Pedestrian)	490	SF		
99	Flush Curb	140	LF		
100	Toddler Play Equipment	1	LS		
101	Wood Fibar	65	CY		
102	Bench	1	EA		
103	Trash & Recycle Receptables	1	EA		
104	Sod Lawn	2,540	SF		
105	8" Storm Drain Pipe	70	LF		
106	Perforated 4" Dripline	90	LF		
107	Storm Drain Inlet	1	EA		
108	Storm Drain Clean-Out	2	EA		
109	Irrigation Spray Heads	44	EA		
110	Remote Control Valves	3	EA		
111	Irrigation Lateral Pipe	460	LF		
112	Quick Coupler Valves	1	EA		
113	Low Voltage Wire	1	LS		
114	Irrigation Conduit	90	LF		
115	Sleeves 4" & 6"	10	LF		
116	Site Receptable Conduit and Wiring	800	LF		

BID ITEM NO.	ITEM DESCRIPTION	EST. QTY.	UNIT	UNIT COST	EXTENDED TOTAL AMOUNT
117	Site Receptables	2	EA		
118	Clear & Grub	19,000	SF		
119	Remove & Dispose of Concrete Sidewalk	305	SF		
120	Earthwork and Excavation (Rough Grading)	270	CY		
121	4" Concrete Paving (Pedestrian)	645	SF		
122	Compacted Aggregate Base	30	CY		
123	Vertical Curb	25	LF		
124	Curb & Gutter	35	LF		
125	Hot Mix Asphalt	15	TON		
126	Irrigation Drip	5,016	SF		
127	Irrigation Tree Bubblers	20	EA		
128	Remote Control Valves	1	EA		
129	Drip Irrigation Remote Control Valve Assembly	3	EA		
130	Quick Coupler Valves	2	EA		
131	Irrigation Main line	210	LF		
132	Sleeves 4" & 6"	30	LF		
133	Low Voltage Wire	1	LS		
134	Removable Bollard	3	EA		
135	In-Grade Boxes	2	EA		
136	Light Poles and Fixtures	2	EA		
137	Light Pole Conduit and Wiring	700	LF		
138	Misc Site Demo	1	LS		
139	Site Receptables Conduit and Wiring	400	LF		
140	Camera Poles	1	EA		
141	Camera Conduit and Wiring	400	LF		
142	Shrubs and Groundcovers (1 gal)	315	EA		
143	Hydroseed	13,690	SF		
144	Gopher Removal and Maintenance	1	LS		
145	Bark Mulch	235	CY		
146	Linear Root Barrier	156	LF		

TOTAL BASE BID:      Items 1 through \_\_\_\_\_ inclusive: \$ \_\_\_\_\_

*Note: The amount entered as the "Total Base Bid" should be identical to the Base Bid amount entered in Section 1 of the Bid Proposal form.*

BIDDER NAME: \_\_\_\_\_

END OF BID SCHEDULE



**Noncollusion Declaration**

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:

I am the \_\_\_\_\_ [title] of \_\_\_\_\_  
[business name], the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid and will not pay, any person or entity for such purpose.

This declaration is intended to comply with California Public Contract Code § 7106 and Title 23 U.S.C § 112.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on \_\_\_\_\_ [date], at \_\_\_\_\_ [city], \_\_\_\_\_ [state].

s/ \_\_\_\_\_

\_\_\_\_\_  
Name [print]

END OF NONCOLLUSION DECLARATION



## Bid Bond

\_\_\_\_\_ (“Bidder”) has submitted a bid, dated June 21, 2024 (“Bid”), to City of San Rafael (“City”) for work on the Pickleweed Park Enhancement Project (“Project”). Under this duly executed bid bond (“Bid Bond”), Bidder as Principal and \_\_\_\_\_, its surety (“Surety”), are bound to City as obligee in the penal sum of ten percent of the maximum amount of the Bid (the “Bond Sum”). Bidder and Surety bind themselves and their respective heirs, executors, administrators, successors and assigns, jointly and severally, as follows:

1. **General.** If Bidder is awarded the Contract for the Project, Bidder will enter into the Contract with City in accordance with the terms of the Bid.
2. **Submittals.** Within ten days following issuance of the Notice of Potential Award to Bidder, Bidder must submit to City the following:
  - 2.1 **Contract.** The executed Contract, using the form provided by City in the Project contract documents (“Contract Documents”);
  - 2.2 **Payment Bond.** A payment bond for 100% of the maximum Contract Price, executed by a surety licensed to do business in the State of California using the Payment Bond form included with the Contract Documents;
  - 2.3 **Performance Bond.** A performance bond for 100% of the maximum Contract Price, executed by a surety licensed to do business in the State of California using the Performance Bond form included with the Contract Documents; and
  - 2.4 **Insurance.** The insurance certificate(s) and endorsement(s) required by the Contract Documents, and any other documents required by the Instructions to Bidders or Notice of Potential Award.
3. **Enforcement.** If Bidder fails to execute the Contract and to submit the bonds and insurance certificates as required by the Contract Documents, Surety guarantees that Bidder forfeits the Bond Sum to City. Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: Theo Sanchez, Associate Civil Engineer  
Address: 111 Morphew St.  
City/State/Zip: San Rafael, CA 94901  
Phone: 415.725.1003  
Email: [Theo.Sanchez@cityofsanrafael.org](mailto:Theo.Sanchez@cityofsanrafael.org)
4. **Duration and Waiver.** If Bidder fulfills its obligations under Section 2, above, then this obligation will be null and void; otherwise, it will remain in full force and effect for 60 days following the bid opening or until this Bid Bond is returned to Bidder, whichever occurs first. Surety waives the provisions of Civil Code §§ 2819 and 2845.

*[Signatures are on the following page.]*

This Bid Bond is entered into and effective on \_\_\_\_\_, 20\_\_\_\_\_.

**SURETY:**

\_\_\_\_\_  
Business Name

s/ \_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title

(Attach Acknowledgment with Notary Seal and Power of Attorney)

**BIDDER:**

\_\_\_\_\_  
Business Name

s/ \_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title

END OF BID BOND

**Bidder's Questionnaire**

**Pickleweed Park Enhancement Project**

Within 48 hours following a request by City, a bidder must submit to City a completed, signed Bidder's Questionnaire using this form and all required attachments, including clearly labeled additional sheets as needed. City may request the Questionnaire from one or more of the apparent low bidders following the bid opening, and may use the completed Questionnaire as part of its investigation to evaluate a bidder's qualifications for this Project. The Questionnaire must be filled out completely, accurately, and legibly. Any errors, omissions, or misrepresentations in completion of the Questionnaire may be grounds for rejection of the bid or termination of a Contract awarded pursuant to the bid.

**Part A: General Information**

Bidder Business Name: \_\_\_\_\_ ("Bidder")

Check One:     Corporation (State of incorporation: \_\_\_\_\_)  
                   Partnership  
                   Sole Proprietorship  
                   Joint Venture of: \_\_\_\_\_  
                   Other: \_\_\_\_\_

Main Office Address and Phone: \_\_\_\_\_  
\_\_\_\_\_

Local Office Address and Phone: \_\_\_\_\_  
\_\_\_\_\_

Website address: \_\_\_\_\_

Owner of Business: \_\_\_\_\_

Contact Name and Title: \_\_\_\_\_

Contact Phone and Email: \_\_\_\_\_

Bidder's California Contractor's License Number(s): \_\_\_\_\_

Bidder's DIR Registration Number: \_\_\_\_\_

**Part B: Bidder Experience**

1. How many years has Bidder been in business under its present business name? \_\_\_\_\_ years
2. Has Bidder completed projects similar in type and size to this Project as a general contractor?  
\_\_\_\_\_ Yes      \_\_\_\_\_ No
3. Has Bidder ever been disqualified from a bid on grounds that it is not responsible, or otherwise disqualified or disbarred from bidding under state or federal law?  
\_\_\_\_\_ Yes      \_\_\_\_\_ No

If yes, provide additional information on a separate sheet regarding the disqualification or disbarment, including the name and address of the agency or owner of the project, the type and size of the project, the reasons that Bidder was disqualified or disbarred, and the month and year in which the disqualification or disbarment occurred.

4. Has Bidder ever been terminated for cause, alleged default, or legal violation from a construction project, either as a general contractor or as a subcontractor?

\_\_\_\_\_ Yes      \_\_\_\_\_ No

If yes, provide additional information on a separate sheet regarding the termination, including the name and address of the agency or owner of the subject project, the type and size of the project, whether Bidder was under contract as a general contractor or a subcontractor, the reasons that Bidder was terminated, and the month and year in which the termination occurred.

5. Provide information about Bidder’s past projects performed as general contractor as follows:

- 5.1 Six most recently completed public works projects within the last three years;
- 5.2 Three largest completed projects within the last three years; and
- 5.3 Any project which is similar to this Project including scope and character of the work.

6. Use separate sheets to provide all of the following information for each project identified in response to the above three categories:

- 6.1 Project name, location, and description;
- 6.2 Owner (name, address, email, and phone number);
- 6.3 Prime contractor, if applicable (name, address, email, and phone number);
- 6.4 Architect or engineer (name, email, and phone number);
- 6.5 Project and/or construction manager (name, email, and phone number);
- 6.6 Scope of work performed (as general or as subcontractor);
- 6.7 Initial contract price and final contract price (including change orders);
- 6.8 Original scheduled completion date and actual date of completion;
- 6.9 Time extensions granted (number of days);
- 6.10 Number and amount of stop notices or mechanic’s liens filed;
- 6.11 Amount of any liquidated damages assessed against Bidder; and
- 6.12 Nature and resolution of any project-related claim, lawsuit, mediation, or arbitration involving Bidder.

**Part C: Safety**

1. Provide Bidder’s Experience Modification Rate (EMR) for the last three years:

Year	EMR

2. Complete the following, based on information provided in Bidder’s CalOSHA Form 300 or Form 300A, Annual Summary of Work-Related Illnesses and Injuries, from the most recent past calendar year:

- 2.1 Number of lost workday cases: \_\_\_\_\_
- 2.2 Number of medical treatment cases: \_\_\_\_\_
- 2.3 Number of deaths: \_\_\_\_\_

3. Has Bidder ever been cited, fined, or prosecuted by any local, state, or federal agency, including OSHA, CalOSHA, or EPA, for violation of any law, regulation, or requirements pertaining to health and safety?

\_\_\_\_\_ Yes \_\_\_\_\_ No

If yes, provide additional information on a separate sheet regarding each such citation, fine, or prosecution, including the name and address of the agency or owner of the project, the type and size of the project, the reasons for and nature of the citation, fine, or prosecution, and the month and year in which the incident giving rise to the citation, fine, or prosecution occurred.

4. Name, title, and email for person responsible for Bidder's safety program:

\_\_\_\_\_  
Name Title Email

**Part D: Verification**

In signing this document, I, the undersigned, declare that I am duly authorized to sign and submit this Bidder's Questionnaire on behalf of the named Bidder, and that all responses and information set forth in this Bidder's Questionnaire and accompanying attachments are, to the best of my knowledge, true, accurate and complete as of the date of submission. **I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.**

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

By: \_\_\_\_\_  
Name and Title

END OF BIDDER'S QUESTIONNAIRE

## Contract

This public works contract ("Contract") is entered into by and between the City of San Rafael ("City") and \_\_\_\_\_ ("Contractor"), for work on the Pickleweed Park Enhancement Project ("Project").

The parties agree as follows:

1. **Award of Contract.** In response to the Notice Inviting Bids, Contractor has submitted a Bid Proposal to perform the Work to construct the Project. On \_\_\_\_\_, 2024, City authorized award of this Contract to Contractor for the amount set forth in Section 4, below.
2. **Contract Documents.** The Contract Documents incorporated into this Contract include and are comprised of all of the documents listed below. The definitions provided in Article 1 of the General Conditions apply to all of the Contract Documents, including this Contract.

- 2.1 Notice Inviting Bids;
- 2.2 Instructions to Bidders;
- 2.3 Addenda, if any;
- 2.4 Bid Proposal and attachments thereto;
- 2.5 Contract;
- 2.6 Payment and Performance Bonds;
- 2.7 General Conditions;
- 2.8 Special Conditions;
- 2.9 Project Plans and Specifications;
- 2.10 Change Orders, if any;
- 2.11 Notice of Potential Award;
- 2.12 Notice to Proceed; and
- 2.13 The following:

\_\_\_\_\_. <List additional documents here, if any, including the formal title and document date. If there are no additional documents, write "No other documents" in the space above.>

3. **Contractor's Obligations.** Contractor will perform all of the Work required for the Project, as specified in the Contract Documents. Contractor must provide, furnish, and supply all things necessary and incidental for the timely performance and completion of the Work, including all necessary labor, materials, supplies, tools, equipment, transportation, onsite facilities, and utilities, unless otherwise specified in the Contract Documents. Contractor must use its best efforts to diligently prosecute and complete the Work in a professional and expeditious manner and to meet or exceed the performance standards required by the Contract Documents.
4. **Payment.** As full and complete compensation for Contractor's timely performance and completion of the Work in strict accordance with the terms and conditions of the Contract Documents, City will pay Contractor \$\_\_\_\_\_ ("Contract Price") for all of Contractor's direct and indirect costs to perform the Work, including all labor, materials, supplies, equipment, taxes, insurance, bonds and all overhead costs, in accordance with the payment provisions in the General Conditions.
5. **Time for Completion.** Contractor will fully complete the Work for the Project, meeting all requirements for Final Completion, within 210 working days from the commencement date given in the Notice to Proceed ("Contract Time"). By signing below, Contractor expressly waives any claim for delayed early completion.

6. **Liquidated Damages.** As further specified in Section 5.4 of the General Conditions, if Contractor fails to complete the Work within the Contract Time, City will assess liquidated damages in the amount of \$7,000 per day for each day of unexcused delay in achieving Final Completion, and such liquidated damages may be deducted from City's payments due or to become due to Contractor under this Contract.
7. **Labor Code Compliance.**
  - 7.1 **General.** This Contract is subject to all applicable requirements of Chapter 1 of Part 7 of Division 2 of the Labor Code, including requirements pertaining to wages, working hours and workers' compensation insurance, as further specified in Article 9 of the General Conditions.
  - 7.2 **Prevailing Wages.** This Project is subject to the prevailing wage requirements applicable to the locality in which the Work is to be performed for each craft, classification or type of worker needed to perform the Work, including employer payments for health and welfare, pension, vacation, apprenticeship and similar purposes. Copies of these prevailing rates are available online at <http://www.dir.ca.gov/DLSR>.
  - 7.3 **DIR Registration.** City may not enter into the Contract with a bidder without proof that the bidder and its Subcontractors are registered with the California Department of Industrial Relations to perform public work pursuant to Labor Code § 1725.5, subject to limited legal exceptions.
8. **Workers' Compensation Certification.** Pursuant to Labor Code § 1861, by signing this Contract, Contractor certifies as follows: "I am aware of the provisions of Labor Code § 3700 which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work on this Contract."
9. **Conflicts of Interest.** Contractor, its employees, Subcontractors and agents, may not have, maintain or acquire a conflict of interest in relation to this Contract in violation of any City ordinance or requirement, or in violation of any California law, including Government Code § 1090 et seq., or the Political Reform Act, as set forth in Government Code § 81000 et seq. and its accompanying regulations. Any violation of this Section constitutes a material breach of the Contract.
10. **Independent Contractor.** Contractor is an independent contractor under this Contract and will have control of the Work and the means and methods by which it is performed. Contractor and its Subcontractors are not employees of City and are not entitled to participate in any health, retirement, or any other employee benefits from City.
11. **Notice.** Any notice, billing, or payment required by or pursuant to the Contract Documents must be made in writing, signed, dated and sent to the other party by personal delivery, U.S. Mail, a reliable overnight delivery service, or by email as a PDF file. Notice is deemed effective upon delivery, except that service by U.S. Mail is deemed effective on the second working day after deposit for delivery. Notice for each party must be given as follows:

**City:**

Department of Public Works  
111 Morpew St.  
San Rafael, CA 94901

Attn: Theo Sanchez, Associate Civil Engineer  
Theo.Sanchez@cityofsanrafael.org

**Contractor:**

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_  
Attn: \_\_\_\_\_  
Email: \_\_\_\_\_  
Copy to: \_\_\_\_\_

**12. General Provisions.**

**12.1 Assignment and Successors.** Contractor may not assign its rights or obligations under this Contract, in part or in whole, without City’s written consent. This Contract is binding on Contractor’s and City’s lawful heirs, successors and permitted assigns.

**12.2 Third Party Beneficiaries.** There are no intended third party beneficiaries to this Contract.

**12.3 Governing Law and Venue.** This Contract will be governed by California law and venue will be in the Marin County Superior Court, and no other place. Contractor waives any right it may have pursuant to Code of Civil Procedure § 394, to file a motion to transfer any action arising from or relating to this Contract to a venue outside of Marin County, California.

**12.4 Amendment.** No amendment or modification of this Contract will be binding unless it is in a writing duly authorized and signed by the parties to this Contract.

**12.5 Integration.** This Contract and the Contract Documents incorporated herein, including authorized amendments or Change Orders thereto, constitute the final, complete, and exclusive terms of the agreement between City and Contractor.

**12.6 Severability.** If any provision of the Contract Documents is determined to be illegal, invalid, or unenforceable, in whole or in part, the remaining provisions of the Contract Documents will remain in full force and effect.

**12.7 Iran Contracting Act.** If the Contract Price exceeds \$1,000,000, Contractor certifies, by signing below, that it is not identified on a list created under the Iran Contracting Act, Public Contract Code § 2200 et seq. (the “Act”), as a person engaging in investment activities in Iran, as defined in the Act, or is otherwise expressly exempt under the Act.

**12.8 Authorization.** Each individual signing below warrants that he or she is authorized to do so by the party that he or she represents, and that this Contract is legally



binding on that party. If Contractor is a corporation, signatures from two officers of the corporation are required pursuant to California Corporation Code § 313.

The parties agree to this Contract as witnessed by the signatures below:

**CITY:**

Approved as to form:

s/ \_\_\_\_\_  
CRISTINE ALLILOVICH, City Manager

s/ \_\_\_\_\_  
ROBERT F. EPSTEIN, City Attorney

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Attest:

s/ \_\_\_\_\_  
LINDSAY LARA, City Clerk

Date: \_\_\_\_\_

**CONTRACTOR:** \_\_\_\_\_  
Business Name

s/ \_\_\_\_\_

Seal:

\_\_\_\_\_  
Name, Title

Date: \_\_\_\_\_

Second Signature (See Section 12.8):

s/ \_\_\_\_\_

\_\_\_\_\_  
Name, Title

Date: \_\_\_\_\_

\_\_\_\_\_  
Contractor's California License Number(s) and Expiration Date(s)

END OF CONTRACT

## Payment Bond

The City of San Rafael ("City") and \_\_\_\_\_ ("Contractor") have entered into a contract for work on the Pickleweed Park Enhancement Project ("Project"). The Contract is incorporated by reference into this Payment Bond ("Bond").

1. **General.** Under this Bond, Contractor as principal and \_\_\_\_\_, its surety ("Surety"), are bound to City as obligee in an amount not less than \$ \_\_\_\_\_, under California Civil Code § 9550 et seq., to ensure payment to authorized claimants. This Bond is binding on the respective successors, assigns, owners, heirs, or executors of Surety and Contractor.
2. **Surety's Obligation.** If Contractor or any of its Subcontractors fails to pay a person authorized in California Civil Code § 9100 to assert a claim against a payment bond, any amounts due under the Unemployment Insurance Code with respect to work or labor performed under the Contract, or any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of Contractor and its Subcontractors under California Unemployment Insurance Code § 13020 with respect to the work and labor, then Surety will pay the obligation.
3. **Beneficiaries.** This Bond inures to the benefit of any of the persons named in California Civil Code § 9100, so as to give a right of action to those persons or their assigns in any suit brought upon this Bond. Contractor must promptly provide a copy of this Bond upon request by any person with legal rights under this Bond.
4. **Duration.** If Contractor promptly makes payment of all sums for all labor, materials, and equipment furnished for use in the performance of the Work required by the Contract, in conformance with the time requirements set forth in the Contract and as required by California law, Surety's obligations under this Bond will be null and void. Otherwise, Surety's obligations will remain in full force and effect.
5. **Waivers.** Surety waives any requirement to be notified of alterations to the Contract or extensions of time for performance of the Work under the Contract. Surety waives the provisions of Civil Code §§ 2819 and 2845. City waives the requirement of a new bond for any supplemental contract under Civil Code § 9550. Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:  
  
Attn: Theo Sanchez, Associate Civil Engineer  
Address: 111 Morphew St.  
City/State/Zip: San Rafael, CA 94901  
Phone: 415.725.1003  
Email: Theo.Sanchez@cityofsanrafael.org
6. **Law and Venue.** This Bond will be governed by California law, and venue for any dispute pursuant to this Bond will be in the Marin County Superior Court, and no other place. Surety will be responsible for City's attorneys' fees and costs in any action to enforce the provisions of this Bond.

*[Signatures are on the following page.]*

7. **Effective Date; Execution.** This Bond is entered into and is effective on \_\_\_\_\_, 2024.

**SURETY:**

\_\_\_\_\_  
Business Name

s/ \_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title

(Attach Acknowledgment with Notary Seal and Power of Attorney)

**CONTRACTOR:**

\_\_\_\_\_  
Business Name

s/ \_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title

**APPROVED BY CITY:**

s/ \_\_\_\_\_  
ROBERT F. EPSTEIN, City Attorney

\_\_\_\_\_  
Date

END OF PAYMENT BOND

## Performance Bond

The City of San Rafael ("City") and \_\_\_\_\_ ("Contractor") have entered into a contract for work on the Pickleweed Park Enhancement Project ("Project"). The Contract is incorporated by reference into this Performance Bond ("Bond").

1. **General.** Under this Bond, Contractor as principal and \_\_\_\_\_, its surety ("Surety"), are bound to City as obligee for an amount not less than \$\_\_\_\_\_ to ensure Contractor's faithful performance of its obligations under the Contract. This Bond is binding on the respective successors, assigns, owners, heirs, or executors of Surety and Contractor.
2. **Surety's Obligations.** Surety's obligations are co-extensive with Contractor's obligations under the Contract. If Contractor fully performs its obligations under the Contract, including its warranty obligations under the Contract, Surety's obligations under this Bond will become null and void. Otherwise, Surety's obligations will remain in full force and effect.
3. **Waiver.** Surety waives any requirement to be notified of and further consents to any alterations to the Contract made under the applicable provisions of the Contract Documents, including changes to the scope of Work or extensions of time for performance of Work under the Contract. Surety waives the provisions of Civil Code §§ 2819 and 2845.
4. **Application of Contract Balance.** Upon making a demand on this Bond for completion of the Work prior to acceptance of the Project, City will make the Contract Balance available to Surety for completion of the Work under the Contract. For purposes of this provision, the Contract Balance is defined as the total amount payable by City to Contractor as the Contract Price minus amounts already paid to Contractor, and minus any liquidated damages, credits, or backcharges to which City is entitled under the terms of the Contract.
5. **Contractor Default.** Upon written notification from City of Contractor's termination for default under Article 13 of the Contract General Conditions, time being of the essence, Surety must act within the time specified in Article 13 to remedy the default through one of the following courses of action:
  - 5.1 Arrange for completion of the Work under the Contract by Contractor, with City's consent, but only if Contractor is in default solely due to its financial inability to complete the Work;
  - 5.2 Arrange for completion of the Work under the Contract by a qualified contractor acceptable to City, and secured by performance and payment bonds issued by an admitted surety as required by the Contract Documents, at Surety's expense; or
  - 5.3 Waive its right to complete the Work under the Contract and reimburse City the amount of City's costs to have the remaining Work completed.
6. **Surety Default.** If Surety defaults on its obligations under the Bond, City will be entitled to recover all costs it incurs due to Surety's default, including legal, design professional, or delay costs.
7. **Notice.** Any notice to Surety may be given in the manner specified in the Contract and sent to Surety as follows:

Attn: Theo Sanchez, Associate Civil Engineer  
Address: 111 Morpew St.  
City/State/Zip: San Rafael, CA 94901  
Phone: 415.725.1003  
Email: [Theo.Sanchez@cityofsanrafael.org](mailto:Theo.Sanchez@cityofsanrafael.org)

8. **Law and Venue.** This Bond will be governed by California law, and venue for any dispute pursuant to this Bond will be in the Marin County Superior Court, and no other place. Surety will be responsible for City's attorneys' fees and costs in any action to enforce the provisions of this Bond.
9. **Effective Date; Execution.** This Bond is entered into and effective on \_\_\_\_\_, 2024.

**SURETY:**

\_\_\_\_\_  
Business Name

s/ \_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title

(Attach Acknowledgment with Notary Seal and Power of Attorney)

**CONTRACTOR:**

\_\_\_\_\_  
Business Name

s/ \_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title

**APPROVED BY CITY:**

s/ \_\_\_\_\_  
ROBERT F. EPSTEIN, City Attorney

\_\_\_\_\_  
Date

END OF PERFORMANCE BOND

## General Conditions

### Article 1 - Definitions

**Definitions.** The following definitions apply to all of the Contract Documents unless otherwise indicated, e.g., additional definitions that apply solely to the Specifications or other technical documents. Defined terms and titles of documents are capitalized in the Contract Documents, with the exception of the following (in any tense or form): “day,” “furnish,” “including,” “install,” “work day” or “working day.”

**Allowance** means a specific amount that must be included in the Bid Proposal for a specified purpose.

**Article**, as used in these General Conditions, means a numbered Article of the General Conditions, unless otherwise indicated by the context.

**Change Order** means a written document duly approved and executed by City, which changes the scope of Work, the Contract Price, or the Contract Time.

**City** means the municipality which has entered into the Contract with Contractor for performance of the Work, acting through its City Council, officers, employees, City Engineer, and any other authorized representatives.

**City Engineer** means the City Engineer for City and his or her authorized delegee(s).

**Claim** means a separate demand by Contractor for a change in the Contract Time or Contract Price, that has previously been submitted to City in accordance with the requirements of the Contract Documents, and which has been rejected by City, in whole or in part; or a written demand by Contractor objecting to the amount of Final Payment.

**Contract** means the signed agreement between City and Contractor for performing the Work required for the Project, and all documents expressly incorporated therein.

**Contract Documents** means, collectively, all of the documents listed as such in Section 2 of the Contract, including the Notice Inviting Bids; the Instructions to Bidders; addenda, if any; the Bid Proposal, and attachments thereto; the Contract; the Notice of Potential Award and Notice to Proceed; the payment and performance bonds; the General Conditions; the Special Conditions; the Project Plans and Specifications; any Change Orders; and any other documents which are clearly and unambiguously made part of the Contract Documents. The Contract Documents do not include documents provided “For Reference Only,” or documents that are intended solely to provide information regarding existing conditions.

**Contract Price** means the total compensation to be paid to Contractor for performance of the Work, as set forth in the Contract and as may be amended by Change Order or adjusted for an Allowance. The Contract Price is not subject to adjustment due to inflation or due to the increased cost of labor, material, supplies or equipment following submission of the Bid Proposal.

**Contract Time** means the time specified for complete performance of the Work, as set forth in the Contract and as may be amended by Change Order.

**Contractor** means the individual, partnership, corporation, or joint-venture that has signed the Contract with City to perform the Work.

**Day** means a calendar day unless otherwise specified.

**Design Professional** means the licensed individual(s) or firm(s) retained by City to provide architectural, engineering, or electrical engineering design services for the Project. If no Design Professional has been retained for this Project, any reference to Design Professional is deemed to refer to the Engineer.

**DIR** means the California Department of Industrial Relations.

**Drawings** has the same meaning as Plans.

**Engineer** means the City Engineer for the City of San Rafael and his or her authorized delegates.

**Excusable Delay** is defined in Section 5.3(B), Excusable Delay.

**Extra Work** means new or unforeseen work added to the Project, as determined by the Engineer in his or her sole discretion, including Work that was not part of or incidental to the scope of the Work when the Contractor's bid was submitted; Work that is substantially different from the Work as described in the Contract Documents at bid time; or Work that results from a substantially differing and unforeseeable condition.

**Final Completion** means Contractor has fully completed all of the Work required by the Contract Documents to the City's satisfaction, including all punch list items and any required commissioning or training, and has provided the City with all required submittals, including the instructions and manuals, product warranties, and as-built drawings.

**Final Payment** means payment to Contractor of the unpaid Contract Price, including release of undisputed retention, less amounts withheld or deducted pursuant to the Contract Documents.

**Furnish** means to purchase and deliver for the Project.

**Government Code Claim** means a claim submitted pursuant to California Government Code § 900 et seq.

**Hazardous Materials** means any substance or material identified now or in the future as hazardous under any Laws, or any other substance or material that may be considered hazardous or otherwise subject to Laws governing handling, disposal, or cleanup.

**Including**, whether or not capitalized, means "including, but not limited to," unless the context clearly requires otherwise.

**Inspector** means the individual(s) or firm(s) retained or employed by City to inspect the workmanship, materials, and manner of construction of the Project and its components to ensure compliance with the Contract Documents and all Laws.

**Install** means to fix in place for materials, and to fix in place and connect for equipment.

**Laws** means all applicable local, state, and federal laws, regulations, rules, codes, ordinances, permits, orders, and the like enacted or imposed by or under the auspices of any governmental entity with jurisdiction over any of the Work or any performance of the Work, including health and safety requirements.

**Non-Excusable Delay** is defined in Section 5.3(D), Non-Excusable Delay.

**Plans** means the City-provided plans, drawings, details, or graphical depictions of the Project requirements, but does not include Shop Drawings.

**Project** means the public works project referenced in the Contract.

**Project Manager** means the individual designated by City to oversee and manage the Project on City's behalf and may include his or her authorized delegee(s) when the Project Manager is unavailable. If no Project Manager has been designated for this Project, any reference to Project Manager is deemed to refer to the Engineer.

**Recoverable Costs** is defined in Section 5.3(F), Recoverable Costs.

**Request for Information** or **RFI** means Contractor's written request for information about the Contract Documents, the Work or the Project, submitted to City in the manner and format specified by City.

**Section**, when capitalized in these General Conditions, means a numbered section or subsection of the General Conditions, unless the context clearly indicates otherwise.

**Shop Drawings** means drawings, plan details or other graphical depictions prepared by or on behalf of Contractor, and subject to City acceptance, which are intended to provide details for fabrication, installation, and the like, of items required by or shown in the Plans or Specifications.

**Specialty Work** means Work that must be performed by a specialized Subcontractor with the specified license or other special certification, and that the Contractor is not qualified to self-perform.

**Specifications** means the technical, text specifications describing the Project requirements, which are prepared for and incorporated into the Contract by or on behalf of City, and does not include the Contract, General Conditions or Special Conditions.

**Subcontractor** means an individual, partnership, corporation, or joint-venture retained by Contractor directly or indirectly through a subcontract to perform a specific portion of the Work. The term Subcontractor applies to subcontractors of all tiers, unless otherwise indicated by the context. A third party such as a utility performing related work on the Project is not a Subcontractor, even if Contractor must coordinate its Work with the third party.

**Technical Specifications** has the same meaning as Specifications.

**Work** means all of the construction and services necessary for or incidental to completing the Project in conformance with the requirements of the Contract Documents.

**Work Day** or **Working Day**, whether or not capitalized, means a weekday when the City is open for business, and does not include holidays observed by the City.

**Worksite** means the place or places where the Work is performed, which includes, but may extend beyond the Project site, including separate locations for staging, storage, or fabrication.

## Article 2 - Roles and Responsibilities

### 2.1 City.

(A) **City Council.** The City Council has final authority in all matters affecting the Project, except to the extent it has delegated authority to the Engineer.

(B) **Engineer.** The Engineer, acting within the authority conferred by the City Council, is responsible for administration of the Project on behalf of City, including authority to provide directions to the Design Professional and to Contractor to ensure proper and timely completion of the Project. The Engineer's decisions are final and



conclusive within the scope of his or her authority, including interpretation of the Contract Documents.

(C) **Project Manager.** The Project Manager assigned to the Project will be the primary point of contact for the Contractor and will serve as City's representative for daily administration of the Project on behalf of City. Unless otherwise specified, all of Contractor's communications to City (in any form) will go to or through the Project Manager. City reserves the right to reassign the Project Manager role at any time or to delegate duties to additional City representatives, without prior notice to or consent of Contractor.

(D) **Design Professional.** The Design Professional is responsible for the overall design of the Project and, to the extent authorized by City, may act on City's behalf to ensure performance of the Work in compliance with the Plans and Specifications, including any design changes authorized by Change Order. The Design Professional's duties may include review of Contractor's submittals, visits to any Worksite, inspecting the Work, evaluating test and inspection results, and participation in Project-related meetings, including any pre-construction conference, weekly meetings, and coordination meetings. The Design Professional's interpretation of the Plans or Specifications is final and conclusive.

## 2.2 Contractor.

(A) **General.** Contractor must provide all labor, materials, supplies, equipment, services, and incidentals necessary to perform and timely complete the Work in strict accordance with the Contract Documents, and in an economical and efficient manner in the best interests of City, and with minimal inconvenience to the public.

(B) **Responsibility for the Work and Risk of Loss.** Contractor is responsible for supervising and directing all aspects of the Work to facilitate the efficient and timely completion of the Work. Contractor is solely responsible for and required to exercise full control over the Work, including the construction means, methods, techniques, sequences, procedures, safety precautions and programs, and coordination of all portions of the Work with that of all other contractors and Subcontractors, except to the extent that the Contract Documents provide other specific instructions. Contractor's responsibilities extend to any plan, method or sequence suggested, but not required by City or specified in the Contract Documents. From the date of commencement of the Work until either the date on which City formally accepts the Project or the effective date of termination of the Contract, whichever is later, Contractor bears all risks of injury or damage to the Work and the materials and equipment delivered to any Worksite, by any cause including fire, earthquake, wind, weather, vandalism or theft.

(C) **Project Administration.** Contractor must provide sufficient and competent administration, staff, and skilled workforce necessary to perform and timely complete the Work in accordance with the Contract Documents. Before starting the Work, Contractor must designate in writing and provide complete contact information, including telephone numbers and email address, for the officer or employee in Contractor's organization who is to serve as Contractor's primary representative for the Project, and who has authority to act on Contractor's behalf. A Subcontractor may not serve as Contractor's primary representative.

(D) **On-Site Superintendent.** Contractor must, at all times during performance of the Work, provide a qualified and competent full-time superintendent acceptable to City, and assistants as necessary, who must be physically present at the Project site while any aspect of the Work is being performed. The superintendent must have full authority to act and communicate on behalf of Contractor, and Contractor will be bound by the

superintendent's communications to City. City's approval of the superintendent is required before the Work commences. If City is not satisfied with the superintendent's performance, City may request a qualified replacement of the superintendent. Failure to comply may result in temporary suspension of the Work, at Contractor's sole expense and with no extension of Contract Time, until an approved superintendent is physically present to supervise the Work. Contractor must provide written notice to City, as soon as practicable, before replacing the superintendent.

(E) **Standards.** Contractor must, at all times, ensure that the Work is performed in an efficient, skillful manner following best practices and in full compliance with the Contract Documents and Laws and applicable manufacturer's recommendations. Contractor has a material and ongoing obligation to provide true and complete information, to the best of its knowledge, with respect to all records, documents, or communications pertaining to the Project, including oral or written reports, statements, certifications, Change Order requests, or Claims.

(F) **Meetings.** Contractor, its project manager, superintendent and any primary Subcontractors requested by City, must attend a pre-construction conference, if requested by City, as well as weekly Project progress meetings scheduled with City. If applicable, Contractor may also be required to participate in coordination meetings with other parties relating to other work being performed on or near the Project site or in relation to the Project, including work or activities performed by City, other contractors, or other utility owners.

(G) **Construction Records.** Contractor will maintain up-to-date, thorough, legible, and dated daily job reports, which document all significant activity on the Project for each day that Work is performed on the Project. The daily report for each day must include the number of workers at the Project site; primary Work activities; major deliveries; problems encountered, including injuries, if any; weather and site conditions; and delays, if any. Contractor will take date and time-stamped photographs to document general progress of the Project, including site conditions prior to construction activities, before and after photographs at offset trench laterals, existing improvements and utilities, damage and restoration. Contractor will maintain copies of all subcontracts, Project-related correspondence with Subcontractors, and records of meetings with Subcontractors. Upon request by the City, Contractor will permit review of and/or provide copies of any of these construction records.

(H) **Responsible Party.** Contractor is solely responsible to City for the acts or omissions of any Subcontractors, or any other party or parties performing portions of the Work or providing equipment, materials or services for or on behalf of Contractor or the Subcontractors. Upon City's written request, Contractor must promptly and permanently remove from the Project, at no cost to City, any employee or Subcontractor or employee of a Subcontractor who the Engineer has determined to be incompetent, intemperate or disorderly, or who has failed or refused to perform the Work as required under the Contract Documents.

(I) **Correction of Defects.** Contractor must promptly correct, at Contractor's sole expense, any Work that is determined by City to be deficient or defective in any way, including workmanship, materials, parts or equipment. Workmanship, materials, parts or equipment that do not conform to the requirements under the Plans, Specifications and every other Contract Document, as determined by City, will be considered defective and subject to rejection. Contractor must also promptly correct, at Contractor's sole expense, any Work performed beyond the lines and grades shown on the Plans or established by City, and any Extra Work performed without City's prior written approval. If Contractor fails to correct or to take reasonable steps toward correcting defective Work within five days following notice from City, or within the time specified in City's notice to correct, City

may elect to have the defective Work corrected by its own forces or by a third party, in which case the cost of correction will be deducted from the Contract Price. If City elects to correct defective Work due to Contractor's failure or refusal to do so, City or its agents will have the right to take possession of and use any equipment, supplies, or materials available at the Project site or any Worksite on City property, in order to effectuate the correction, at no extra cost to City. Contractor's warranty obligations under Section 11.2, Warranty, will not be waived nor limited by City's actions to correct defective Work under these circumstances. Alternatively, City may elect to retain defective Work, and deduct the difference in value, as determined by the Engineer, from payments otherwise due to Contractor. This paragraph applies to any defective Work performed by Contractor during the one-year warranty period under Section 11.2.

(J) **Contractor's Records.** Contractor must maintain all of its records relating to the Project in any form, including paper documents, photos, videos, electronic records, approved samples, and the construction records required pursuant to paragraph (G), above. Project records subject to this provision include complete Project cost records and records relating to preparation of Contractor's bid, including estimates, take-offs, and price quotes or bids.

(1) Contractor's cost records must include all supporting documentation, including original receipts, invoices, and payroll records, evidencing its direct costs to perform the Work, including, but not limited to, costs for labor, materials and equipment. Each cost record should include, at a minimum, a description of the expenditure with references to the applicable requirements of the Contract Documents, the amount actually paid, the date of payment, and whether the expenditure is part of the original Contract Price, related to an executed Change Order, or otherwise categorized by Contractor as Extra Work. Contractor's failure to comply with this provision as to any claimed cost operates as a waiver of any rights to recover the claimed cost.

(2) Contractor must continue to maintain its Project-related records in an organized manner for a period of five years after City's acceptance of the Project or following Contract termination, whichever occurs first. Subject to prior notice to Contractor, City is entitled to inspect or audit any of Contractor's records relating to the Project during Contractor's normal business hours. The record-keeping requirements set forth in this subsection 2.2(J) will survive expiration or termination of the Contract.

(K) **Copies of Project Documents.** Contractor and its Subcontractors must keep copies, at the Project site, of all Work-related documents, including the Contract, permit(s), Plans, Specifications, Addenda, Contract amendments, Change Orders, RFIs and RFI responses, Shop Drawings, as-built drawings, schedules, daily records, testing and inspection reports or results, and any related written interpretations. These documents must be available to City for reference at all times during construction of the Project.

### 2.3 Subcontractors.

(A) **General.** All Work which is not performed by Contractor with its own forces must be performed by Subcontractors. City reserves the right to approve or reject any and all Subcontractors proposed to perform the Work, for reasons including the subcontractor's poor reputation, lack of relevant experience, financial instability, and lack of technical ability or adequate trained workforce. Each Subcontractor must obtain a City business license before performing any Work.

(B) **Contractual Obligations.** Contractor must require each Subcontractor to comply with the provisions of the Contract Documents as they apply to the Subcontractor's portion(s) of the Work, including the generally applicable terms of the Contract Documents, and to likewise bind their subcontractors. Contractor will provide that the rights that each Subcontractor may have against any manufacturer or supplier for breach of warranty or guarantee relating to items provided by the Subcontractor for the Project, will be assigned to City. Nothing in these Contract Documents creates a contractual relationship between a Subcontractor and City, but City is deemed to be a third-party beneficiary of the contract between Contractor and each Subcontractor.

(C) **Termination.** If the Contract is terminated, each Subcontractor's agreement must be assigned by Contractor to City, subject to the prior rights of any surety, but only if and to the extent that City accepts, in writing, the assignment by written notification, and assumes all rights and obligations of Contractor pursuant to each such subcontract agreement.

(D) **Substitution of Subcontractor.** If Contractor requests substitution of a listed Subcontractor under Public Contract Code § 4107, Contractor is solely responsible for all costs City incurs in responding to the request, including legal fees and costs to conduct a hearing, and any increased subcontract cost to perform the Work that was to be performed by the listed Subcontractor. If City determines that a Subcontractor is unacceptable to City based on the Subcontractor's failure to satisfactorily perform its Work, or for any of the grounds for substitution listed in Public Contract Code § 4107(a), City may request removal of the Subcontractor from the Project. Upon receipt of a written request from City to remove a Subcontractor pursuant to this paragraph, Contractor will immediately remove the Subcontractor from the Project and, at no further cost to City, will either (1) self-perform the remaining Work to the extent that Contractor is duly licensed and qualified to do so, or (2) substitute a Subcontractor that is acceptable to City, in compliance with Public Contract Code § 4107, as applicable.

## 2.4 Coordination of Work.

(A) **Concurrent Work.** City reserves the right to perform, have performed, or permit performance of other work on or adjacent to the Project site while the Work is being performed for the Project. Contractor is responsible for coordinating its Work with other work being performed on or adjacent to the Project site, including by any utility companies or agencies, and must avoid hindering, delaying, or interfering with the work of other contractors, individuals, or entities, and must ensure safe and reasonable site access and use as required or authorized by City. To the full extent permitted by law, Contractor must hold harmless and indemnify City against any and all claims arising from or related to Contractor's avoidable, negligent, or willful hindrance of, delay to, or interference with the work of any utility company or agency or another contractor or subcontractor.

(B) **Coordination.** If Contractor's Work will connect or interface with work performed by others, Contractor is responsible for independently measuring and visually inspecting such work to ensure a correct connection and interface. Contractor is responsible for any failure by Contractor or its Subcontractors to confirm measurements before proceeding with connecting Work. Before proceeding with any portion of the Work affected by the construction or operations of others, Contractor must give the Project Manager prompt written notification of any defects Contractor discovers which will prevent the proper execution of the Work. Failure to give notice of any known or reasonably discoverable defects will be deemed acknowledgement by Contractor that the work of others is not defective and will not prevent the proper execution of the Work. Contractor must also promptly notify City if work performed by others, including work or activities performed by City's own forces, is operating to hinder, delay, or interfere with Contractor's timely

performance of the Work. City reserves the right to backcharge Contractor for any additional costs incurred due to Contractor's failure to comply with the requirements in this Section 2.4.

**2.5 Submittals.** Unless otherwise specified, Contractor must submit to the Engineer for review and acceptance, all schedules, Shop Drawings, samples, product data, and similar submittals required by the Contract Documents, or upon request by the Engineer. Unless otherwise specified, all submittals, including Requests for Information, are subject to the general provisions of this Section, as well as specific submittal requirements that may be included elsewhere in the Contract Documents, including the Special Conditions or Specifications. The Engineer may require submission of a submittal schedule at or before a pre-construction conference, as may be specified in the Notice to Proceed.

(A) **General.** Contractor is responsible for ensuring that its submittals are accurate and conform to the Contract Documents.

(B) **Time and Manner of Submission.** Contractor must ensure that its submittals are prepared and delivered in a manner consistent with the current City-accepted schedule for the Work and within the applicable time specified in the Contract Documents, or if no time is specified, in such time and sequence so as not to delay the performance of the Work or completion of the Project.

(C) **Required Contents.** Each submittal must include the Project name and contract number, Contractor's name and address, the name and address of any Subcontractor or supplier involved with the submittal, the date, and references to applicable Specification section(s) and/or drawing and detail number(s).

(D) **Required Corrections.** If corrections are required, Contractor must promptly make and submit any required corrections as specified in full conformance with the requirements of this Section, or other requirements that apply to that submittal.

(E) **Effect of Review and Acceptance.** Review and acceptance of a submittal by City will not relieve Contractor from complying with the requirements of the Contract Documents. Contractor is responsible for any errors in any submittal, and review or acceptance of a submittal by City is not an assumption of risk or liability by City.

(F) **Enforcement.** Any Work performed or any material furnished, installed, fabricated or used without City's prior acceptance of a required submittal is performed or provided at Contractor's risk, and Contractor may be required to bear the costs incident thereto, including the cost of removing and replacing such Work, repairs to other affected portions of the Work or material, and the cost of additional time or services required of City, including costs for the Design Professional, Project Manager, or Inspector.

(G) **Excessive RFIs.** An RFI will be considered excessive or unnecessary if City determines that the explanation or response to the RFI is clearly and unambiguously discernable from the Contract Documents. City's costs to review and respond to excessive or unnecessary RFIs may be deducted from payments otherwise due to Contractor.

**2.6 Shop Drawings.** When Shop Drawings are required by the Specifications or requested by the Engineer, they must be prepared according to best practices at Contractor's expense. The Shop Drawings must be of a size and scale to clearly show all necessary details. Unless otherwise specified by City, Shop Drawings must be provided to the Engineer for review and acceptance at least 30 days before the Work will be performed. If City requires changes, the corrected Shop Drawings must be resubmitted to the Engineer for review within the time specified by the Engineer. For all Project components

requiring Shop Drawings, Contractor will not furnish materials or perform any Work until the Shop Drawings for those components are accepted by City. Contractor is responsible for any errors or omissions in the Shop Drawings, shop fits and field corrections; any deviations from the Contract Documents; and for the results obtained by the use of Shop Drawings. Acceptance of Shop Drawings by City does not relieve Contractor of Contractor's responsibility.

- 2.7 Access to Work.** Contractor must afford prompt and safe access to any Worksite by City and its employees, agents, or consultants authorized by City; and upon request by City, Contractor must promptly arrange for City representatives to visit or inspect manufacturing sites or fabrication facilities for items to be incorporated into the Work.
- 2.8 Personnel.** Contractor and its Subcontractors must employ only competent and skillful personnel to perform the Work. Contractor and its Subcontractor's supervisors, security or safety personnel, and employees who have unescorted access to the Project site must possess proficiency in English sufficient to read, understand, receive, and implement oral or written communications or instructions relating to their respective job functions, including safety and security requirements. Upon written notification from the Engineer, Contractor and its Subcontractors must immediately discharge any personnel who are incompetent, disorderly, disruptive, threatening, abusive, or profane, or otherwise refuse or fail to comply with the requirements of the Contract Documents or Laws, including Laws pertaining to health and safety. Any such discharged personnel may not be re-employed or permitted on the Project in any capacity without City's prior written consent.

### Article 3 - Contract Documents

#### 3.1 Interpretation of Contract Documents.

(A) **Plans and Specifications.** The Plans and Specifications included in the Contract Documents are complementary. If Work is shown on one but not on the other, Contractor must perform the Work as though fully described on both, consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. The Plans and Specifications are deemed to include and require everything necessary and reasonably incidental to completion of the Work, whether or not particularly mentioned or shown. Contractor must perform all Work and services and supply all things reasonably related to and inferable from the Contract Documents. In the event of a conflict between the Plans and Specifications, the Specifications will control, unless the drawing(s) at issue are dated later than the Specification(s) at issue. Detailed drawings take precedence over general drawings, and large-scale drawings take precedence over smaller scale drawings. Any arrangement or division of the Plans and Specifications into sections is for convenience and is not intended to limit the Work required by separate trades. A conclusion presented in the Plans or Specifications is only a recommendation. Actual locations and depths must be determined by Contractor's field investigation. Contractor may request access to underlying or background information in City's possession that is necessary for Contractor to form its own conclusions.

(B) **Duty to Notify and Seek Direction.** If Contractor becomes aware of a changed condition in the Project, or of any ambiguity, conflict, inconsistency, discrepancy, omission, or error in the Contract Documents, including the Plans or Specifications, Contractor must promptly submit a Request for Information to the Engineer and wait for a response from City before proceeding further with the related Work. The RFI must notify City of the issue and request clarification, interpretation or direction. The Engineer's clarification, interpretation or direction will be final and binding on Contractor. If Contractor proceeds with the related Work before obtaining City's response, Contractor will be responsible for any resulting costs, including the cost of correcting any incorrect or

defective Work that results. Timely submission of a clear and complete RFI is essential to avoiding delay. Delay resulting from Contractor's failure to submit a timely and complete RFI to the Engineer is Non-Excusable Delay. If Contractor believes that City's response to an RFI justifies a change to the Contract Price or Contract Time, Contractor must perform the Work as directed, but may submit a timely Change Order request in accordance with the Contract Documents. (See Article 5 and 6.)

(C) **Figures and Dimensions.** Figures control over scaled dimensions.

(D) **Technical or Trade Terms.** Any terms that have well-known technical or trade meanings will be interpreted in accordance with those meanings, unless otherwise specifically defined in the Contract Documents.

(E) **Measurements.** Contractor must verify all relevant measurements in the Contract Documents and at the Project site before ordering any material or performing any Work, and will be responsible for the correctness of those measurements or for costs that could have been avoided by independently verifying measurements.

(F) **Compliance with Laws.** The Contract Documents are intended to comply with Laws and will be interpreted to comply with Laws.

**3.2 Order of Precedence.** Information included in one Contract Document but not in another will not be considered a conflict or inconsistency. Unless otherwise specified in the Special Conditions, in case of any conflict or inconsistency among the Contract Documents, the following order of precedence will apply, beginning from highest to lowest, with the most recent version taking precedent over an earlier version:

- (A) Change Orders;
- (B) Addenda;
- (C) Contract;
- (D) Notice to Proceed;
- (E) Attachment B – Federal Contract Requirements (only if used);
- (F) Special Conditions;
- (G) General Conditions;
- (H) Payment and Performance Bonds;
- (I) Specifications;
- (J) Plans;
- (K) Notice of Potential Award;
- (L) Notice Inviting Bids;
- (M) Attachment A – Federal Bidding Requirements (only if used);
- (N) Instructions to Bidders;
- (O) Contractor's Bid Proposal and attachments;
- (P) the City's standard specifications, as applicable; and
- (Q) Any generic documents prepared by and on behalf of a third party, that were not prepared specifically for this Project, such as the Caltrans Standard Specifications or Caltrans Special Provisions.

**3.3 Caltrans Standard Specifications.** Any reference to or incorporation of the Standard Specifications of the State of California, Department of Transportation ("Caltrans"), including "Standard Specifications," "Caltrans Specifications," "State Specifications," or "CSS," means the most current edition of Caltrans' Standard Specifications, unless otherwise specified ("Caltrans Standard Specifications"), including the most current amendments as of the date that Contractor's bid was submitted for this Project. The following provisions apply to use of or reference to the Caltrans Standard Specifications or Special Provisions:

(A) **Limitations.** The “General Provisions” of the Caltrans Standard Specifications, i.e., sections 1 through 9, do not apply to these Contract Documents with the exception of any specific provisions, if any, which are expressly stated to apply to these Contract Documents.

(B) **Conflicts or Inconsistencies.** If there is a conflict or inconsistency between any provision in the Caltrans Standard Specifications or Special Provisions and a provision of these Contract Documents, as determined by City, the provision in the Contract Documents will govern.

(C) **Meanings.** Terms used in the Caltrans Standard Specifications or Special Provisions are to be interpreted as follows:

(1) Any reference to the “Engineer” is deemed to mean the City Engineer.

(2) Any reference to the “Special Provisions” is deemed to mean the Special Conditions, unless the Caltrans Special Provisions are expressly included in the Contract Documents listed in Section 2 of the Contract.

(3) Any reference to the “Department” or “State” is deemed to mean City.

**3.4 For Reference Only.** Contractor is responsible for the careful review of any document, study, or report provided by City or appended to the Contract Documents solely for informational purposes and identified as “For Reference Only.” Nothing in any document, study, or report so appended and identified is intended to supplement, alter, or void any provision of the Contract Documents. Contractor is advised that City or its representatives may be guided by information or recommendations included in such reference documents, particularly when making determinations as to the acceptability of proposed materials, methods, or changes in the Work. Any record drawings or similar final or accepted drawings or maps that are not part of the Contract Documents are deemed to be For Reference Only. The provisions of the Contract Documents are not modified by any perceived or actual conflict with provisions in any document that is provided For Reference Only.

**3.5 Current Versions.** Unless otherwise specified by City, any reference to standard specifications, technical specifications, or any City or state codes or regulations means the latest specification, code or regulation in effect at the time the Contract is signed.

**3.6 Conformed Copies.** If City prepares a conformed set of the Contract Documents following award of the Contract, it will provide Contractor with two hard copy (paper) sets and one copy of the electronic file in PDF format. It is Contractor’s responsibility to ensure that all Subcontractors, including fabricators, are provided with the conformed set of the Contract Documents at Contractor’s sole expense.

**3.7 Ownership.** No portion of the Contract Documents may be used for any purpose other than construction of the Project, without prior written consent from City. Contractor is deemed to have conveyed the copyright in any designs, drawings, specifications, Shop Drawings, or other documents (in paper or electronic form) developed by Contractor for the Project, and City will retain all rights to such works, including the right to possession.

#### **Article 4 - Bonds, Indemnity, and Insurance**

**4.1 Payment and Performance Bonds.** Within ten days following issuance of the Notice of Potential Award, Contractor is required to provide a payment bond and a performance bond, each in the penal sum of not less than 100% of the Contract Price, and each



executed by Contractor and its surety using the bond forms included with the Contract Documents.

(A) **Surety.** Each bond must be issued and executed by a surety admitted in California. If an issuing surety cancels the bond or becomes insolvent, within seven days following written notice from City, Contractor must substitute a surety acceptable to City. If Contractor fails to substitute an acceptable surety within the specified time, City may, at its sole discretion, withhold payment from Contractor until the surety is replaced to City's satisfaction, or terminate the Contract for default.

(B) **Supplemental Bonds for Increase in Contract Price.** If the Contract Price increases during construction by five percent or more over the original Contract Price, Contractor must provide supplemental or replacement bonds within ten days of written notice from City pursuant to this Section, covering 100% of the increased Contract Price and using the bond forms included with the Contract Documents.

**4.2 Indemnity.** To the fullest extent permitted by law, Contractor must indemnify, defend, and hold harmless City, its Council, officers, officials, employees, agents, volunteers, and consultants (individually, an "Indemnitee," and collectively the "Indemnitees") from and against any and all liability, loss, damage, claims, causes of action, demands, charges, fines, costs, and expenses (including, without limitation, attorney fees, expert witness fees, paralegal fees, and fees and costs of litigation or arbitration) (collectively, "Liability") of every nature arising out of or in connection with the acts or omissions of Contractor, its employees, Subcontractors, representatives, or agents, in bidding or performing the Work or in failing to comply with any obligation of Contractor under the Contract, except such Liability caused by the active negligence, sole negligence, or willful misconduct of an Indemnitee. This indemnity requirement applies to any Liability arising from alleged defects in the content or manner of submission of Contractor's bid for the Contract. Contractor's failure or refusal to timely accept a tender of defense pursuant to this Contract will be deemed a material breach of the Contract. City will timely notify Contractor upon receipt of any third-party claim relating to the Contract, as required by Public Contract Code § 9201. Contractor waives any right to express or implied indemnity against any Indemnitee. Contractor's indemnity obligations under this Contract will survive the expiration or any early termination of the Contract.

**4.3 Insurance.** No later than ten days following issuance of the Notice of Potential Award, Contractor must procure and provide proof of the insurance coverage required by this Section in the form of certificates and endorsements acceptable to City. The required insurance must cover the activities of Contractor and its Subcontractors relating to or arising from the performance of the Work, and must remain in full force and effect at all times during the period covered by the Contract, through the date of City's acceptance of the Project. All required insurance must be issued by a company licensed to do business in the State of California, and each such insurer must have an A.M. Best's financial strength rating of "A" or better and a financial size rating of "VIII" or better. If Contractor fails to provide any of the required coverage in full compliance with the requirements of the Contract Documents, City may, at its sole discretion, purchase such coverage at Contractor's expense and deduct the cost from payments due to Contractor, or terminate the Contract for default. The procurement of the required insurance will not be construed to limit Contractor's liability under this Contract or to fulfill Contractor's indemnification obligations under this Contract.

(A) **Policies and Limits.** The following insurance policies and limits are required for this Contract, unless otherwise specified in the Special Conditions:

(1) *Commercial General Liability ("CGL") Insurance:* The CGL insurance policy must be issued on an occurrence basis, written on a comprehensive general

liability form, and must include coverage for liability arising from Contractor's or its Subcontractor's acts or omissions in the performance of the Work, including contractor's protected coverage, contractual liability, products and completed operations, and broad form property damage, with limits of at least \$2,000,000 per occurrence and at least \$4,000,000 general aggregate. The CGL insurance coverage may be arranged under a single policy for the full limits required or by a combination of underlying policies with the balance provided by excess or umbrella policies, provided each such policy complies with the requirements set forth in this Section, including required endorsements.

(2) *Automobile Liability Insurance*: The automobile liability insurance policy must provide coverage of at least \$2,000,000 combined single-limit per accident for bodily injury, death, or property damage, including hired and non-owned auto liability.

(3) *Workers' Compensation Insurance and Employer's Liability*: The workers' compensation and employer's liability insurance policy must comply with the requirements of the California Labor Code, providing coverage of at least \$1,000,000 or as otherwise required by the statute. If Contractor is self-insured, Contractor must provide its Certificate of Permission to Self-Insure, duly authorized by the DIR.

(4) *Pollution Liability Insurance*: The pollution liability insurance policy must be issued on an occurrence basis, providing coverage of at least \$2,000,000 for all loss arising out of claims for bodily injury, death, property damage, or environmental damage caused by pollution conditions resulting from the Work.

(5) *Builder's Risk Insurance*: The builder's risk insurance policy must be issued on an occurrence basis, for all-risk or "all perils" coverage on a 100% completed value basis on the insurable portion of the Project for the benefit of City.

(B) **Notice.** Each certificate of insurance must state that the coverage afforded by the policy or policies will not be reduced, cancelled or allowed to expire without at least 30 days written notice to City, unless due to non-payment of premiums, in which case ten days written notice must be made to City.

(C) **Waiver of Subrogation.** Each required policy must include an endorsement providing that the carrier will waive any right of subrogation it may have against City.

(D) **Required Endorsements.** The CGL policy, automobile liability policy, pollution liability policy, and builder's risk policy must include the following specific endorsements:

(1) The City, including its Council, officials, officers, employees, agents, volunteers and consultants (collectively, "Additional Insured") must be named as an additional insured for all liability arising out of the operations by or on behalf of the named insured, and the policy must protect the Additional Insured against any and all liability for personal injury, death or property damage or destruction arising directly or indirectly in the performance of the Contract. The additional insured endorsement must be provided using ISO form CG 20 10 11 85 or an equivalent form approved by the City.

(2) The inclusion of more than one insured will not operate to impair the rights of one insured against another, and the coverages afforded will apply as though separate policies have been issued to each insured.

(3) The insurance provided by Contractor is primary and no insurance held or owned by any Additional Insured may be called upon to contribute to a loss.

(4) This policy does not exclude explosion, collapse, underground excavation hazard, or removal of lateral support.

(E) **Contractor's Responsibilities.** This Section 4.3 establishes the minimum requirements for Contractor's insurance coverage in relation to this Project, but is not intended to limit Contractor's ability to procure additional or greater coverage. Contractor is responsible for its own risk assessment and needs and is encouraged to consult its insurance provider to determine what coverage it may wish to carry beyond the minimum requirements of this Section. Contractor is solely responsible for the cost of its insurance coverage, including premium payments, deductibles, or self-insured retentions, and no Additional Insured will be responsible or liable for any of the cost of Contractor's insurance coverage.

(F) **Deductibles and Self-Insured Retentions.** Any deductibles or self-insured retentions that apply to the required insurance (collectively, "deductibles") in excess of \$100,000 are subject to approval by the City's Risk Manager, acting in his or her sole discretion, and must be declared by Contractor when it submits its certificates of insurance and endorsements pursuant to this Section 4.3. If the City's Risk Manager determines that the deductibles are unacceptably high, at City's option, Contractor must either reduce or eliminate the deductibles as they apply to City and all required Additional Insured; or must provide a financial guarantee, to City's satisfaction, guaranteeing payment of losses and related investigation, claim administration, and legal expenses.

(G) **Subcontractors.** Contractor must ensure that each Subcontractor is required to maintain the same insurance coverage required under this Section 4.3, with respect to its performance of Work on the Project, including those requirements related to the Additional Insureds and waiver of subrogation, but excluding pollution liability or builder's risk insurance unless otherwise specified in the Special Conditions. A Subcontractor may be eligible for reduced insurance coverage or limits, but only to the extent approved in writing in advance by the City's Risk Manager. Contractor must confirm that each Subcontractor has complied with these insurance requirements before the Subcontractor is permitted to begin Work on the Project. Upon request by the City, Contractor must provide certificates and endorsements submitted by each Subcontractor to prove compliance with this requirement. The insurance requirements for Subcontractors do not replace or limit the Contractor's insurance obligations.

## Article 5 - Contract Time

**5.1 Time is of the Essence.** Time is of the essence in Contractor's performance and completion of the Work, and Contractor must diligently prosecute the Work and complete it within the Contract Time.

(A) **General.** Contractor must commence the Work on the date indicated in the Notice to Proceed and must fully complete the Work in strict compliance with all requirements of the Contract Documents and within the Contract Time. Contractor may not begin performing the Work before the date specified in the Notice to Proceed.

(B) **Authorization.** Contractor is not entitled to compensation or credit for any Work performed before the date specified in the Notice to Proceed, with the exception of any schedules, submittals, or other requirements, if any, that must be provided or performed before issuance of the Notice to Proceed.

(C) **Rate of Progress.** Contractor and its Subcontractors must, at all times, provide workers, materials, and equipment sufficient to maintain the rate of progress necessary to ensure full completion of the Work within the Contract Time. If City determines that Contractor is failing to prosecute the Work at a sufficient rate of progress, City may, in its sole discretion, direct Contractor to provide additional workers, materials, or equipment, or to work additional hours or days without additional cost to City, in order to achieve a rate of progress satisfactory to City. If Contractor fails to comply with City's directive in this regard, City may, at Contractor's expense, separately contract for additional workers, materials, or equipment or use City's own forces to achieve the necessary rate of progress. Alternatively, City may terminate the Contract based on Contractor's default.

**5.2 Schedule Requirements.** Contractor must prepare all schedules using standard, commercial scheduling software acceptable to the Engineer, and must provide the schedules in electronic and paper form as requested by the Engineer. In addition to the general scheduling requirements set forth below, Contractor must also comply with any scheduling requirements included in the Special Conditions or in the Technical Specifications.

(A) **Baseline (As-Planned) Schedule.** Within ten calendar days following City's issuance of the Notice to Proceed (or as otherwise specified in the Notice to Proceed), Contractor must submit to City for review and acceptance a baseline (as-planned) schedule using critical path methodology showing in detail how Contractor plans to perform and fully complete the Work within the Contract Time, including labor, equipment, materials and fabricated items. The baseline schedule must show the order of the major items of Work and the dates of start and completion of each item, including when the materials and equipment will be procured. The schedule must also include the work of all trades, reflecting anticipated labor or crew hours and equipment loading for the construction activities, and must be sufficiently comprehensive and detailed to enable progress to be monitored on a day-by-day basis. For each activity, the baseline schedule must be dated, provided in the format specified in the Contract Documents or as required by City, and must include, at a minimum, a description of the activity, the start and completion dates of the activity, and the duration of the activity.

(1) **Specialized Materials Ordering.** Within five calendar days following issuance of the Notice to Proceed, Contractor must order any specialized material or equipment for the Work that is not readily available from material suppliers. Contractor must also retain documentation of the purchase order date(s).

(B) **City's Review of Schedules.** City will review and may note exceptions to the baseline schedule, and to the progress schedules submitted as required below, to assure completion of the Work within the Contract Time. Contractor is solely responsible for resolving any exceptions noted in a schedule and, within seven days, must correct the schedule to address the exceptions. City's review or acceptance of Contractor's schedules will not operate to waive or limit Contractor's duty to complete the Project within the Contract Time, nor to waive or limit City's right to assess liquidated damages for Contractor's unexcused failure to do so.

(C) **Progress Schedules.** After City accepts the final baseline schedule with no exceptions, Contractor must submit an updated progress schedule and three-week look-ahead schedule, in the format specified by City, for review and acceptance with each application for a progress payment, or when otherwise specified by City, until completion of the Work. The updated progress schedule must: show how the actual progress of the Work as constructed to date compares to the baseline schedule; reflect any proposed changes in the construction schedule or method of operations, including to achieve Project milestones within the Contract Time; and identify any actual or potential impacts

to the critical path. Contractor must also submit periodic reports to City of any changes in the projected material or equipment delivery dates for the Project.

(1) *Float*. The progress schedule must show early and late completion dates for each task. The number of days between those dates will be designated as the "float." Any float belongs to the Project and may be allocated by the Engineer to best serve timely completion of the Project.

(2) *Failure to Submit Schedule*. Reliable, up-to-date schedules are essential to efficient and cost-effective administration of the Project and timely completion. If Contractor fails to submit a schedule within the time periods specified in this Section, or submits a schedule to which City has noted exceptions that are not corrected, City may withhold up to ten percent from payment(s) otherwise due to Contractor until the exceptions are resolved, the schedule is corrected and resubmitted, and City has accepted the schedule. In addition, Contractor's failure to comply with the schedule requirements in this Section 5.2 will be deemed a material default and a waiver of any claims for Excusable Delay or loss of productivity arising during any period when Contractor is out of compliance, subject only to the limits of Public Contract Code § 7102.

(D) **Recovery Schedule**. If City determines that the Work is more than one week behind schedule, within seven days following written notice of such determination, Contractor must submit a recovery schedule, showing how Contractor intends to perform and complete the Work within the Contract Time, based on actual progress to date.

(E) **Effect of Acceptance**. Contractor and its Subcontractors must perform the Work in accordance with the most current City-accepted schedule unless otherwise directed by City. City's acceptance of a schedule does not operate to extend the time for completion of the Work or any component of the Work, and will not affect City's right to assess liquidated damages for Contractor's unexcused delay in completing the Work within the Contract Time.

(F) **Posting**. Contractor must at all times prominently post a copy of the most current City-accepted progress or recovery schedule in its on-site office.

(G) **Reservation of Rights**. City reserves the right to direct the sequence in which the Work must be performed or to make changes in the sequence of the Work in order to facilitate the performance of work by City or others, or to facilitate City's use of its property. The Contract Time or Contract Price may be adjusted to the extent such changes in sequence actually increase or decrease Contractor's time or cost to perform the Work.

(H) **Authorized Working Days and Times**. Contractor is limited to working Monday through Friday, excluding holidays, during City's normal business hours, except as provided in the Special Conditions or as authorized in writing by City. City reserves the right to charge Contractor for additional costs incurred by City due to Work performed on days or during hours not expressly authorized in the Contract Documents, including reimbursement of costs incurred for inspection, testing, and construction management services.

### 5.3 Delay and Extensions of Contract Time.

(A) **Notice of Delay**. If Contractor becomes aware of any actual or potential delay affecting the critical path, Contractor must promptly notify the Engineer in writing, regardless of the nature or cause of the delay, so that City has a reasonable opportunity to mitigate or avoid the delay.

(B) **Excusable Delay.** The Contract Time may be extended if Contractor encounters "Excusable Delay," which is an unavoidable delay in completing the Work within the Contract Time due to causes completely beyond Contractor's control, and which Contractor could not have avoided or mitigated through reasonable care, planning, foresight, and diligence, provided that Contractor is otherwise fully performing its obligations under the Contract Documents. Grounds for Excusable Delay may include fire, natural disasters including earthquake or unusually severe weather, acts of terror or vandalism, epidemic, unforeseeable adverse government actions, unforeseeable actions of third parties, encountering unforeseeable hazardous materials, unforeseeable site conditions, or suspension for convenience under Article 13. The Contract Time will not be extended based on circumstances which will not unavoidably delay completing the Work within the Contract Time based on critical path analysis.

(C) **Weather Delays.** A "Weather Delay Day" is a Working Day during which Contractor and its forces, including Subcontractors, are unable to perform more than 40% of the critical path Work scheduled for that day due to adverse weather conditions which impair the ability to safely or effectively perform the scheduled critical path Work that day. Adverse weather conditions may include rain, saturated soil, and Project site clean-up required due to adverse weather. Determination of what constitutes critical path Work scheduled for that day will be based on the most current, City-approved schedule. Contractor will be entitled to a non-compensable extension of the Contract Time for each Weather Delay Day in excess of the normal Weather Delay Days within a given month as determined by reliable records, including monthly rainfall averages, for the preceding ten years (or as otherwise specified in the Special Conditions or Specifications).

(1) Contractor must fully comply with the applicable procedures in Articles 5 and 6 of the General Conditions regarding requests to modify the Contract Time.

(2) Contractor will not be entitled to an extension of time for a Weather Delay Day to the extent Contractor is responsible for concurrent delay on that day.

(3) Contractor must take reasonable steps to mitigate the consequences of Weather Delay Days, including prudent workforce management and protecting the Work, Project Site, materials, and equipment.

(D) **Non-Excusable Delay.** Delay which Contractor could have avoided or mitigated through reasonable care, planning, foresight and diligence is "Non-Excusable Delay." Contractor is not entitled to an extension of Contract Time or any compensation for Non-Excusable Delay, or for Excusable Delay that is concurrent with Non-Excusable Delay. Non-Excusable Delay includes delay caused by:

(1) weather conditions which are normal for the location of the Project, as determined by reliable records, including monthly rainfall averages, for the preceding ten years;

(2) Contractor's failure to order equipment and materials sufficiently in advance of the time needed for completion of the Work within the Contract Time;

(3) Contractor's failure to provide adequate notification to utility companies or agencies for connections or services necessary for completion of the Work within the Contract Time;

- (4) foreseeable conditions which Contractor could have ascertained from reasonably diligent inspection of the Project site or review of the Contract Documents or other information provided or available to Contractor;
- (5) Contractor's failure, refusal, or financial inability to perform the Work within the Contract Time, including insufficient funds to pay its Subcontractors or suppliers;
- (6) performance or non-performance by Contractor's Subcontractors or suppliers;
- (7) the time required to respond to excessive RFIs (see Section 2.5(G));
- (8) delayed submission of required submittals, or the time required for correction and resubmission of defective submittals;
- (9) time required for repair of, re-testing, or re-inspection of defective Work;
- (10) enforcement of Laws by City, or outside agencies with jurisdiction over the Work; or
- (11) City's exercise or enforcement of any of its rights or Contractor's duties pursuant to the Contract Documents, including correction of defective Work, extra inspections or testing due to non-compliance with Contract requirements, safety compliance, environmental compliance, or rejection and return of defective or deficient submittals.

(E) **Compensable Delay.** Pursuant to Public Contract Code § 7102, in addition to entitlement to an extension of Contract Time, Contractor is entitled to compensation for costs incurred due to delay caused solely by City, when that delay is unreasonable under the circumstances involved and not within the contemplation of the parties ("Compensable Delay"). Contractor is not entitled to an extension of Contract Time or recovery of costs for Compensable Delay that is concurrent with Non-Excusable Delay. Delay due to causes that are beyond the control of either City or Contractor, including Weather Delay Days, discovery of Historic or Archeological Items pursuant to Section 7.18, or the actions or inactions of third parties or other agencies, is not Compensable Delay, and will only entitle Contractor to an extension of time commensurate with the time lost due to such delay.

(F) **Recoverable Costs.** Contractor is not entitled to compensation for Excusable Delay unless it is Compensable Delay, as defined above. Contractor is entitled to recover only the actual, direct, reasonable, and substantiated costs ("Recoverable Costs") for each working day that the Compensable Delay prevents Contractor from proceeding with more than 50% of the critical path Work scheduled for that day, based on the most recent progress schedule accepted by City. Recoverable Costs will not include home office overhead or lost profit.

(G) **Request for Extension of Contract Time or Recoverable Costs.** A request for an extension of Contract Time or any associated Recoverable Costs must be submitted in writing to City within ten calendar days of the date the delay is first encountered, even if the duration of the delay is not yet known at that time, or any entitlement to the Contract Time extension or to the Recoverable Costs will be deemed waived. In addition to complying with the requirements of this Article 5, the request must be submitted in compliance with the Change Order request procedures in Article 6 below. Strict compliance with these requirements is necessary to ensure that any delay or consequences of delay may be mitigated as soon as possible, and to facilitate cost-

efficient administration of the Project and timely performance of the Work. Any request for an extension of Contract Time or Recoverable Costs that does not strictly comply with all of the requirements of Article 5 and Article 6 will be deemed waived.

(1) *Required Contents.* The request must include a detailed description of the cause(s) of the delay and must also describe the measures that Contractor has taken to mitigate the delay and/or its effects, including efforts to mitigate the cost impact of the delay, such as by workforce management or by a change in sequencing. If the delay is still ongoing at the time the request is submitted, the request should also include Contractor's plan for continued mitigation of the delay or its effects.

(2) *Delay Days and Costs.* The request must specify the number of days of Excusable Delay claimed or provide a realistic estimate if the duration of the delay is not yet known. If Contractor believes it is entitled to Recoverable Costs for Compensable Delay, the request must specify the amount and basis for the Recoverable Costs that are claimed or provide a realistic estimate if the amount is not yet known. Any estimate of delay duration or cost must be updated in writing and submitted with all required supporting documentation as soon as the actual time and cost is known. The maximum extension of Contract Time will be the number of days, if any, by which an Excusable Delay or a Compensable Delay exceeds any concurrent Non-Excusable Delay. Contractor is entitled to an extension of Contract Time, or compensation for Recoverable Costs, only if, and only to the extent that, such delay will unavoidably delay Final Completion.

(3) *Supporting Documentation.* The request must also include any and all supporting documentation necessary to evidence the delay and its actual impacts, including scheduling and cost impacts with a time impact analysis using critical path methodology and demonstrating the unavoidable delay to Final Completion. The time impact analysis must be submitted in a form or format acceptable to City.

(4) *Burden of Proof.* Contractor has the burden of proving that: the delay was an Excusable or Compensable Delay, as defined above; Contractor has fully complied with its scheduling obligations in Section 5.2, Schedule Requirements; Contractor has made reasonable efforts to mitigate the delay and its schedule and cost impacts; the delay will unavoidably result in delaying Final Completion; and any Recoverable Costs claimed by Contractor were actually incurred and were reasonable under the circumstances.

(5) *Legal Compliance.* Nothing in this Section 5.3 is intended to require the waiver, alteration, or limitation of the applicability of Public Contract Code § 7102.

(6) *No Waiver.* Any grant of an extension of Contract Time, or compensation for Recoverable Costs due to Compensable Delay, will not operate as a waiver of City's right to assess liquidated damages for Non-Excusable Delay.

(7) *Dispute Resolution.* In the event of a dispute over entitlement to an extension of Contract Time or compensation for Recoverable Costs, Contractor may not stop Work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work. Contractor's sole recourse for an unresolved dispute based on City's rejection of a Change Order request for an extension of Contract Time or compensation for Recoverable Costs is to comply with the dispute resolution provisions set forth in Article 12 below.



**5.4 Liquidated Damages.** It is expressly understood that if Final Completion is not achieved within the Contract Time, City will suffer damages from the delay that are difficult to determine and accurately specify. Pursuant to Public Contract Code § 7203, if Contractor fails to achieve Final Completion within the Contract Time due to Contractor's Non-Excusable Delay, City will charge Contractor in the amount specified in the Contract for each calendar day that Final Completion is delayed beyond the Contract Time, as liquidated damages and not as a penalty. Any waiver of accrued liquidated damages, in whole or in part, is subject to approval of the City Council or its authorized delegee.

(A) **Liquidated Damages.** Liquidated damages will not be assessed for any Excusable or Compensable Delay, as set forth above.

(B) **Milestones.** Liquidated damages may also be separately assessed for failure to meet milestones specified elsewhere in the Contract Documents.

(C) **Setoff.** City is entitled to deduct the amount of liquidated damages assessed against any payments otherwise due to Contractor, including progress payments, Final Payment, or unreleased retention. If there are insufficient Contract funds remaining to cover the full amount of liquidated damages assessed, City is entitled to recover the balance from Contractor or its performance bond surety.

(D) **Occupancy or Use.** Occupancy or use of the Project in whole or in part prior to Final Completion does not constitute City's acceptance of the Project and will not operate as a waiver of City's right to assess liquidated damages for Contractor's Non-Excusable Delay in achieving Final Completion.

(E) **Other Remedies.** City's right to liquidated damages under this Section applies only to damages arising from Contractor's Non-Excusable Delay or failure to complete the Work within the Contract Time. City retains its right to pursue all other remedies under the Contract for other types of damage, including damage to property or persons, costs or diminution in value from defective materials or workmanship, costs to repair or complete the Work, or other liability caused by Contractor.

## Article 6 - Contract Modification

**6.1 Contract Modification.** Subject to the limited exception set forth in subsection (D) below, any change in the Work or the Contract Documents, including the Contract Price or Contract Time, will not be a valid and binding change to the Contract unless it is formalized in a Change Order, including a "no-cost" Change Order or a unilateral Change Order. Changes in the Work pursuant to this Article 6 will not operate to release, limit, or abridge Contractor's warranty obligations pursuant to Article 11 or any obligations of Contractor's bond sureties.

(A) **City-Directed Changes.** City may direct changes in the scope or sequence of Work or the requirements of the Contract Documents, without invalidating the Contract. Such changes may include Extra Work as set forth in subsection (C) below, or deletion or modification of portions of the Work. Contractor must promptly comply with City-directed changes in the Work in accordance with the original Contract Documents, even if Contractor and City have not yet reached agreement as to adjustments to the Contract Price or Contract Time for the change in the Work or for the Extra Work. Contractor is not entitled to extra compensation for cost savings resulting from "value engineering" pursuant to Public Contract Code § 7101, except to the extent authorized in advance by City in writing, and subject to any applicable procedural requirements for submitting a proposal for value engineering cost savings.

(B) **Disputes.** In the event of a dispute over entitlement to or the amount of a change in Contract Time or a change in Contract Price related to a City-directed change in the Work, Contractor must perform the Work as directed and may not delay its Work or cease Work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute. Likewise, in the event that City and Contractor dispute whether a portion or portions of the Work are already required by the Contract Documents or constitute Extra Work, or otherwise dispute the interpretation of any portion(s) of the Contract Documents, Contractor must perform the Work as directed and may not delay its Work or cease Work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute, as directed by City. If Contractor refuses to perform the Work in dispute, City may, acting in its sole discretion, elect to delete the Work from the Contract and reduce the Contract Price accordingly, and self-perform the Work or direct that the Work be performed by others. Alternatively, City may elect to terminate the Contract for convenience or for cause. Contractor's sole recourse for an unresolved dispute related to changes in the Work or performance of any Extra Work is to comply with the dispute resolution provisions set forth in Article 12, below.

(C) **Extra Work.** City may direct Contractor to perform Extra Work related to the Project. Contractor must promptly perform any Extra Work as directed or authorized by City in accordance with the original Contract Documents, even if Contractor and City have not yet reached agreement on adjustments to the Contract Price or Contract Time for such Extra Work. If Contractor believes it is necessary to perform Extra Work due to changed conditions, Contractor must promptly notify the Engineer in writing, specifically identifying the Extra Work and the reason(s) the Contractor believes it is Extra Work. This notification requirement does not constitute a Change Order request pursuant to Section 6.2, below. Contractor must maintain detailed daily records that itemize the cost of each element of Extra Work, and sufficiently distinguish the direct cost of the Extra Work from the cost of other Work performed. For each day that Contractor performs Extra Work, or Work that Contractor contends is Extra Work, Contractor must submit no later than the following Working Day, a daily report of the Extra Work performed that day and the related costs, together with copies of certified payroll, invoices, and other documentation substantiating the costs ("Extra Work Report"). The Engineer will make any adjustments to Contractor's Extra Work Report(s) based on the Engineer's records of the Work. When an Extra Work Report(s) is agreed on and signed by both City and Contractor, the Extra Work Report(s) will become the basis for payment under a duly authorized and signed Change Order. Failure to submit the required documentation by close of business on the next Working Day is deemed a full and complete waiver for any change in the Contract Price or Contract Time for any Extra Work performed that day.

(D) **Minor Changes and RFIs.** Minor field changes, including RFI replies from City, that do not affect the Contract Price or Contract Time and that are approved by the Engineer acting within his or her scope of authority, do not require a Change Order. By executing an RFI reply from City, Contractor agrees that it will perform the Work as clarified therein, with no change to the Contract Price or Contract Time.

(E) **Remedy for Non-Compliance.** Contractor's failure to promptly comply with a City-directed change is deemed a material breach of the Contract, and in addition to all other remedies available to it, City may, at its sole discretion, hire another contractor or use its own forces to complete the disputed Work at Contractor's sole expense, and may deduct the cost from the Contract Price.

**6.2 Contractor Change Order Requests.** Contractor must submit a request or proposal for a change in the Work, compensation for Extra Work, or a change in the Contract Price or Contract Time as a written Change Order request or proposal.

(A) **Time for Submission.** Any request for a change in the Contract Price or the Contract Time must be submitted in writing to the Engineer within ten calendar days of the date that Contractor first encounters the circumstances, information or conditions giving rise to the Change Order request, even if the total amount of the requested change in the Contract Price or impact on the Contract Time is not yet known at that time. If City requests that Contractor propose the terms of a Change Order, unless otherwise specified in City's request, Contractor must provide the Engineer with a written proposal for the change in the Contract Price or Contract Time within five working days of receiving City's request, in a form satisfactory to the Engineer.

(B) **Required Contents.** Any Change Order request or proposal submitted by Contractor must include a complete breakdown of actual or estimated costs and credits, and must itemize labor, materials, equipment, taxes, insurance, subcontract amounts, and, if applicable, Extra Work Reports. Any estimated cost must be updated in writing as soon as the actual amount is known.

(C) **Required Documentation.** All claimed costs must be fully documented, and any related request for an extension of time or delay-related costs must be included at that time and in compliance with the requirements of Article 5 of the General Conditions. Upon request, Contractor must permit City to inspect its original and unaltered bidding records, subcontract agreements, subcontract change orders, purchase orders, invoices, or receipts associated with the claimed costs.

(D) **Required Form.** Contractor must use City's form(s) for submitting all Change Order requests or proposals, unless otherwise specified by City.

(E) **Certification.** All Change Order requests must be signed by Contractor and must include the following certification:

"The undersigned Contractor certifies under penalty of perjury that its statements and representations in this Change Order request are true and correct. Contractor warrants that this Change Order request is comprehensive and complete as to the Work or changes referenced herein, and agrees that any known or foreseeable costs, expenses, or time extension requests not included herein, are deemed waived."

**6.3 Adjustments to Contract Price.** The amount of any increase or decrease in the Contract Price will be determined based on one of the following methods listed below, in the order listed with unit pricing taking precedence over the other methods. Markup applies only to City-authorized time and material Work, and does not apply to any other payments to Contractor. For Work items or components that are deleted in their entirety, Contractor will only be entitled to compensation for those direct, actual, and documented costs (including restocking fees), reasonably incurred before Contractor was notified of the City's intent to delete the Work, with no markup for overhead, profit, or other indirect costs.

(A) **Unit Pricing.** Amounts previously provided by Contractor in the form of unit prices, either in a bid schedule or in a post-award schedule of values pursuant to Section 8.1, Schedule of Values, will apply to determine the price for the affected Work, to the extent applicable unit prices have been provided for that type of Work. No additional markup for overhead, profit, or other indirect costs will be added to the calculation.

(B) **Lump Sum.** A mutually agreed upon, all-inclusive lump sum price for the affected Work with no additional markup for overhead, profit, or other indirect costs.

(C) **Time and Materials.** On a time and materials basis, if and only to the extent compensation on a time and materials basis is expressly authorized by City in advance of Contractor's performance of the Work and subject to any not-to-exceed limit. Time and materials compensation for increased costs or Extra Work (but not decreased costs or deleted Work), will include allowed markup for overhead, profit, and other indirect costs, calculated as the total of the following sums, the cumulative total of which may not exceed the maximum markup rate of 15%:

- (1) All direct labor costs provided by the Contractor, excluding superintendence, project management, or administrative costs, plus 15% markup;
- (2) All direct material costs provided by the Contractor, including sales tax, plus 15% markup;
- (3) All direct plant and equipment rental costs provided by the Contractor, plus 15% markup;
- (4) All direct additional subcontract costs plus 10% markup for Work performed by Subcontractors; and
- (5) Increased bond or insurance premium costs computed at 1.5% of total of the previous four sums.

**6.4 Unilateral Change Order.** If the parties dispute the terms of a proposed Change Order, including disputes over the amount of compensation or extension of time that Contractor has requested, the value of deleted or changed Work, what constitutes Extra Work, or quantities used, City may elect to issue a unilateral Change Order, directing performance of the Work, and authorizing a change in the Contract Price or Contract Time for the adjustment to compensation or time that the City believes is merited. Contractor's sole recourse to dispute the terms of a unilateral Change Order is to submit a timely Claim pursuant to Article 12, below.

**6.5 Non-Compliance Deemed Waiver.** Contractor waives its entitlement to any increase in the Contract Price or Contract Time if Contractor fails to fully comply with the provisions of this Article. Contractor will not be paid for unauthorized Extra Work.

## **Article 7 - General Construction Provisions**

### **7.1 Permits, Fees, Business License, and Taxes.**

(A) **Permits, Fees, and City Business License.** Contractor must obtain and pay for all permits, fees, or licenses required to perform the Work, including a City business license. Contractor must cooperate with and provide notifications to all government agencies with jurisdiction over the Project, as may be required. Contractor must provide City with copies of all records of permits and permit applications, payment of required fees, and any licenses required for the Work.

(B) **Taxes.** Contractor must pay for all taxes on labor, material and equipment, except Federal Excise Tax to the extent that City is exempt from Federal Excise Tax.

**7.2 Temporary Facilities.** Contractor must provide, at Contractor's sole expense, any and all temporary facilities for the Project, including an onsite staging area for materials and equipment, a field office, sanitary facilities, utilities, storage, scaffolds, barricades, walkways, and any other temporary structure required to safely perform the Work along with any incidental utility services. The location of all temporary facilities must be

approved by the City prior to installation. Temporary facilities must be safe and adequate for the intended use and installed and maintained in accordance with Laws and the Contract Documents. Contractor must fence and screen the Project site and, if applicable, any separate Worksites, including the staging area, and its operation must minimize inconvenience to neighboring properties. Additional provisions pertaining to temporary facilities may be included in the Specifications or Special Conditions.

(A) **Utilities.** Contractor must install and maintain the power, water, sewer and all other utilities required for the Project site, including the piping, wiring, internet and wifi connections, and any related equipment necessary to maintain the temporary facilities.

(B) **Removal and Repair.** Contractor must promptly remove all such temporary facilities when they are no longer needed or upon completion of the Work, whichever comes first. Contractor must promptly repair any damage to City's property or to other property caused by the installation, use, or removal of the temporary facilities, and must promptly restore the property to its original or intended condition.

**7.3 Noninterference and Site Management.** Contractor must avoid interfering with City's use of its property at or adjacent to the Project site, including use of roadways, entrances, parking areas, walkways, and structures. Contractor must also minimize disruption of access to private property in the Project vicinity. Contractor must coordinate with affected property owners, tenants, and businesses, and maintain some vehicle and pedestrian access to their residences or properties at all times. Temporary access ramps, fencing or other measures must be provided as needed. Before blocking access to a private driveway or parking lot, Contractor must provide effective notice to the affected parties at least 48 hours in advance of the pending closure and allow them to remove vehicles. Private driveways, residences and parking lots must have access to a roadway during non-Work hours.

(A) **Offsite Acquisition.** Unless otherwise provided by City, Contractor must acquire, use and dispose of, at its sole expense, any Worksites, licenses, easements, and temporary facilities necessary to access and perform the Work.

(B) **Offsite Staging Area and Field Office.** If additional space beyond the Project site is needed, such as for the staging area or the field office, Contractor may need to make arrangements with the nearby property owner(s) to secure the space. Before using or occupying any property owned by a third party, Contractor must provide City with a copy of the necessary license agreement, easement, or other written authorization from the property owner, together with a written release from the property owner holding City harmless from any related liability, in a form acceptable to the City Attorney.

(C) **Traffic Management.** Contractor must provide traffic management and traffic controls as specified in the Contract Documents, as required by Laws, and as otherwise required to ensure public and worker safety, and to avoid interference with public or private operations or the normal flow of vehicular, bicycle, or pedestrian traffic.

**7.4 Signs.** No signs may be displayed on or about City's property, except signage which is required by Laws or by the Contract Documents, without City's prior written approval as to size, design, and location.

**7.5 Project Site and Nearby Property Protections.**

(A) **General.** Contractor is responsible at all times, on a 24-hour basis and at its sole cost, for protecting the Work, the Project site, and the materials and equipment to be incorporated into the Work, until the City has accepted the Project, excluding any exceptions to acceptance, if any. Except as specifically authorized by City, Contractor

must confine its operations to the area of the Project site indicated in the Plans and Specifications. Contractor is liable for any damage caused by Contractor or its Subcontractors to the Work, City's property, the property of adjacent or nearby property owners and the work or personal property of other contractors working for City, including damage related to Contractor's failure to adequately secure the Work or any Worksite.

(1) Subject to City's approval, Contractor will provide and install safeguards to protect the Work; any Worksite, including the Project site; City's real or personal property and the real or personal property of adjacent or nearby property owners, including plant and tree protections.

(2) City wastewater systems may not be interrupted. If the Work disrupts existing sewer facilities, Contractor must immediately notify City and establish a plan, subject to City's approval, to convey the sewage in closed conduits back into the sanitary sewer system. Sewage must not be permitted to flow in trenches or be covered by backfill.

(3) Contractor must remove with due care, and store at City's request, any objects or material from the Project site that City will salvage or reuse at another location.

(4) If directed by Engineer, Contractor must promptly repair or replace any property damage, as specified by the Engineer. However, acting in its sole discretion, City may elect to have the property damage remedied otherwise, and may deduct the cost to repair or replace the damaged property from payment otherwise due to Contractor.

(5) Contractor will not permit any structure or infrastructure to be loaded in a manner that will damage or endanger the integrity of the structure or infrastructure.

(B) **Securing Project Site.** After completion of Work each day, Contractor must secure the Project site and, to the extent feasible, make the area reasonably accessible to the public unless City approves otherwise. All excess materials and equipment not protected by approved traffic control devices must be relocated to the staging area or demobilized. Trench spoils must be hauled off the Project site daily and open excavations must be protected with steel plates. Contractor and Subcontractor personnel may not occupy or use the Project site for any purpose during non-Work hours, except as may be provided in the Contract Documents or pursuant to prior written authorization from City.

(C) **Unforeseen Conditions.** If Contractor encounters facilities, utilities, or other unknown conditions not shown on or reasonably inferable from the Plans or apparent from inspection of the Project site, Contractor must immediately notify the City and promptly submit a Request for Information to obtain further directions from the Engineer. Contractor must avoid taking any action which could cause damage to the facilities or utilities pending further direction from the Engineer. The Engineer's written response will be final and binding on Contractor. If the Engineer's subsequent direction to Contractor affects Contractor's cost or time to perform the Work, Contractor may submit a Change Order request as set forth in Article 6 above.

(D) **Support; Adjacent Properties.** Contractor must provide, install, and maintain all shoring, bracing, and underpinning necessary to provide support to City's property and adjacent properties and improvements thereon. Contractor must provide notifications to adjacent property owners as may be required by Laws. See also, Section 7.15, Trenching of Five Feet or More.

(E) **Notification of Property Damage.** Contractor must immediately notify the City of damage to any real or personal property resulting from Work on the Project. Contractor must immediately provide a written report to City of any such property damage in excess of \$500 (based on estimated cost to repair or replace) within 24 hours of the occurrence. The written report must include: (1) the location and nature of the damage, and the owner of the property, if known; (2) the name and address of each employee of Contractor or any Subcontractor involved in the damage; (3) a detailed description of the incident, including precise location, time, and names and contact information for known witnesses; and (4) a police or first responder report, if applicable. If Contractor is required to file an accident report with another government agency, Contractor will provide a copy of the report to City.

## 7.6 Materials and Equipment.

(A) **General.** Unless otherwise specified, all materials and equipment required for the Work must be new, free from defects, and of the best grade for the intended purpose, and furnished in sufficient quantities to ensure the proper and expeditious performance of the Work. Contractor must employ measures to preserve the specified quality and fitness of the materials and equipment. Unless otherwise specified, all materials and equipment required for the Work are deemed to include all components required for complete installation and intended operation and must be installed in accordance with the manufacturer's recommendations or instructions. Contractor is responsible for all shipping, handling, and storage costs associated with the materials and equipment required for the Work. Contractor is responsible for providing security and protecting the Work and all of the required materials, supplies, tools and equipment at Contractor's sole cost until City has formally accepted the Project as set forth in Section 11.1, Final Completion. Contractor will not assign, sell, mortgage, or hypothecate any materials or equipment for the Project, or remove any materials or equipment that have been installed or delivered.

(B) **City-Provided.** If the Work includes installation of materials or equipment to be provided by City, Contractor is solely responsible for the proper examination, handling, storage, and installation in accordance with the Contract Documents. Contractor must notify City of any defects discovered in City-provided materials or equipment, sufficiently in advance of scheduled use or installation to afford adequate time to procure replacement materials or equipment as needed. Contractor is solely responsible for any loss of or damage to such items which occurs while the items are in Contractor's custody and control, the cost of which may be offset from the Contract Price and deducted from any payment(s) due to Contractor.

(C) **Intellectual Property Rights.** Contractor must, at its sole expense, obtain any authorization or license required for use of patented or copyright-protected materials, equipment, devices or processes that are incorporated into the Work. Contractor's indemnity obligations in Article 4 apply to any claimed violation of intellectual property rights in violation of this provision.

## 7.7 Substitutions.

(A) **"Or Equal."** Any Specification designating a material, product, or thing (collectively, "item") or service by specific brand or trade name, followed by the words "or equal," is intended only to indicate the quality and type of item or service desired, and Contractor may request use of any equal item or service. Unless otherwise stated in the Specifications, any reference to a specific brand or trade name for an item or service that is used solely for the purpose of describing the type of item or service desired, will be deemed to be followed by the words "or equal." A substitution will only be approved if it is a true "equal" item or service in every aspect of design, function, and quality, as

determined by City, including dimensions, weight, maintenance requirements, durability, fit with other elements, and schedule impacts.

(B) **Request for Substitution.** A post-award request for substitution of an item or service must be submitted in writing to the Engineer for approval in advance, within the applicable time period provided in the Contract Documents. If no time period is specified, the substitution request may be submitted any time within 35 days after the date of award of the Contract, or sufficiently in advance of the time needed to avoid delay of the Work, whichever is earlier.

(C) **Substantiation.** Any available data substantiating the proposed substitute as an equal item or service must be submitted with the written request for substitution. Contractor's failure to timely provide all necessary substantiation, including any required test results as soon as they are available, is grounds for rejection of the proposed substitution, without further review.

(D) **Burden of Proving Equality.** Contractor has the burden of proving the equality of the proposed substitution at Contractor's sole cost. City has sole discretion to determine whether a proposed substitution is equal, and City's determination is final.

(E) **Approval or Rejection.** If the proposed substitution is approved, Contractor is solely responsible for any additional costs or time associated with the substituted item or service. If the proposed substitution is rejected, Contractor must, without delay, install the item or use the service as specified by City.

(F) **Contractor's Obligations.** City's approval of a proposed substitution will not relieve Contractor from any of its obligations under the Contract Documents. In the event Contractor makes an unauthorized substitution, Contractor will be solely responsible for all resulting cost impacts, including the cost of removal and replacement and the impact to other design elements.

## 7.8 Testing and Inspection.

(A) **General.** All materials, equipment, and workmanship used in the Work are subject to inspection and testing by City at all times and locations during construction and/or fabrication and at any Worksite, including at shops and yards as well as at the Project site. All manufacturers' application or installation instructions must be provided to the Inspector at least ten days prior to the first such application or installation. Contractor must, at all times, make the Work available for testing or inspection. Neither City's inspection or testing of Work, nor its failure to do so, operate to waive or limit Contractor's duty to complete the Work in accordance with the Contract Documents.

(B) **Scheduling and Notification.** Contractor must cooperate with City in coordinating the inspections and testing. Contractor must submit samples of materials, at Contractor's expense, and schedule all tests required by the Contract Documents in time to avoid any delay to the progress of the Work. Contractor must notify the Engineer no later than noon of the Working Day before any inspection or testing and must provide timely notice to the other necessary parties as specified in the Contract Documents. If Contractor schedules an inspection or test beyond regular Work hours, or on a Saturday, Sunday, or recognized City holiday, Contractor must notify the Engineer at least two Working Days in advance for approval. If approved, Contractor must reimburse City for the cost of the overtime inspection or testing. Such costs, including the City's hourly costs for required personnel, may be deducted from payments otherwise due to Contractor.



(C) **Responsibility for Costs.** City will bear the initial cost of inspection and testing to be performed by independent testing consultants retained by City, subject to the following exceptions:

(1) Contractor will be responsible for the costs of any subsequent tests which are required to substantiate compliance with the Contract Documents, and any associated remediation costs.

(2) Contractor will be responsible for inspection costs, at City's hourly rates, for inspection time lost because the Work is not ready or Contractor fails to appear for a scheduled inspection.

(3) If any portion of the Work that is subject to inspection or testing is covered or concealed by Contractor prior to the inspection or testing, Contractor will bear the cost of making that portion of the Work available for the inspection or testing required by the Contract Documents, and any associated repair or remediation costs.

(4) Contractor is responsible for properly shoring all compaction test sites deeper than five feet below grade, as required under Section 7.15 below.

(5) Any Work or material that is defective or fails to comply with the requirements of the Contract Documents must be promptly repaired, removed, replaced, or corrected by Contractor, at Contractor's sole expense, even if that Work or material was previously inspected or included in a progress payment.

(D) **Contractor's Obligations.** Contractor is solely responsible for any delay occasioned by remediation of defective or noncompliant Work or material. Inspection of the Work does not in any way relieve Contractor of its obligations to perform the Work as specified. Any Work done without the required inspection(s) will also be subject to rejection by City.

(E) **Distant Locations.** If required off-site testing or inspection must be conducted at a location more than 100 miles from the Project site, Contractor is solely responsible for the additional travel costs required for testing and/or inspection at such locations.

(F) **Final Inspection.** The provisions of this Section 7.8 also apply to final inspection under Article 11, Completion and Warranty Provisions.

**7.9 Project Site Conditions and Maintenance.** Contractor must at all times, on a 24-hour basis and at its sole cost, maintain the Project site and staging and storage areas in clean, neat, and sanitary condition and in compliance with all Laws pertaining to safety, air quality, and dust control. Adequate toilets must be provided, and properly maintained and serviced for all workers on the Project site, located in a suitably secluded area, subject to City's prior approval. Contractor must also, on a daily basis and at its sole cost, remove and properly dispose of the debris and waste materials from the Project site.

(A) **Air Emissions Control.** Contractor must not discharge smoke or other air contaminants into the atmosphere in violation of any Laws.

(B) **Dust and Debris.** Contractor must minimize and confine dust and debris resulting from the Work. Contractor must abate dust nuisance by cleaning, sweeping, and immediately sprinkling with water excavated areas of dirt or other materials prone to cause dust, and within one hour after the Engineer notifies Contractor that an airborne nuisance exists. The Engineer may direct that Contractor provide an approved water-spraying truck for this purpose. If water is used for dust control, Contractor will only use

the minimum necessary. Contractor must take all necessary steps to keep waste water out of streets, gutters, or storm drains. See Section 7.19, Environmental Control. If City determines that the dust control is not adequate, City may have the work done by others and deduct the cost from the Contract Price. Contractor will immediately remove any excess excavated material from the Project site and any dirt deposited on public streets.

(C) **Clean up.** Before discontinuing Work in an area, Contractor must clean the area and remove all debris and waste along with the construction equipment, tools, machinery, and surplus materials.

(1) Except as otherwise specified, all excess Project materials, and the materials removed from existing improvements on the Project site with no salvage value or intended reuse by City, will be Contractor's property.

(2) Hauling trucks and other vehicles leaving the Project site must be cleaned of exterior mud or dirt before traveling on City streets. Materials and loose debris must be delivered and loaded to prevent dropping materials or debris. Contractor must immediately remove spillage from hauling on any publicly traveled way. Streets affected by Work on the Project must be kept clean by street sweeping.

(D) **Disposal.** Contractor must dispose of all Project debris and waste materials in a safe and legal manner. Contractor may not burn or bury waste materials on the Project site. Contractor will not allow any dirt, refuse, excavated material, surplus concrete or mortar, or any associated washings, to be disposed of onto streets, into manholes or into the storm drain system.

(E) **Completion.** At the completion of the Work, Contractor must remove from the Project site all of its equipment, tools, surplus materials, waste materials and debris, presenting a clean and neat appearance. Before demobilizing from the Project site, Contractor must ensure that all surfaces are cleaned, sealed, waxed, or finished as applicable, and that all marks, stains, paint splatters, and the like have been properly removed from the completed Work and the surrounding areas. Contractor must ensure that all parts of the construction are properly joined with the previously existing and adjacent improvements and conditions. Contractor must provide all cutting, fitting and patching needed to accomplish that requirement. Contractor must also repair or replace all existing improvements that are damaged or removed during the Work, both on and off the Project site, including curbs, sidewalks, driveways, fences, signs, utilities, street surfaces and structures. Repairs and replacements must be at least equal to the previously existing improvements, and the condition, finish and dimensions must match the previously existing improvements. Contractor must restore to original condition all property or items that are not designated for alteration under the Contract Documents and leave each Worksite clean and ready for occupancy or use by City.

(F) **Non-Compliance.** If Contractor fails to comply with its maintenance and cleanup obligations or any City clean up order, City may, acting in its sole discretion, elect to suspend the Work until the condition(s) is corrected with no increase in the Contract Time or Contract Price, or undertake appropriate cleanup measures without further notice and deduct the cost from any amounts due or to become due to Contractor.

**7.10 Instructions and Manuals.** Contractor must provide to City three copies each of all instructions and manuals required by the Contract Documents, unless otherwise specified. These must be complete as to drawings, details, parts lists, performance data, and other information that may be required for City to easily maintain and service the materials and equipment installed for this Project.

(A) **Submittal Requirements.** All manufacturers' application or installation instructions must be provided to City at least ten days prior to the first such application. The instructions and manuals, along with any required guarantees, must be delivered to City for review.

(B) **Training.** Contractor or its Subcontractors must train City's personnel in the operation and maintenance of any complex equipment or systems as a condition precedent to Final Completion, if required in the Contract Documents.

**7.11 As-built Drawings.** Contractor and its Subcontractors must prepare and maintain at the Project site a detailed, complete and accurate as-built set of the Plans which will be used solely for the purpose of recording changes made in any portion of the original Plans in order to create accurate record drawings at the end of the Project.

(A) **Duty to Update.** The as-built drawings must be updated as changes occur, on a daily basis if necessary. City may withhold the estimated cost for City to have the as-built drawings prepared from payments otherwise due to Contractor, until the as-built drawings are brought up to date to the satisfaction of City. Actual locations to scale must be identified on the as-built drawings for all runs of mechanical and electrical work, including all site utilities installed underground, in walls, floors, or otherwise concealed. Deviations from the original Plans must be shown in detail. The exact location of all main runs, whether piping, conduit, ductwork or drain lines, must be shown by dimension and elevation. The location of all buried pipelines, appurtenances, or other improvements must be represented by coordinates and by the horizontal distance from visible above-ground improvements.

(B) **Final Completion.** Contractor must verify that all changes in the Work are depicted in the as-built drawings and must deliver the complete set of as-built drawings to the Engineer for review and acceptance as a condition precedent to Final Completion and Final Payment.

**7.12 Existing Utilities.**

(A) **General.** The Work may be performed in developed, urban areas with existing utilities, both above and below ground, including utilities identified in the Contract Documents or in other informational documents or records. Contractor must take due care to locate identified or reasonably identifiable utilities before proceeding with trenching, excavation, or any other activity that could damage or disrupt existing utilities. This may include excavation with small equipment, potholing, or hand excavation, and, if practical, using white paint or other suitable markings to delineate the area to be excavated. Except as otherwise provided herein, Contractor will be responsible for costs resulting from damage to identified or reasonably identifiable utilities due to Contractor's negligence or failure to comply with the Contract Documents, including the requirements in this Article 7.

(B) **Unidentified Utilities.** Pursuant to Government Code § 4215, if, during the performance of the Work, Contractor discovers utility facilities not identified by City in the Contract Documents, Contractor must immediately provide written notice to City and the utility. City assumes responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities located on the Project site if those utilities are not identified in the Contract Documents. Contractor will be compensated in accordance with the provisions of the Contract Documents for the costs of locating, repairing damage not due to Contractor's failure to exercise reasonable care, and removing or relocating utility facilities not indicated in the Plans or Specifications with reasonable accuracy, and for equipment on the Project necessarily idled during such work. Contractor will not be

assessed liquidated damages for delay in completion of the Work, to the extent the delay was caused by City's failure to provide for removal or relocation of the utility facilities.

**7.13 Notice of Excavation.** Contractor must comply with all applicable requirements in Government Code §§ 4216 through 4216.5, which are incorporated by reference herein. Government Code § 4216.2 requires that, except in an emergency, Contractor must contact the appropriate regional notification center, or Underground Services Alert, at least two working days, but not more than 14 calendar days, before starting any excavation if the excavation will be conducted in an area that is known, or reasonably should be known, to contain subsurface installations. Contractor may not begin excavation until it has obtained and submitted to Engineer an inquiry identification number from Underground Services Alert.

**7.14 Trenching and Excavations of Four Feet or More.** As required by Public Contract Code § 7104, if the Work includes digging trenches or other excavations that extend deeper than four feet below the surface, the provisions in this Section apply to the Work and the Project.

(A) **Duty to Notify.** Contractor must promptly, and before the following conditions are disturbed, provide written notice to City if Contractor finds any of the following conditions:

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

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

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

(B) **City Investigation.** City will promptly investigate the conditions and if City finds that the conditions materially differ from those indicated, apparent, or reasonably inferred from information about the Project site made available to bidders, or involve hazardous waste, and cause a decrease or increase in Contractor's cost of, or the time required for, performance of any part of the Work, City will issue a Change Order.

(C) **Disputes.** In the event that a dispute arises between City and Contractor regarding any of the conditions specified in subsection (B) above, or the terms of a Change Order issued by City, Contractor will not be excused from completing the Work within the Contract Time, but must proceed with all Work to be performed under the Contract. Contractor will retain any and all rights provided either by the Contract or by Laws which pertain to the resolution of disputes between Contractor and City.

**7.15 Trenching of Five Feet or More.** As required by Labor Code § 6705, if the Contract Price exceeds \$25,000 and the Work includes the excavation of any trench or trenches of five feet or more in depth, a detailed plan must be submitted to City for acceptance in advance of the excavation. The detailed plan must show the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation. If the plan varies from the shoring system standards, it must be prepared by a California registered civil or structural engineer. Use of a shoring,

sloping, or protective system less effective than that required by the Construction Safety Orders is prohibited.

**7.16 New Utility Connections.** Except as otherwise specified, City will pay connection charges and meter costs for new permanent utilities required by the Contract Documents, if any. Contractor must notify City sufficiently in advance of the time needed to request service from each utility provider so that connections and services are initiated in accordance with the Project schedule.

**7.17 Lines and Grades.** Contractor is required to use any benchmark provided by the Engineer. Unless otherwise specified in the Contract Documents, Contractor must provide all lines and grades required to execute the Work. Contractor must also provide, preserve, and replace if necessary, all construction stakes required for the Project. All stakes or marks must be set by a California licensed surveyor or a California registered civil engineer. Contractor must notify the Engineer of any discrepancies found between Contractor's staking and grading and information provided by the Contract Documents. Upon completion, all Work must conform to the lines, elevations, and grades shown in the Plans, including any changes directed by a Change Order.

**7.18 Historic or Archeological Items.**

(A) **Contractor's Obligations.** Contractor must ensure that all persons performing Work at the Project site are required to immediately notify the Project Manager, upon discovery of any potential historic or archeological items, including historic or prehistoric ruins, a burial ground, archaeological or vertebrate paleontological site, including fossilized footprints or other archeological, paleontological or historical feature on the Project site (collectively, "Historic or Archeological Items").

(B) **Discovery; Cessation of Work.** Upon discovery of any potential Historic or Archeological Items, Work must be stopped within an 85-foot radius of the find and may not resume until authorized in writing by City. If required by City, Contractor must assist in protecting or recovering the Historic or Archeological Items, with any such assistance to be compensated as Extra Work on a time and materials basis under Article 6, Contract Modification. At City's discretion, a suspension of Work required due to discovery of Historic or Archeological Items may be treated as Excusable Delay pursuant to Article 5, or as a suspension for convenience under Article 13.

**7.19 Environmental Control.** Contractor must not pollute any drainage course or its tributary inlets with fuels, oils, bitumens, acids, insecticides, herbicides or other harmful materials. Contractor must prevent the release of any hazardous material or hazardous waste into the soil or groundwater, and prevent the unlawful discharge of pollutants into City's storm drain system and watercourses as required below. Contractor and its Subcontractors must at all times in the performance of the Work comply with all Laws concerning pollution of waterways.

(A) **Stormwater Permit.** Contractor must comply with all applicable conditions of the State Water Resources Control Board National Pollutant Discharge Elimination System General Permit for Waste Discharge Requirements for Discharges of Stormwater Runoff Associated with Construction Activity ("Stormwater Permit").

(B) **Contractor's Obligations.** If required for the Work, a copy of the Stormwater Permit is on file in City's principal administrative offices, and Contractor must comply with it without adjustment of the Contract Price or the Contract Time. Contractor must timely and completely submit required reports and monitoring information required by the conditions of the Stormwater Permit. Contractor also must comply with all other Laws

governing discharge of stormwater, including applicable municipal stormwater management programs.

- 7.20 Noise Control.** Contractor must comply with all applicable noise control Laws. Noise control requirements apply to all equipment used for the Work or related to the Work, including trucks, transit mixers or transient equipment that may or may not be owned by Contractor.
- 7.21 Mined Materials.** Pursuant to the Surface Mining and Reclamation Act of 1975, Public Resources Code § 2710 et seq., any purchase of mined materials, such as construction aggregate, sand, gravel, crushed stone, road base, fill materials, and any other mineral materials must originate from a surface mining operation included on the AB 3098 List, which is available online at:  
<ftp://ftp.consrv.ca.gov/pub/omr/AB3098%20List/AB3908List.pdf>.

## Article 8 - Payment

- 8.1 Schedule of Values.** Prior to submitting its first application for payment, Contractor must prepare and submit to the Project Manager a schedule of values apportioned to the various divisions and phases of the Work, including mobilization and demobilization. If a Bid Schedule was submitted with Contractor's bid, the amounts in the schedule of values must be consistent with the Bid Schedule. Each line item contained in the schedule of values must be assigned a value such that the total of all items equals the Contract Price. The items must be sufficiently detailed to enable accurate evaluation of the percentage of completion claimed in each application for payment, and the assigned value consistent with any itemized or unit pricing submitted with Contractor's bid.
- (A) **Measurements for Unit Price Work.** Materials and items of Work to be paid for on the basis of unit pricing will be measured according to the methods specified in the Contract Documents.
- (B) **Deleted or Reduced Work.** Contractor will not be compensated for Work that City has deleted or reduced in scope, except for any labor, material or equipment costs for such Work that Contractor reasonably incurred before Contractor learned that the Work could be deleted or reduced. Contractor will only be compensated for those actual, direct and documented costs incurred, and will not be entitled to any mark up for overhead or lost profits.
- 8.2 Progress Payments.** Following the last day of each month, or as otherwise required by the Special Conditions or Specifications, Contractor will submit to the Project Manager a monthly application for payment for Work performed during the preceding month based on the estimated value of the Work performed during that preceding month.
- (A) **Application for Payment.** Each application for payment must be itemized to include labor, materials, and equipment incorporated into the Work, and materials and equipment delivered to the Project site, as well as authorized and approved Change Orders. Each payment application must be supported by the unit prices submitted with Contractor's Bid Schedule and/or schedule of values and any other substantiating data required by the Contract Documents.
- (B) **Payment of Undisputed Amounts.** City will pay the undisputed amount due within 30 days after Contractor has submitted a complete and accurate payment application, subject to Public Contract Code § 20104.50. City will deduct a percentage from each progress payment as retention, as set forth in Section 8.5, below, and may withhold additional amounts as set forth in Section 8.3, below.

**8.3 Adjustment of Payment Application.** City may adjust or reject the amount requested in a payment application, including application for Final Payment, in whole or in part, if the amount requested is disputed or unsubstantiated. Contractor will be notified in writing of the basis for the modification to the amount requested. City may also deduct or withhold from payment otherwise due based upon any of the circumstances and amounts listed below. Sums withheld from payment otherwise due will be released when the basis for that withholding has been remedied and no longer exists.

(A) For Contractor's unexcused failure to perform the Work as required by the Contract Documents, including correction or completion of punch list items, City may withhold or deduct an amount based on the City's estimated cost to correct or complete the Work.

(B) For loss or damage caused by Contractor or its Subcontractors arising out of or relating to performance of the Work or any failure to protect the Project site, City may deduct an amount based on the estimated cost to repair or replace.

(C) For Contractor's failure to pay its Subcontractors and suppliers when payment is due, City may withhold an amount equal to the total of past due payments and may opt to pay that amount separately via joint check pursuant to Section 8.6(B), Joint Checks.

(D) For Contractor's failure to timely correct rejected, nonconforming, or defective Work, City may withhold or deduct an amount based on the City's estimated cost to correct or complete the Work.

(E) For any unreleased stop notice, City may withhold 125% of the amount claimed.

(F) For Contractor's failure to submit any required schedule or schedule update in the manner and within the time specified in the Contract Documents, City may withhold an amount equal to five percent of the total amount requested until Contractor complies with its schedule submittal obligations.

(G) For Contractor's failure to maintain or submit as-built documents in the manner and within the time specified in the Contract Documents, City may withhold or deduct an amount based on the City's cost to prepare the as-builts.

(H) For Work performed without Shop Drawings that have been accepted by City, when accepted Shop Drawings are required before proceeding with the Work, City may deduct an amount based on the estimated cost to correct unsatisfactory Work or diminution in value.

(I) For fines, payments, or penalties assessed under the Labor Code, City may deduct from payments due to Contractor as required by Laws and as directed by the Division of Labor Standards Enforcement.

(J) For any other costs or charges that may be withheld or deducted from payments to Contractor, as provided in the Contract Documents, including liquidated damages, City may withhold or deduct such amounts from payment otherwise due to Contractor.

**8.4 Early Occupancy.** Neither City's payment of progress payments nor its partial or full use or occupancy of the Project constitutes acceptance of any part of the Work.

**8.5 Retention.** City will retain five percent of the full amount due on each progress payment (i.e., the amount due before any withholding or deductions pursuant to Section 8.3, Adjustment of Payment Application), or the percentage stated in the Notice Inviting Bids, whichever is greater, as retention to ensure full and satisfactory performance of the Work.

Contractor is not entitled to any reduction in the rate of withholding at any time, nor to release of any retention before 35 days following City's acceptance of the Project.

(A) **Substitution of Securities.** As provided by Public Contract Code § 22300, Contractor may request in writing that it be allowed, at its sole expense, to substitute securities for the retention withheld by City. Any escrow agreement entered into pursuant to this provision must fully comply with Public Contract Code § 22300 and will be subject to approval as to form by City's legal counsel. If City exercises its right to draw upon such securities in the event of default pursuant to section (7) of the statutory Escrow Agreement for Security Deposits in Lieu of Retention, pursuant to subdivision (f) of Public Contract Code § 22300 ("Escrow Agreement"), and if Contractor disputes that it is in default, its sole remedy is to comply with the dispute resolution procedures in Article 12 and the provisions therein. It is agreed that for purposes of this paragraph, an event of default includes City's rights pursuant to these Contract Documents to withhold or deduct sums from retention, including withholding or deduction for liquidated damages, incomplete or defective Work, stop payment notices, or backcharges. It is further agreed that if any individual authorized to give or receive written notice on behalf of a party pursuant to section (10) of the Escrow Agreement are unavailable to give or receive notice on behalf of that party due to separation from employment, retirement, death, or other circumstances, the successor or delegee of the named individual is deemed to be the individual authorized to give or receive notice pursuant to section (10) of the Escrow Agreement.

(B) **Release of Undisputed Retention.** All undisputed retention, less any amounts that may be assessed as liquidated damages, retained for stop notices, or otherwise withheld pursuant to Section 8.3, Adjustment of Payment Application, will be released as Final Payment to Contractor no sooner than 35 days following recordation of the notice of completion, and no later than 60 days following acceptance of the Project by City's governing body or authorized designee pursuant to Section 11.1(C), Acceptance, or, if the Project has not been accepted, no later than 60 days after the Project is otherwise considered complete pursuant to Public Contract Code § 7107(c).

**8.6 Payment to Subcontractors and Suppliers.** Each month, Contractor must promptly pay each Subcontractor and supplier the value of the portion of labor, materials, and equipment incorporated into the Work or delivered to the Project site by the Subcontractor or supplier during the preceding month. Such payments must be made in accordance with the requirements of Laws pertaining to such payments, and those of the Contract Documents and applicable subcontract or supplier contract.

(A) **Withholding for Stop Notice.** Pursuant to Civil Code § 9358, City will withhold 125% of the amount claimed by an unreleased stop notice, a portion of which may be retained by City for the costs incurred in handling the stop notice claim, including attorneys' fees and costs, as authorized by law.

(B) **Joint Checks.** City reserves the right, acting in its sole discretion, to issue joint checks made payable to Contractor and a Subcontractor or supplier, if City determines this is necessary to ensure fair and timely payment for a Subcontractor or supplier who has provided services or goods for the Project. As a condition to release of payment by a joint check, the joint check payees may be required to execute a joint check agreement in a form provided or approved by the City Attorney's Office. The joint check payees will be jointly and severally responsible for the allocation and disbursement of funds paid by joint check. Payment by joint check will not be construed to create a contractual relationship between City and a Subcontractor or supplier of any tier beyond the scope of the joint check agreement.



- 8.7 Final Payment.** Contractor's application for Final Payment must comply with the requirements for submitting an application for a progress payment as stated in Section 8.2, above. Corrections to previous progress payments, including adjustments to estimated quantities for unit priced items, may be included in the Final Payment. If Contractor fails to submit a timely application for Final Payment, City reserves the right to unilaterally process and issue Final Payment without an application from Contractor in order to close out the Project. For the purposes of determining the deadline for Claim submission pursuant to Article 12, the date of Final Payment is deemed to be the date that City acts to release undisputed retention as final payment to Contractor, or otherwise provides written notice to Contractor of Final Payment or that no undisputed funds remain available for Final Payment due to offsetting withholdings or deductions pursuant to Section 8.3, Adjustment of Payment Application. If the amount due from Contractor to City exceeds the amount of Final Payment, City retains the right to recover the balance from Contractor or its sureties.
- 8.8 Release of Claims.** City may, at any time, require that payment of the undisputed portion of any progress payment or Final Payment be contingent upon Contractor furnishing City with a written waiver and release of all claims against City arising from or related to the portion of Work covered by those undisputed amounts subject to the limitations of Public Contract Code § 7100. Any disputed amounts may be specifically excluded from the release.
- 8.9 Warranty of Title.** Contractor warrants that title to all work, materials, or equipment incorporated into the Work and included in a request for payment will pass over to City free of any claims, liens, or encumbrances upon payment to Contractor.

#### Article 9 - Labor Provisions

- 9.1 Discrimination Prohibited.** Discrimination against any prospective or present employee engaged in the Work on grounds of race, color, ancestry, national origin, ethnicity, religion, sex, sexual orientation, age, disability, or marital status is strictly prohibited. Contractor and its Subcontractors are required to comply with all applicable Laws prohibiting discrimination, including the California Fair Employment and Housing Act (Govt. Code § 12900 et seq.), Government Code § 11135, and Labor Code §§ 1735, 1777.5, 1777.6, and 3077.5.
- 9.2 Labor Code Requirements.**
- (A) **Eight Hour Day.** Pursuant to Labor Code § 1810, eight hours of labor constitute a legal day's work under this Contract.
- (B) **Penalty.** Pursuant to Labor Code § 1813, Contractor will forfeit to City as a penalty, the sum of \$25.00 for each day during which a worker employed by Contractor or any Subcontractor is required or permitted to work more than eight hours in any one calendar day or more than 40 hours per calendar week, except if such workers are paid overtime under Labor Code § 1815.
- (C) **Apprentices.** Contractor is responsible for compliance with the requirements governing employment and payment of apprentices, as set forth in Labor Code § 1777.5, which is fully incorporated by reference.
- (D) **Notices.** Pursuant to Labor Code § 1771.4, Contractor is required to post all job site notices prescribed by Laws.

**9.3 Prevailing Wages.** Each worker performing Work under this Contract that is covered under Labor Code §§ 1720 or 1720.9, including cleanup at the Project site, must be paid at a rate not less than the prevailing wage as defined in §§ 1771 and 1774 of the Labor Code. The prevailing wage rates are on file with the City and available online at <http://www.dir.ca.gov/dlsr>. Contractor must post a copy of the applicable prevailing rates at the Project site.

(A) **Penalties.** Pursuant to Labor Code § 1775, Contractor and any Subcontractor will forfeit to City as a penalty up to \$200.00 for each calendar day, or portion thereof, for each worker paid less than the applicable prevailing wage rate. Contractor must also pay each worker the difference between the applicable prevailing wage rate and the amount actually paid to that worker.

(B) **Federal Requirements.** If this Project is subject to federal prevailing wage requirements in addition to California prevailing wage requirements, Contractor and its Subcontractors are required to pay the higher of the currently applicable state or federal prevailing wage rates.

**9.4 Payroll Records.** Contractor must comply with the provisions of Labor Code §§ 1771.4, 1776, and 1812 and all implementing regulations, which are fully incorporated by this reference, including requirements for monthly electronic submission of payroll records to the DIR.

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

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

(2) Contractor or the Subcontractor has complied with the requirements of Labor Code §§ 1771, 1811, and 1815 for any Work performed by its employees on the Project.

(B) **Certified Record.** A certified copy of an employee's payroll record must be made available for inspection or furnished to the employee or his or her authorized representative on request, to City, to the Division of Labor Standards Enforcement, to the Division of Apprenticeship Standards of the DIR, and as further required by the Labor Code.

(C) **Enforcement.** Upon notice of noncompliance with Labor Code § 1776, Contractor or Subcontractor has ten days in which to comply with the requirements of this section. If Contractor or Subcontractor fails to do so within the ten-day period, Contractor or Subcontractor will forfeit a penalty of \$100.00 per day, or portion thereof, for each worker for whom compliance is required, until strict compliance is achieved. Upon request by the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement, these penalties will be withheld from payments then due to Contractor.

**9.5 Labor Compliance.** Pursuant to Labor Code § 1771.4, the Contract for this Project is subject to compliance monitoring and enforcement by the DIR.

## Article 10 - Safety Provisions

**10.1 Safety Precautions and Programs.** Contractor and its Subcontractors are fully responsible for safety precautions and programs, and for the safety of persons and property in the performance of the Work. Contractor and its Subcontractors must at all times comply with all applicable health and safety Laws and seek to avoid injury, loss, or damage to persons or property by taking reasonable steps to protect its employees and other persons at any Worksite, materials and equipment stored on or off site, and property at or adjacent to any Worksite.

(A) **Reporting Requirements.** Contractor must immediately notify the City of any death, serious injury or illness resulting from Work on the Project. Contractor must immediately provide a written report to City of each recordable accident or injury occurring at any Worksite within 24 hours of the occurrence. The written report must include: (1) the name and address of the injured or deceased person; (2) the name and address of each employee of Contractor or of any Subcontractor involved in the incident; (3) a detailed description of the incident, including precise location, time, and names and contact information for known witnesses; and (4) a police or first responder report, if applicable. If Contractor is required to file an accident report with a government agency, Contractor will provide a copy of the report to City.

(B) **Legal Compliance.** Contractor's safety program must comply with the applicable legal and regulatory requirements. Contractor must provide City with copies of all notices required by Laws.

(C) **Contractor's Obligations.** Any damage or loss caused by Contractor arising from the Work which is not insured under property insurance must be promptly remedied by Contractor.

(D) **Remedies.** If City determines, in its sole discretion, that any part of the Work or Project site is unsafe, City may, without assuming responsibility for Contractor's safety program, require Contractor or its Subcontractor to cease performance of the Work or to take corrective measures to City's satisfaction. If Contractor fails to promptly take the required corrective measures, City may perform them and deduct the cost from the Contract Price. Contractor agrees it is not entitled to submit a Claim for damages, for an increase in Contract Price, or for a change in Contract Time based on Contractor's compliance with City's request for corrective measures pursuant to this provision.

**10.2 Hazardous Materials.** Unless otherwise specified in the Contract Documents, this Contract does not include the removal, handling, or disturbance of any asbestos or other Hazardous Materials. If Contractor encounters materials on the Project site that Contractor reasonably believes to be asbestos or other Hazardous Materials, and the asbestos or other Hazardous Materials have not been rendered harmless, Contractor may continue Work in unaffected areas reasonably believed to be safe, but must immediately cease work on the area affected and report the condition to City. No asbestos, asbestos-containing products or other Hazardous Materials may be used in performance of the Work.

**10.3 Material Safety.** Contractor is solely responsible for complying with § 5194 of Title 8 of the California Code of Regulations, including by providing information to Contractor's employees about any hazardous chemicals to which they may be exposed in the course of the Work. A hazard communication program and other forms of warning and training about such exposure must be used. Contractor must also maintain Safety Data Sheets ("SDS") at the Project site, as required by Laws, for materials or substances used or consumed in the performance of the Work. The SDS will be accessible and available to Contractor's employees, Subcontractors, and City.

(A) **Contractor Obligations.** Contractor is solely responsible for the proper delivery, handling, use, storage, removal, and disposal of all materials brought to the Project site and/or used in the performance of the Work. Contractor must notify the Engineer if a specified product or material cannot be used safely.

(B) **Labeling.** Contractor must ensure proper labeling on any material brought onto the Project site so that any persons working with or in the vicinity of the material may be informed as to the identity of the material, any potential hazards, and requirements for proper handling, protections, and disposal.

**10.4 Hazardous Condition.** Contractor is solely responsible for determining whether a hazardous condition exists or is created during the course of the Work, involving a risk of bodily harm to any person or risk of damage to any property. If a hazardous condition exists or is created, Contractor must take all precautions necessary to address the condition and ensure that the Work progresses safely under the circumstances. Hazardous conditions may result from, but are not limited to, use of specified materials or equipment, the Work location, the Project site condition, the method of construction, or the way any Work must be performed.

**10.5 Emergencies.** In an emergency affecting the safety or protection of persons, Work, or property at or adjacent to any Worksite, Contractor must take reasonable and prompt actions to prevent damage, injury, or loss, without prior authorization from the City if, under the circumstances, there is inadequate time to seek prior authorization from the City.

## Article 11 - Completion and Warranty Provisions

### 11.1 Final Completion.

(A) **Final Inspection and Punch List.** When the Work required by this Contract is fully performed, Contractor must provide written notification to City requesting final inspection. The Engineer will schedule the date and time for final inspection, which must include Contractor's primary representative for this Project and its superintendent. Based on that inspection, City will prepare a punch list of any items that are incomplete, missing, defective, incorrectly installed, or otherwise not compliant with the Contract Documents. The punch list to Contractor will specify the time by which all of the punch list items must be completed or corrected. The punch list may include City's estimated cost to complete each punch list item if Contractor fails to do so within the specified time. The omission of any non-compliant item from a punch list will not relieve Contractor from fulfilling all requirements of the Contract Documents. Contractor's failure to complete any punch list item within the time specified in the punch list will not waive or abridge its warranty obligations for any such items that must be completed by the City or by a third party retained by the City due to Contractor's failure to timely complete any such outstanding item.

(B) **Requirements for Final Completion.** Final Completion will be achieved upon completion or correction of all punch list items, as verified by City's further inspection, and upon satisfaction of all other Contract requirements, including any commissioning required under the Contract Documents and submission of all final submittals, including instructions and manuals as required under Section 7.10, and complete, final as-built drawings as required under Section 7.11, all to City's satisfaction.

(C) **Acceptance.** The Project will be considered accepted upon City Council action during a public meeting to accept the Project, unless the Engineer is authorized to accept

the Project, in which case the Project will be considered accepted upon the date of the Engineer's issuance of a written notice of acceptance. In order to avoid delay of Project close out, the City may elect, acting in its sole discretion, to accept the Project as complete subject to exceptions for punch list items that are not completed within the time specified in the punch list.

(D) **Final Payment and Release of Retention.** Final Payment and release of retention, less any sums withheld pursuant to the provisions of the Contract Documents, will not be made sooner than 35 days after recordation of the notice of completion. If Contractor fails to complete all of the punch list items within the specified time, City may withhold up to 150% of City's estimated cost to complete each of the remaining items from Final Payment and may use the withheld retention to pay for the costs to self-perform the outstanding items or to retain a third party to complete any such outstanding punch list item.

## 11.2 Warranty.

(A) **General.** Contractor warrants that all materials and equipment will be new unless otherwise specified, of good quality, in conformance with the Contract Documents, and free from defective workmanship and materials. Contractor further warrants that the Work will be free from material defects not intrinsic in the design or materials required in the Contract Documents. Contractor warrants that materials or items incorporated into the Work comply with the requirements and standards in the Contract Documents, including compliance with Laws, and that any Hazardous Materials encountered or used were handled as required by Laws. At City's request, Contractor must furnish satisfactory evidence of the quality and type of materials and equipment furnished. Contractor's warranty does not extend to damage caused by normal wear and tear, or improper use or maintenance.

(B) **Warranty Period.** Contractor's warranty must guarantee its Work for a period of one year from the date of Project acceptance (the "Warranty Period"), except when a longer guarantee is provided by a supplier or manufacturer or is required by the Specifications or Special Conditions. Contractor must obtain from its Subcontractors, suppliers and manufacturers any special or extended warranties required by the Contract Documents.

(C) **Warranty Documents.** As a condition precedent to Final Completion, Contractor must supply City with all warranty and guarantee documents relevant to equipment and materials incorporated into the Work and guaranteed by their suppliers or manufacturers.

(D) **Subcontractors.** The warranty obligations in the Contract Documents apply to Work performed by Contractor and its Subcontractors, and Contractor agrees to be co-guarantor of such Work.

(E) **Contractor's Obligations.** Upon written notice from City to Contractor of any defect in the Work discovered during the Warranty Period, Contractor or its responsible Subcontractor must promptly correct the defective Work at its own cost. Contractor's obligation to correct defects discovered during the Warranty Period will continue past the expiration of the Warranty Period as to any defects in Work for which Contractor was notified prior to expiration of the Warranty Period. Work performed during the Warranty Period ("Warranty Work") will be subject to the warranty provisions in this Section 11.2 for a one-year period that begins upon completion of such Warranty Work to City's satisfaction.

(F) **City's Remedies.** If Contractor or its responsible Subcontractor fails to correct defective Work within ten days following notice by City, or sooner if required by the circumstances, City may correct the defects to conform with the Contract Documents at Contractor's sole expense. Contractor must reimburse City for its costs in accordance with subsection (H), below.

(G) **Emergency Repairs.** In cases of emergency where any delay in correcting defective Work could cause harm, loss or damage, City may immediately correct the defects to conform with the Contract Documents at Contractor's sole expense. Contractor or its surety must reimburse City for its costs in accordance with subsection (H), below.

(H) **Reimbursement.** Contractor must reimburse City for its costs to repair under subsections (F) or (G), above, within 30 days following City's submission of a demand for payment pursuant to this provision. If City is required to initiate legal action to compel Contractor's compliance with this provision, and City is the prevailing party in such action, Contractor and its surety are solely responsible for all of City's attorney's fees and legal costs expended to enforce Contractor's warranty obligations herein, in addition to any and all costs City incurs to correct the defective Work.

**11.3 Use Prior to Final Completion.** City reserves the right to occupy or make use of the Project, or any portions of the Project, prior to Final Completion if City has determined that the Project or portion of it is in a condition suitable for the proposed occupation or use, and that it is in its best interest to occupy or make use of the Project, or any portions of it, prior to Final Completion.

(A) **Non-Waiver.** Occupation or use of the Project, in whole or in part, prior to Final Completion will not operate as acceptance of the Work or any portion of it, nor will it operate as a waiver of any of City's rights or Contractor's duties pursuant to these Contract Documents, and will not affect nor bear on the determination of the time of substantial completion with respect to any statute of repose pertaining to the time for filing an action for construction defect.

(B) **City's Responsibility.** City will be responsible for the cost of maintenance and repairs due to normal wear and tear with respect to those portions of the Project that are being occupied or used before Final Completion. The Contract Price or the Contract Time may be adjusted pursuant to the applicable provisions of these Contract Documents if, and only to the extent that, any occupation or use under this Section actually adds to Contractor's cost or time to complete the Work within the Contract Time.

**11.4 Substantial Completion.** For purposes of determining "substantial completion" with respect to any statute of repose pertaining to the time for filing an action for construction defect, "substantial completion" is deemed to mean the last date that Contractor or any Subcontractor performs Work on the Project prior to City acceptance of the Project, except for warranty work performed under this Article.

## Article 12 - Dispute Resolution

**12.1 Claims.** This Article applies to and provides the exclusive procedures for any Claim arising from or related to the Contract or performance of the Work.

(A) **Definition.** "Claim" means a separate demand by Contractor, submitted in writing by registered or certified mail with return receipt requested, for a change in the Contract Time, including a time extension or relief from liquidated damages, or a change in the Contract Price, when the demand has previously been submitted to City in accordance with the requirements of the Contract Documents, and which has been

rejected or disputed by City, in whole or in part. A Claim may also include that portion of a unilateral Change Order that is disputed by the Contractor.

(B) **Limitations.** A Claim may only include the portion of a previously rejected demand that remains in dispute between Contractor and City. With the exception of any dispute regarding the amount of money actually paid to Contractor as Final Payment, Contractor is not entitled to submit a Claim demanding a change in the Contract Time or the Contract Price, which has not previously been submitted to City in full compliance with Article 5 and Article 6, and subsequently rejected in whole or in part by City.

(C) **Scope of Article.** This Article is intended to provide the exclusive procedures for submission and resolution of Claims of any amount and applies in addition to the provisions of Public Contract Code § 9204 and § 20104 et seq., which are incorporated by reference herein.

(D) **No Work Delay.** Notwithstanding the submission of a Claim or any other dispute between the parties related to the Project or the Contract Documents, Contractor must perform the Work and may not delay or cease Work pending resolution of a Claim or other dispute, but must continue to diligently prosecute the performance and timely completion of the Work, including the Work pertaining to the Claim or other dispute.

(E) **Informal Resolution.** Contractor will make a good faith effort to informally resolve a dispute before initiating a Claim, preferably by face-to-face meeting between authorized representatives of Contractor and City.

**12.2 Claims Submission.** The following requirements apply to any Claim subject to this Article:

(A) **Substantiation.** The Claim must be submitted to City in writing, clearly identified as a "Claim" submitted pursuant to this Article 12 and must include all of the documents necessary to substantiate the Claim including the Change Order request that was rejected in whole or in part, and a copy of City's written rejection that is in dispute. The Claim must clearly identify and describe the dispute, including relevant references to applicable portions of the Contract Documents, and a chronology of relevant events. Any Claim for additional payment must include a complete, itemized breakdown of all known or estimated labor, materials, taxes, insurance, and subcontract, or other costs. Substantiating documentation such as payroll records, receipts, invoices, or the like, must be submitted in support of each component of claimed cost. Any Claim for an extension of time or delay costs must be substantiated with a schedule analysis and narrative depicting and explaining claimed time impacts.

(B) **Claim Format and Content.** A Claim must be submitted in the following format:

(1) Provide a cover letter, specifically identifying the submission as a "Claim" submitted under this Article 12 and specifying the requested remedy (e.g., amount of proposed change to Contract Price and/or change to Contract Time).

(2) Provide a summary of each Claim, including underlying facts and the basis for entitlement, and identify each specific demand at issue, including the specific Change Order request (by number and submittal date), and the date of City's rejection of that demand, in whole or in part.

(3) Provide a detailed explanation of each issue in dispute. For multiple issues included within a single Claim or for multiple Claims submitted concurrently, separately number and identify each individual issue or Claim, and include the following for each separate issue or Claim:

- a. A succinct statement of the matter in dispute, including Contractor's position and the basis for that position;
- b. Identify and attach all documents that substantiate the Claim, including relevant provisions of the Contract Documents, RFIs, calculations, and schedule analysis (see subsection (A), Substantiation, above);
- c. A chronology of relevant events; and
- d. Analysis and basis for claimed changes to Contract Price, Contract Time, or any other remedy requested.

(4) Provide a summary of issues and corresponding claimed damages. If, by the time of the Claim submission deadline (below), the precise amount of the requested change in the Contract Price or Contract Time is not yet known, Contractor must provide a good faith estimate, including the basis for that estimate, and must identify the date by which it is anticipated that the Claim will be updated to provide final amounts.

(5) Include the following certification, executed by Contractor's authorized representative:

"The undersigned Contractor certifies under penalty of perjury that its statements and representations in this Claim submittal are true and correct. Contractor warrants that this Claim submittal is comprehensive and complete as to the matters in dispute, and agrees that any costs, expenses, or delay not included herein are deemed waived."

(C) ***Submission Deadlines.***

(1) A Claim disputing rejection of a request for a change in the Contract Time or Contract Price must be submitted within 15 days following the date that City notified Contractor in writing that a request for a change in the Contract Time or Contract Price, duly submitted in compliance with Article 5 and Article 6, has been rejected in whole or in part. A Claim disputing the terms of a unilateral Change Order must be submitted within 15 days following the date of issuance of the unilateral Change Order. These Claim deadlines apply even if Contractor cannot yet quantify the total amount of any requested change in the Contract Time or Contract Price. If the Contractor cannot quantify those amounts, it must submit an estimate of the amounts claimed pending final determination of the requested remedy by Contractor.

(2) With the exception of any dispute regarding the amount of Final Payment, any Claim must be filed on or before the date of Final Payment or will be deemed waived.

(3) A Claim disputing the amount of Final Payment must be submitted within 15 days of the effective date of Final Payment, under Section 8.7, Final Payment.

(4) Strict compliance with these Claim submission deadlines is necessary to ensure that any dispute may be mitigated as soon as possible, and to facilitate cost-efficient administration of the Project. ***Any Claim that is not submitted within the specified deadlines will be deemed waived by Contractor.***



**12.3 City's Response.** City will respond within 45 days of receipt of the Claim with a written statement identifying which portion(s) of the Claim are disputed, unless the 45-day period is extended by mutual agreement of City and Contractor or as otherwise allowed under Public Contract Code § 9204. However, if City determines that the Claim is not adequately substantiated pursuant to Section 12.2(A), Substantiation, City may first request in writing, within 30 days of receipt of the Claim, any additional documentation supporting the Claim or relating to defenses to the Claim that City may have against the Claim.

(A) **Additional Information.** If additional information is thereafter required, it may be requested and provided upon mutual agreement of City and Contractor. If Contractor's Claim is based on estimated amounts, Contractor has a continuing duty to update its Claim as soon as possible with information on actual amounts in order to facilitate prompt and fair resolution of the Claim.

(B) **Non-Waiver.** Any failure by City to respond within the times specified above will not be construed as acceptance of the Claim, in whole or in part, or as a waiver of any provision of these Contract Documents.

**12.4 Meet and Confer.** If Contractor disputes City's written response, or City fails to respond within the specified time, within 15 days of receipt of City's response or within 15 days of City's failure to respond within the applicable 45-day time period under Section 12.3, respectively, Contractor may notify City of the dispute in writing sent by registered or certified mail, return receipt requested, and demand an informal conference to meet and confer for settlement of the issues in dispute. If Contractor fails to notify City of the dispute and demand an informal conference to meet and confer in writing within the specified time, Contractor's Claim will be deemed waived.

(A) **Schedule Meet and Confer.** Upon receipt of the demand to meet and confer, City will schedule the meet and confer conference to be held within 30 days, or later if needed to ensure the mutual availability of each of the individuals that each party requires to represent its interests at the meet and confer conference.

(B) **Location for Meet and Confer.** The meet and confer conference will be scheduled at a location at or near City's principal office.

(C) **Written Statement After Meet and Confer.** Within ten working days after the meet and confer has concluded, City will issue a written statement identifying which portion(s) of the Claim remain in dispute, if any.

(D) **Submission to Mediation.** If the Claim or any portion remains in dispute following the meet and confer conference, within ten working days after the City issues the written statement identifying any portion(s) of the Claim remaining in dispute, the Contractor may identify in writing disputed portion(s) of the Claim, which will be submitted for mediation, as set forth below.

**12.5 Mediation and Government Code Claims.**

(A) **Mediation.** Within ten working days after the City issues the written statement identifying any portion(s) of the Claim remaining in dispute following the meet and confer, City and Contractor will mutually agree to a mediator, as provided under Public Contract Code § 9204. Mediation will be scheduled to ensure the mutual availability of the selected mediator and all of the individuals that each party requires to represent its interests. If there are multiple Claims in dispute, the parties may agree to schedule the mediation to address all outstanding Claims at the same time. The parties will share the costs of the mediator and mediation fees equally, but each party is otherwise solely and separately

responsible for its own costs to prepare for and participate in the mediation, including costs for its legal counsel or any other consultants.

(B) **Government Code Claims.**

(1) Timely presentation of a Government Code Claim is a condition precedent to filing any legal action based on or arising from the Contract. Compliance with the Claim submission requirements in this Article 12 is a condition precedent to filing a Government Code Claim.

(2) The time for filing a Government Code Claim will be tolled from the time Contractor submits its written Claim pursuant to Section 12.2, above, until the time that Claim is denied in whole or in part at the conclusion of the meet and confer process, including any period of time used by the meet and confer process. However, if the Claim is submitted to mediation, the time for filing a Government Code Claim will be tolled until conclusion of the mediation, including any continuations, if the Claim is not fully resolved by mutual agreement of the parties during the mediation or any continuation of the mediation.

- 12.6 Tort Claims.** This Article does not apply to tort claims and nothing in this Article is intended nor will be construed to change the time periods for filing tort-based Government Code Claims.
- 12.7 Arbitration.** It is expressly agreed, under Code of Civil Procedure § 1296, that in any arbitration to resolve a dispute relating to this Contract, the arbitrator's award must be supported by law and substantial evidence.
- 12.8 Burden of Proof and Limitations.** Contractor bears the burden of proving entitlement to and the amount of any claimed damages. Contractor is not entitled to damages calculated on a total cost basis, but must prove actual damages. Contractor is not entitled to speculative, special, or consequential damages, including home office overhead or any form of overhead not directly incurred at the Project site or any other Worksite; lost profits; loss of productivity; lost opportunity to work on other projects; diminished bonding capacity; increased cost of financing for the Project; extended capital costs; non-availability of labor, material or equipment due to delays; or any other indirect loss arising from the Contract. The Eichleay Formula or similar formula will not be used for any recovery under the Contract. The City will not be directly liable to any Subcontractor or supplier.
- 12.9 Legal Proceedings.** In any legal proceeding that involves enforcement of any requirements of the Contract Documents, the finder of fact will receive detailed instructions on the meaning and operation of the Contract Documents, including conditions, limitations of liability, remedies, claim procedures, and other provisions bearing on the defenses and theories of liability. Detailed findings of fact will be requested to verify enforcement of the Contract Documents. All of the City's remedies under the Contract Documents will be construed as cumulative, and not exclusive, and the City reserves all rights to all remedies available under law or equity as to any dispute arising from or relating to the Contract Documents or performance of the Work.
- 12.10 Other Disputes.** The procedures in this Article 12 will apply to any and all disputes or legal actions, in addition to Claims, arising from or related to this Contract, including disputes regarding suspension or early termination of the Contract, unless and only to the extent that compliance with a procedural requirement is expressly and specifically waived by City. Nothing in this Article is intended to delay suspension or termination under Article 13.

## Article 13 - Suspension and Termination

**13.1 Suspension for Cause.** In addition to all other remedies available to City, if Contractor fails to perform or correct Work in accordance with the Contract Documents, including non-compliance with applicable environmental or health and safety Laws, City may immediately order the Work, or any portion of it, suspended until the circumstances giving rise to the suspension have been eliminated to City's satisfaction.

(A) **Notice of Suspension.** Upon receipt of City's written notice to suspend the Work, in whole or in part, except as otherwise specified in the notice of suspension, Contractor and its Subcontractors must promptly stop Work as specified in the notice of suspension; comply with directions for cleaning and securing the Worksite; and protect the completed and in-progress Work and materials. Contractor is solely responsible for any damages or loss resulting from its failure to adequately secure and protect the Project.

(B) **Resumption of Work.** Upon receipt of the City's written notice to resume the suspended Work, in whole or in part, except as otherwise specified in the notice to resume, Contractor and its Subcontractors must promptly re-mobilize and resume the Work as specified; and within ten days from the date of the notice to resume, Contractor must submit a recovery schedule, prepared in accordance with the Contract Documents, showing how Contractor will complete the Work within the Contract Time.

(C) **Failure to Comply.** Contractor will not be entitled to an increase in the Contract Time or Contract Price for a suspension occasioned by Contractor's failure to comply with the Contract Documents.

(D) **No Duty to Suspend.** City's right to suspend the Work will not give rise to a duty to suspend the Work, and City's failure to suspend the Work will not constitute a defense to Contractor's failure to comply with the requirements of the Contract Documents.

**13.2 Suspension for Convenience.** City reserves the right to suspend, delay, or interrupt the performance of the Work in whole or in part, for a period of time determined to be appropriate for City's convenience. Upon notice by City pursuant to this provision, Contractor must immediately suspend, delay, or interrupt the Work and secure the Project site as directed by City except for taking measures to protect completed or in-progress Work as directed in the suspension notice, and subject to the provisions of Section 13.1(A) and (B), above. If Contractor submits a timely request for a Change Order in compliance with Articles 5 and 6, the Contract Price and the Contract Time will be equitably adjusted by Change Order pursuant to the terms of Articles 5 and 6 to reflect the cost and delay impact occasioned by such suspension for convenience, except to the extent that any such impacts were caused by Contractor's failure to comply with the Contract Documents or the terms of the suspension notice or notice to resume. However, the Contract Time will only be extended if the suspension causes or will cause unavoidable delay in Final Completion. If Contractor disputes the terms of a Change Order issued for such equitable adjustment due to suspension for convenience, its sole recourse is to comply with the Claim procedures in Article 12.

**13.3 Termination for Default.** City may declare that Contractor is in default of the Contract for a material breach of or inability to fully, promptly, or satisfactorily perform its obligations under the Contract.

(A) **Default.** Events giving rise to a declaration of default include Contractor's refusal or failure to supply sufficient skilled workers, proper materials, or equipment to perform the Work within the Contract Time; Contractor's refusal or failure to make prompt

payment to its employees, Subcontractors, or suppliers or to correct defective Work or damage; Contractor's failure to comply with Laws, or orders of any public agency with jurisdiction over the Project; evidence of Contractor's bankruptcy, insolvency, or lack of financial capacity to complete the Work as required within the Contract Time; suspension, revocation, or expiration and nonrenewal of Contractor's license or DIR registration; dissolution, liquidation, reorganization, or other major change in Contractor's organization, ownership, structure, or existence as a business entity; unauthorized assignment of Contractor's rights or duties under the Contract; or any material breach of the Contract requirements.

(B) **Notice of Default and Opportunity to Cure.** Upon City's declaration that Contractor is in default due to a material breach of the Contract Documents, if City determines that the default is curable, City will afford Contractor the opportunity to cure the default within ten days of City's notice of default, or within a period of time reasonably necessary for such cure, including a shorter period of time if applicable.

(C) **Termination.** If Contractor fails to cure the default or fails to expediently take steps reasonably calculated to cure the default within the time period specified in the notice of default, City may issue written notice to Contractor and its performance bond surety of City's termination of the Contract for default.

(D) **Waiver.** Time being of the essence in the performance of the Work, if Contractor's surety fails to arrange for completion of the Work in accordance with the Performance Bond within seven calendar days from the date of the notice of termination pursuant to paragraph (C), City may immediately make arrangements for the completion of the Work through use of its own forces, by hiring a replacement contractor, or by any other means that City determines advisable under the circumstances. Contractor and its surety will be jointly and severally liable for any additional cost incurred by City to complete the Work following termination, where "additional cost" means all cost in excess of the cost City would have incurred if Contractor had timely completed Work without the default and termination. In addition, City will have the right to immediate possession and use of any materials, supplies, and equipment procured for the Project and located at the Project site or any Worksite on City property for the purposes of completing the remaining Work.

(E) **Compensation.** Within 30 days of receipt of updated as-builts, all warranties, manuals, instructions, or other required documents for Work installed to date, and delivery to City of all equipment and materials for the Project for which Contractor has already been compensated, Contractor will be compensated for the Work satisfactorily performed in compliance with the Contract Documents up to the effective date of the termination pursuant to the terms of Article 8, Payment, subject to City's rights to withhold or deduct sums from payment otherwise due pursuant to Section 8.3, and excluding any costs Contractor incurs as a result of the termination, including any cancellation or restocking charges or fees due to third parties. If Contractor disputes the amount of compensation determined by City, its sole recourse is to comply with the Claim Procedures in Article 12, by submitting a Claim no later than 30 days following notice from City of the total compensation to be paid by City.

(F) **Wrongful Termination.** If Contractor disputes the termination, its sole recourse is to comply with the Claim procedures in Article 12. If a court of competent jurisdiction or an arbitrator later determines that the termination for default was wrongful, the termination will be deemed to be a termination for convenience, and Contractor's damages will be strictly limited to the compensation provided for termination for convenience under Section 13.4, below. Contractor waives any claim for any other damages for wrongful termination including special or consequential damages, lost

opportunity costs, or lost profits, and any award of damages is subject to Section 12.8, Burden of Proof and Limitations.

**13.4 Termination for Convenience.** City reserves the right, acting in its sole discretion, to terminate all or part of the Contract for convenience upon written notice to Contractor.

(A) **Compensation to Contractor.** In the event of City's termination for convenience, Contractor waives any claim for damages, including for loss of anticipated profits from the Project. The following will constitute full and fair compensation to Contractor, and Contractor will not be entitled to any additional claim or compensation:

(1) *Completed Work.* The value of its Work satisfactorily performed as of the date notice of termination is received, based on Contractor's schedule of values and unpaid costs for items delivered to the Project site that were fabricated for incorporation in the Work;

(2) *Demobilization.* Demobilization costs specified in the schedule of values, or if demobilization costs were not provided in a schedule of values pursuant to Section 8.1, then based on actual, reasonable, and fully documented demobilization costs; and

(3) *Termination Markup.* Five percent of the total value of the Work performed as of the date of notice of termination, including reasonable, actual, and documented costs to comply with the direction in the notice of termination for convenience, and demobilization costs, which is deemed to cover all overhead and profit to date.

(B) **Disputes.** If Contractor disputes the amount of compensation determined by City pursuant to paragraph (A), above, its sole recourse is to comply with the Claim procedures in Article 12, by submitting a Claim no later than 30 days following notice from City of total compensation to be paid by City.

**13.5 Actions Upon Termination for Default or Convenience.** The following provisions apply to any termination under this Article, whether for default or convenience, and whether in whole or in part.

(A) **General.** Upon termination, City may immediately enter upon and take possession of the Project and the Work and all tools, equipment, appliances, materials, and supplies procured or fabricated for the Project. Contractor will transfer title to and deliver all completed Work and all Work in progress to City.

(B) **Submittals.** Unless otherwise specified in the notice of termination, Contractor must immediately submit to City all designs, drawings, as-built drawings, Project records, contracts with vendors and Subcontractors, manufacturer warranties, manuals, and other such submittals or Work-related documents required under the terms of the Contract Documents, including incomplete documents or drafts.

(C) **Close Out Requirements.** Except as otherwise specified in the notice of termination, Contractor must comply with all of the following:

(1) Immediately stop the Work, except for any Work that must be completed pursuant to the notice of termination and comply with City's instructions for cessation of labor and securing the Project and any other Worksite(s).

(2) Comply with City's instructions to protect the completed Work and materials, using best efforts to minimize further costs.

(3) Contractor must not place further orders or enter into new subcontracts for materials, equipment, services or facilities, except as may be necessary to complete any portion of the Work that is not terminated.

(4) As directed in the notice, Contractor must assign to City or cancel existing subcontracts that relate to performance of the terminated Work, subject to any prior rights, if any, of the surety for Contractor's performance bond, and settle all outstanding liabilities and claims, subject to City's approval.

(5) As directed in the notice, Contractor must use its best efforts to sell any materials, supplies, or equipment intended solely for the terminated Work in a manner and at market rate prices acceptable to City.

(D) **Payment Upon Termination.** Upon completion of all termination obligations, as specified herein and in the notice of termination, Contractor will submit its request for Final Payment, including any amounts due following termination pursuant to this Article 13. Payment will be made in accordance with the provisions of Article 8, based on the portion of the Work satisfactorily completed, including the close out requirements, and consistent with the previously submitted schedule of values and unit pricing, including demobilization costs. Adjustments to Final Payment may include deductions for the cost of materials, supplies, or equipment retained by Contractor; payments received for sale of any such materials, supplies, or equipment, less re-stocking fees charged; and as otherwise specified in Section 8.3, Adjustment of Payment Application.

(E) **Continuing Obligations.** Regardless of any Contract termination, Contractor's obligations for portions of the Work already performed will continue and the provisions of the Contract Documents will remain in effect as to any claim, indemnity obligation, warranties, guarantees, submittals of as-built drawings, instructions, or manuals, record maintenance, or other such rights and obligations arising prior to the termination date.

#### Article 14 - Miscellaneous Provisions

- 14.1 Assignment of Unfair Business Practice Claims.** Under Public Contract Code § 7103.5, Contractor and its Subcontractors agree to assign to City all rights, title, and interest in and to all causes of action it may have under section 4 of the Clayton Act (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 (commencing with § 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the Contract or any subcontract. This assignment will be effective at the time City tenders Final Payment to Contractor, without further acknowledgement by the parties.
- 14.2 Provisions Deemed Inserted.** Every provision of law required to be inserted in the Contract Documents is deemed to be inserted, and the Contract Documents will be construed and enforced as though such provision has been included. If it is discovered that through mistake or otherwise that any required provision was not inserted, or not correctly inserted, the Contract Documents will be deemed amended accordingly.
- 14.3 Waiver.** City's waiver of a breach, failure of any condition, or any right or remedy contained in or granted by the provisions of the Contract Documents will not be effective unless it is in writing and signed by City. City's waiver of any breach, failure, right, or remedy will not be deemed a waiver of any other breach, failure, right, or remedy, whether or not similar, nor will any waiver constitute a continuing waiver unless specified in writing by City.

- 14.4 Titles, Headings, and Groupings.** The titles and headings used and the groupings of provisions in the Contract Documents are for convenience only and may not be used in the construction or interpretation of the Contract Documents or relied upon for any other purpose.
- 14.5 Statutory and Regulatory References.** With respect to any amendments to any statutes or regulations referenced in these Contract Documents, the reference is deemed to be the version in effect on the date that bids were due.
- 14.6 Survival.** The provisions that survive termination or expiration of this Contract include Contract Section 11, Notice, and subsections 12.1, 12.2, 12.3, 12.4, 12.5, and 12.6, of Section 12, General Provisions; and the following provisions in these General Conditions: Section 2.2(J), Contractor's Records, Section 2.3(C), Termination, Section 3.7, Ownership, Section 4.2, Indemnity, Article 12, Dispute Resolution, and Section 11.2, Warranty.

END OF GENERAL CONDITIONS

## **SPECIAL CONDITIONS**

### **1. Work Restrictions During Nesting Bird Season**

- a. Due to the presence of a protected bird specie in the nearby Tiscornia Marsh, construction activities for this project are restricted during the nesting bird season which is February 1<sup>st</sup> thru August 31<sup>st</sup>. During the nesting season, construction activities cannot occur within 700-feet of any surveyed bird nest unless mitigation measures are installed under the direction and approval of the City.
- b. A biological survey had been conducted on March 27, 2024 and positively spotted a bird within the marsh. Based on its approximate sighted location, the 700-foot buffer extends over the entire field. Therefore, only the area west of the west field fencing is outside of this restriction.

### **2. BCDC Permit**

- a. City staff working with the San Francisco Bay Conservation and Development Commission (BCDC) to finalize the required permit for this project. Once received the permit will be attached to these Specifications. The design team has already been addressed BCDC's previous comments so the final permit is not expected to include any additional conditions.

### **3. Additional Notes**

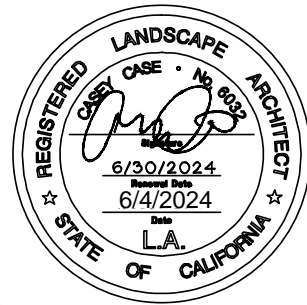
- a. Number of working days (255) assumes that all additional alternatives and phase 2 items will be included. Depending on the bid totals received, City will select which of these to award and change the number of working days accordingly.



CITY OF SAN RAFAEL  
PICKLWEED PARK

Technical Specifications

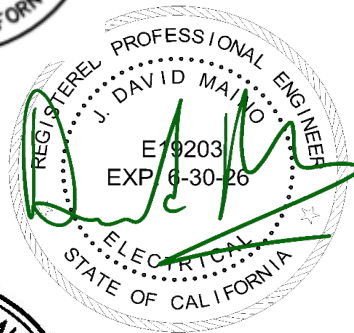
Casey Case, PLA  
Professional Landscape Architect No. 6032  
Exp. 6/30/2024



Andrew DeZurik, PE  
Registered Civil Engineer No. C85129  
Exp. 3/31/2026



Dave Maino, PE  
Registered Electrical Engineer No. E19203  
Exp. 06/30/26



Nathan Klemin, PE, GE  
Geotechnical Engineer No. 3168  
Exp. 3/31/2025



Lucas Jolly, SE  
Registered Structural Engineer No. S-5153  
Exp. 09/30/2024



# PICKLEWEED PARK

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**SECTION 01 10 00**  
**SUMMARY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This section describes the contract and other work, plus project requirements.
- B. Related Sections:
  - 1. Division 00 – General Conditions.

**1.02 CONTRACT DESCRIPTION**

- A. Summary of the Work: The Project includes all work described in Division 00 – General Conditions.
- B. Contract: Perform Work of Contract under stipulated sum contract with City per Contract Documents.
- C. Responsible Parties: Construction of the Project is governed by the agreement between the City and the Contractor. Statements in the specifications are directed to this contractor, who has overall responsibility for the subcontractors.
- D. Project Manager: The City will provide a Project Manager who will administer the project during the contract.

**1.03 WORK UNDER OTHER CONTRACTS**

- A. Separate Contracts: The City may award separate contracts for performance of certain construction operations at the site. Those operations will be conducted simultaneously with the work under the Contract. The Contracts are described in Division 00 Article 2 Section 2.4 – Coordination of Work.

**1.04 SCHEDULE OF VALUES**

- A. Schedule of Values: The Schedule of Values and Bid Schedule are described in Division 00 Article 8 – Payment. Any bid item may be deleted in total or in part prior to or after award of Contract without compensation in any form or adjustment of other bid items or prices, therefore.

**1.05 MISCELLANEOUS WORK**

- A. Miscellaneous Work Requirements: Coordinating, handling, transporting, and installing items such as field testing of systems; leveling; furnishing, coordinating, and installing sleeves, anchors, and other embedded items; posting of signs; performing traffic routing work; providing operating and maintenance data and instruction of the City Project Manager; performing warranty work as

required; and doing incidental and related work to place all systems and structures in operating condition as designed and as required by Federal, State and Local codes and regulations. Refer to Division 00 – General Conditions for a summary of work requirements.

## **1.06 OWNER-FURNISHED PRODUCTS**

### **A. Owner's Responsibilities:**

1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples to Contractor.
2. Upon delivery, inspect products jointly with Contractor.
3. Submit claims for transportation damage and replace damaged, defective, or deficient items.
4. Arrange for manufacturers' warranties, inspections, and service.

### **B. Contractor's Responsibilities:**

1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
3. Arrange and pay for delivery to Site. Retrieve items from City Corporation Yard or other designated location, as required, and transport to site. Transport salvaged items to City Corporation Yard.
4. Handle, store, install, and finish products.
5. Repair or replace items damaged after receipt.

## **1.07 WORK SEQUENCE**

- ### **A. Stages:** Construct Work in stages and at times to accommodate City operation requirements during the construction period; coordinate construction schedule and operations with Project Manager.

## **1.08 COOPERATION OF CONTRACTOR AND COORDINATION WITH OTHER WORK**

- ### **A. Coordination:** Coordinate with City and any City forces, or other contractors and forces, as required by Division 00 Article 2 Section 2.4 – Coordination of Work.

## **1.09 CONTRACTOR USE OF PREMISES**

- ### **A. General:** During the construction period the Contractor shall have full use of the premises within the “limits of work” for construction operations, including use of the site. The Contractor's use of the premises is limited only by the City's right to perform work or to retain other contractors on portions of the Project.

- B. Use of the Site:
1. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available for emergency vehicles at all times.
  2. Traffic and Barrier Plan: When the Contractor needs to access portions of roadways and driveways, on and adjacent to the work, Contractor is required to submit a traffic and barrier plan to the City for their review and approval prior to setting up any traffic control devices.
  3. Stored Materials: The Contractor assumes all responsibility for protection and safekeeping of material stored on the premises. Moving stored materials which interfere with the operations of the City or other contractors is the responsibility of the Contractor.
  4. Condition of Site: Maintain work areas in a safe condition at all times, remove all graffiti and accumulated rubbish and surplus materials at the end of each work day, and clean and restore the work site at completion of the work to the condition that existed prior to the start of work.
- C. Security of the Contractor's Work Area: The security of the Contractor's work areas and its property, equipment, construction materials, and all other items contained in the Contractor's staging areas or elsewhere on the construction site shall be solely the Contractor's responsibility at all times.

#### **1.10 MAINTENANCE**

- A. Contractor's Responsibility: Cost of maintenance of systems and equipment prior to Final Acceptance will be considered as included in prices bid and no direct or additional payment will be made therefore.

#### **1.11 OCCUPANCY REQUIREMENTS**

- A. Early Occupancy: Whenever, in the opinion of Project Manager, Work or any part thereof is in a condition suitable for use, and the best interest of City requires such use, City may take beneficial occupancy of and connect to, open for public use, or use the Work or such part thereof. In such case, City will inspect the Work or part thereof, and issue a Certificate of Substantial Completion for that part of Work.
- B. Repairs: Prior to date of Final Acceptance of the Work by City, all necessary repairs or renewals in Work or part thereof so used, not due to ordinary wear and tear, but due to defective materials or workmanship or to operations of Contractor, shall be made at expense of Contractor, as required in Division 00 Article 11 – Completion and Warranty Provisions.
- C. Acceptance: Use by City of Work or part thereof as contemplated by this section shall in no case be construed as constituting acceptance of Work or any part thereof. Such use shall neither relieve Contractor of any responsibilities under Contract, nor act as waiver by City of any of the conditions thereof.
- D. Partial Completion: City may specify in the Contract Documents that portions of the Work, including electrical and mechanical systems or separate structures, shall be substantially completed on milestone dates prior to substantial completion of all of the Work. Contractor shall

notify Project Manager in writing when Contractor considers any such part of the Work ready for its intended use and substantially complete and request Project Manager to issue a Certificate of Substantial Completion for that part of the Work.

**PART 2 PRODUCTS**

A. NOT USED

**PART 3 EXECUTION**

A. NOT USED

**END OF SECTION 01 10 00**

**SECTION 01 23 00**  
**ALTERNATES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements governing Alternates. Each Alternate is identified by number and describes the basic changes to be made in the Work.
- B. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for work defined in the Bidding Requirements that the City may elect to add to or deduct from the Base Bid amount, if the City decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
- C. Related Requirements:
  - 1. Materials and Methods Required by Alternates: Pertinent Specification Sections.

**1.02 ALTERNATE BIDS**

- A. Alternates will be accepted at option of the City; the Base Bid, including additive or deductive Alternates accepted by the City, will be an element considered in the award of the Contract.

**1.03 SCHEDULE OF ALTERNATES**

- A. Add Alternate No. 1 – Play Area: Demolish and remove existing concrete paving, turf, irrigation, and drainage as shown on plans and all related labor, work, materials, engineered fill, earthwork, compaction, turf sod, play structures, wood fiber play surfacing, seating, receptables and paving as shown on Drawings Sheets C1.03A, C2.03A, C3.03A, C4.03A, L1.13A, L2.13A, L3.13A, and L4.53 and as described in the Geotechnical Report.
- B. Add Alternate No. 2 – Cameras: Install site receptable conduit, wiring, and cameras as shown on sheet E1.1B and all related labor, work, materials, earthwork, compaction, poles, receptables, wiring, and cameras as shown on Drawing Sheets E1.1B.
- C. Add Alternate No. 3 – Phase 3: Regrading of the drainage swale along the norther and east sides of the new turf field, grading of the drainage swale along the basketball court perimeter, pedestrian concrete pathway and vehicular driveway connections to the Tiscornia Marsh levee pathway, and all related labor, work, materials, earthwork, benching, subgrade preparation, compaction, and erosion control required to facilitate the improvements as sown on drawings C1.01B, C1.02B, C2.01B, C2.02B, C3.01B, C3.02B, and C6.02B.



**PART 2 EXECUTION**

**2.01 MODIFICATIONS TO WORK**

- A. Execute accepted alternates under the same conditions as other Work of this Contract.
- B. Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Modify or adjust affected adjacent Work as required to completely and fully integrate that Work into the Project.

**END OF SECTION 01 23 00**

**SECTION 01 25 00**  
**SUBSTITUTION PROCEDURES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. Related Sections:
  - 1. [Division 00 – General Conditions.](#)

**1.02 DEFINITIONS**

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions.
  - 1. Substitutions will not be considered during the Bid process.
  - 2. The following are not considered to be requests for substitution:
    - 3. Revisions to the Contract Documents requested by the Owner or Architect/Engineer.
    - 4. Specified options of products and construction methods included in the Contract Documents.
  - 5. The following are considered to be requests for substitution:
    - a) Any manufacturer, product, process, or method identified in the special provisions, specifications or on the Drawings as either “or equal” or “equal products of another manufacturer when approved in advance by the Architect/Engineer per this Section 01 25 00 – Substitution Procedures”.

**1.03 SUBMITTALS**

- A. Request for Substitution (RFS) Submittal:
  - 1. Receipt:
    - a) The Architect/Engineer will consider requests for substitution (RFS) if received within thirty-five (35) calendar days after the Notice to Proceed.

- b) Requests received after thirty-five (35) calendar days after the Notice to Proceed may be considered or rejected at the discretion of the Project Manager and/or Architect/Engineer.

Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and according to the procedures required in [Division 00 – General Conditions](#).

- B. Identify the product or the fabrication or installation method to be replaced in each request. Include related Special Provisions, Specification Section and Drawing numbers.
- C. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
  - 1. Coordination information, including a list of change or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed substitution.
  - 2. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, operations, maintenance, and visual effect.
  - 3. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
  - 4. Samples, where applicable or requested.
  - 5. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without the approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
  - 6. Cost information, including a proposal of net change, if any, in the Contract Sum.
  - 7. The Contractor's certification that the proposed substitution conforms to the requirements in the Contract Documents, in every respect and is appropriate for the applications indicated.
- D. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
  - 1. Architect/Engineer Action: If necessary, the Architect/Engineer will request additional information or documentation for evaluation within fourteen (14) calendar days of receipt of a request for substitution. The Project Manager will route to the Contractor, the Architect/Engineer's acceptance or rejection of the substitution within fourteen (14) days of the receipt of the request, or receipt of additional information or documentation.

## **PART 2 PRODUCTS**

### **2.01 SUBSTITUTIONS**

- A. Conditions: The Architect/Engineer will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect/Engineer. If the following conditions are not satisfied, the Architect/Engineer will return

the requests without action except to record non-compliance with these requirements:

1. Extensive revisions to the Contract Documents are not required.
  2. Proposed changes are in keeping with the general intent of the Contract Documents.
  3. The request is timely, fully documented, and properly submitted.
  4. The request is directly related to an “or-equal” clause or similar language in the Contract Documents.
  5. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, maintainability, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner’s additional responsibilities may include compensation to the Architect/Engineer for redesign and evaluation services, compensation to the Project Manager for additional management and coordination, increased cost of other construction by the Owner, and similar considerations.
  6. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
  7. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
  8. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- B. The Contractor’s submittal and the Architect/Engineer acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

### **PART 3 EXECUTION**

**NOT USED**

**END OF SECTION 01 25 00**

**SECTION 01 26 00**  
**CONTRACT MODIFICATION PROCEDURES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for handling requests for contract modifications made after award of the Contract.
- B. Related Sections:
  - 1. [Division 00 – General Conditions.](#)

**PART 2 PRODUCTS**

**2.01 CONTRACT MODIFICATION**

- A. Subject to the limited exception set forth in subsection (D) below, any change in the Work or the Contract Documents, including the Contract Price or Contract Time, will not be a valid and binding change to the Contract unless it is formalized in a Change Order, including a “no-cost” Change Order or a unilateral Change Order. Changes in the Work pursuant to this Article 6 will not operate to release, limit, or abridge Contractor’s warranty obligations pursuant to Article 11 or any obligations of Contractor’s bond sureties.
- B. City-Directed Changes. City may direct changes in the scope or sequence of Work or the requirements of the Contract Documents, without invalidating the Contract. Such changes may include Extra Work as set forth in subsection (C) below, or deletion or modification of portions of the Work. Contractor must promptly comply with City-directed changes in the Work in accordance with the original Contract Documents, even if Contractor and City have not yet reached agreement as to adjustments to the Contract Price or Contract Time for the change in the Work or for the Extra Work. Contractor is not entitled to extra compensation for cost savings resulting from “value engineering” pursuant to Public Contract Code § 7101, except to the extent authorized in advance by City in writing, and subject to any applicable procedural requirements for submitting a proposal for value engineering cost savings.
- C. Disputes. In the event of a dispute over entitlement to or the amount of a change in Contract Time or a change in Contract Price related to a City-directed change in the Work, Contractor must perform the Work as directed and may not delay its Work or cease Work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute. Likewise, in the event that City and Contractor dispute whether a portion or portions of the Work are already required by the Contract Documents or constitute Extra Work, or otherwise dispute the interpretation of any portion(s) of the Contract Documents, Contractor must perform the Work as directed and may not delay its Work or cease Work pending resolution of the dispute, but must continue to comply with

its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute, as directed by City. If Contractor refuses to perform the Work in dispute, City may, acting in its sole discretion, elect to delete the Work from the Contract and reduce the Contract Price accordingly, and self-perform the Work or direct that the Work be performed by others. Alternatively, City may elect to terminate the Contract for convenience or for cause. Contractor's sole recourse for an unresolved dispute related to changes in the Work or performance of any Extra Work is to comply with the dispute resolution provisions set forth in Article 12, below.

- D. **Extra Work.** City may direct Contractor to perform Extra Work related to the Project. Contractor must promptly perform any Extra Work as directed or authorized by City in accordance with the original Contract Documents, even if Contractor and City have not yet reached agreement on adjustments to the Contract Price or Contract Time for such Extra Work. If Contractor believes it is necessary to perform Extra Work due to changed conditions, Contractor must promptly notify the Engineer in writing, specifically identifying the Extra Work and the reason(s) the Contractor believes it is Extra Work. This notification requirement does not constitute a Change Order request pursuant to Section 6.2, below. Contractor must maintain detailed daily records that itemize the cost of each element of Extra Work, and sufficiently distinguish the direct cost of the Extra Work from the cost of other Work performed. For each day that Contractor performs Extra Work, or Work that Contractor contends is Extra Work, Contractor must submit no later than the following Working Day, a daily report of the Extra Work performed that day and the related costs, together with copies of certified payroll, invoices, and other documentation substantiating the costs ("Extra Work Report"). The Engineer will make any adjustments to Contractor's Extra Work Report(s) based on the Engineer's records of the Work. When an Extra Work Report(s) is agreed on and signed by both City and Contractor, the Extra Work Report(s) will become the basis for payment under a duly authorized and signed Change Order. Failure to submit the required documentation by close of business on the next Working Day is deemed a full and complete waiver for any change in the Contract Price or Contract Time for any Extra Work performed that day.
- E. **Minor Changes and RFIs.** Minor field changes, including RFI replies from City, that do not affect the Contract Price or Contract Time and that are approved by the Engineer acting within his or her scope of authority, do not require a Change Order. By executing an RFI reply from City, Contractor agrees that it will perform the Work as clarified therein, with no change to the Contract Price or Contract Time.
- F. **Remedy for Non-Compliance.** Contractor's failure to promptly comply with a City-directed change is deemed a material breach of the Contract, and in addition to all other remedies available to it, City may, at its sole discretion, hire another contractor or use its own forces to complete the disputed Work at Contractor's sole expense, and may deduct the cost from the Contract Price.

## **2.02 CONTRACTOR CHANGE ORDER REQUESTS.**

- A. Contractor must submit a request or proposal for a change in the Work, compensation for Extra Work, or a change in the Contract Price or Contract Time as a written Change Order request or proposal.
- B. **Time for Submission.** Any request for a change in the Contract Price or the Contract Time must be submitted in writing to the Engineer within ten calendar days of the date that Contractor first encounters the circumstances, information or conditions giving rise to the Change Order request, even

if the total amount of the requested change in the Contract Price or impact on the Contract Time is not yet known at that time. If City requests that Contractor propose the terms of a Change Order, unless otherwise specified in City's request, Contractor must provide the Engineer with a written proposal for the change in the Contract Price or Contract Time within five working days of receiving City's request, in a form satisfactory to the Engineer.

- C. **Required Contents.** Any Change Order request or proposal submitted by Contractor must include a complete breakdown of actual or estimated costs and credits, and must itemize labor, materials, equipment, taxes, insurance, subcontract amounts, and, if applicable, Extra Work Reports. Any estimated cost must be updated in writing as soon as the actual amount is known.
- D. **Required Documentation.** All claimed costs must be fully documented, and any related request for an extension of time or delay-related costs must be included at that time and in compliance with the requirements of Article 5 of the General Conditions. Upon request, Contractor must permit City to inspect its original and unaltered bidding records, subcontract agreements, subcontract change orders, purchase orders, invoices, or receipts associated with the claimed costs.
- E. **Required Form.** Contractor must use City's form(s) for submitting all Change Order requests or proposals, unless otherwise specified by City.
- F. **Certification.** All Change Order requests must be signed by Contractor and must include the following certification:

“The undersigned Contractor certifies under penalty of perjury that its statements and representations in this Change Order request are true and correct. Contractor warrants that this Change Order request is comprehensive and complete as to the Work or changes referenced herein, and agrees that any known or foreseeable costs, expenses, or time extension requests not included herein, are deemed waived.”

### **2.03 ADJUSTMENTS TO CONTRACT PRICE**

- A. The amount of any increase or decrease in the Contract Price will be determined based on one of the following methods listed below, in the order listed with unit pricing taking precedence over the other methods. Markup applies only to City-authorized time and material Work, and does not apply to any other payments to Contractor. For Work items or components that are deleted in their entirety, Contractor will only be entitled to compensation for those direct, actual, and documented costs (including restocking fees), reasonably incurred before Contractor was notified of the City's intent to delete the Work, with no markup for overhead, profit, or other indirect costs.
- B. **Unit Pricing.** Amounts previously provided by Contractor in the form of unit prices, either in a bid schedule or in a post-award schedule of values pursuant to Section 8.1, Schedule of Values, will apply to determine the price for the affected Work, to the extent applicable unit prices have been provided for type of Work. No additional markup for overhead, profit, or other indirect costs will be added to the calculation.

- C. Lump Sum. A mutually agreed upon, all-inclusive lump sum price for the affected Work with no additional markup for overhead, profit, or other indirect costs.
- D. Time and Materials. On a time and materials basis, if and only to the extent compensation on a time and materials basis is expressly authorized by City in advance of Contractor's performance of the Work and subject to any not-to-exceed limit. Time and materials compensation for increased costs or Extra Work (but not decreased costs or deleted Work), will include allowed markup for overhead, profit, and other indirect costs, and which may include a not-to-exceed limit, calculated as the total of the following sums, the cumulative total of which may not exceed the maximum markup rate of 15%:
  - 1. All direct labor costs provided by the Contractor, excluding superintendence, project management, or administrative costs, plus 15% markup;
  - 2. All direct material costs provided by the Contractor, including sales tax, plus 15% markup;
  - 3. All direct plant and equipment rental costs provided by the Contractor, plus 15% markup;
  - 4. All direct additional subcontract costs plus 10% markup for Work performed by Subcontractors; and
  - 5. Increased bond or insurance premium costs computed at 1.5% of total of the previous four sums.

**2.04 UNILATERAL CHANGE ORDER**

- A. If the parties dispute the terms of a proposed Change Order, including disputes over the amount of compensation or extension of time that Contractor has requested, the value of deleted or changed Work, what constitutes Extra Work, or quantities used, City may elect to issue a unilateral Change Order, directing performance of the Work, and authorizing a change in the Contract Price or Contract Time for the adjustment to compensation or time that the City believes is merited. Contractor's sole recourse to dispute the terms of a unilateral Change Order is to submit a timely Claim pursuant to Article 12, below.

**2.05 NON-COMPLIANCE DEEMED WAIVER**

- A. Contractor waives its entitlement to any increase in the Contract Price or Contract Time if Contractor fails to fully comply with the provisions of this Article. Contractor will not be paid for unauthorized Extra Work.

**PART 3 EXUCUTION**

NOT USED.

**END OF SECTION 01 26 00**



**SECTION 01 30 00**  
**ABNORMAL WEATHER CONDITIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The General Conditions and Supplementary Conditions of the Contract apply to the work in this section.

**1.02 DESCRIPTION**

- A. A rain, windstorm, high water or other natural phenomenon which might reasonably have been anticipated from historical records of the general locality shall not be construed as abnormal. It is hereby agreed that all disruptive weather events with an average interval of ten (10) years or more between their occurrence and the occurrence of a similar event of equal or greater magnitude cannot be reasonably anticipated. For the purposes of this contract, weather information and historical data for an area in question shall be assumed to be the same as that measured at the nearest or most applicable record station of the Environmental Data Service of the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.
- B. Information on measuring stations of the National Oceanic and Atmospheric Administration (NOAA) can be found in the "Climatological Data" published by NOAA. This publication may be found in public libraries or contact:  
  
U.S. Department of Commerce  
National Climatic Center  
Federal Building  
Ashville, NC 28801

**1.03 DELAYS DUE TO ABNORMAL WEATHER**

- A. Weather days will be recorded by the Contractor and forwarded to the Project Manager within five (5) days of occurrence. Each record shall indicate the critical path activity(s) affected. It will be the contractor's duty to perform on unaffected activities whenever possible during weather days.
- B. Weather day delays are calculated by subtracting the 10-year average disruptive weather, as described above, from the actual encountered/report days.
- C. There shall be no increase in the contract sum, time, or remuneration of any kind by Owner to Contractor for extensions due to adverse weather conditions which fall within the parameters of the 10 year average.
- D. Time extensions may be granted for weather impacts occurring beyond the parameters set forth in this section on critical path activities only. The Contractor is to provide schedule data to the

Project manager illustrating the critical path impact. There shall be no increase in the contract sum due to time extensions granted for weather delays.

**PART 2 PRODUCTS**

Not Applicable.

**PART 3 EXECUTION**

Not Applicable.

**PART 4 MEASUREMENT & PAYMENT**

- A. **Measurement and Payment:** Full compensation for “Abnormal Weather Conditions” shall be considered as included in the contract unit prices paid for the various items of work performed and no additional compensation will be allowed.

**END OF SECTION 01 30 00**

**SECTION 01 31 19**  
**PROJECT MEETINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Criteria for Project meetings to be held both before and during construction.

**PART 2 PRECONSTRUCTION CONFERENCE**

- A. A Preconstruction Conference to discuss Project Work will be held at a time and location designated by the Project Manager.
- B. Attendance: Owner, Project Manager, Architect/Engineer, Contractors, Inspector, and representatives of Contractor's major subcontractors. The purpose of this conference is to discuss the Project in general, including scheduling of Work, and to answer questions that may arise. Unless followed up in writing, verbal authorizations or instructions by anyone present shall not be binding.

**PART 3 PROGRESS MEETINGS**

- A. At a time designated by Project Manager, Weekly Progress Meetings will be held at location to be determined.
- B. Attendance: Project Manager, Architect/Engineer, Contractors, Inspector, major subcontractors, Project Manager, Architect, and Suppliers as deemed necessary by the Project Manager.
- C. Contractor will be responsible for notifying subcontractors and suppliers of their required attendance. The purpose of these meetings is to discuss schedule, progress, coordination, submittals, and job related problems.
- D. Verbal authorizations or acknowledgments by anyone present will not be binding unless followed up in writing by authorized representatives of the Owner or Contractor.
- E. The Project Manager will conduct the meetings, prepare and distribute meeting notes.

**PART 4 MEASUREMENT & PAYMENT:**

- A. **Measurement and Payment:** "Project Meetings", will be measured and paid in the *Lump Sum* price paid for "General Conditions" complete and in place, and no additional compensation shall be allowed.

**END OF SECTION 01 31 19**

**SECTION 01 33 00**  
**SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General:
  - 1. Section Addresses:
    - a. Mechanics and administration of the submittal process for shop drawings, operation and maintenance manuals, and miscellaneous submittal items.

**1.02 RELATED SECTIONS**

- A. Related Sections include but are not necessarily limited to:
  - 1. Special Provisions, Proposal, and Contract.
  - 2. Division 1 – General Requirements.
  - 3. Sections in Division 2 through 33 identifying required submittals.

**1.03 DEFINITIONS**

- A. Shop Drawings:
  - 1. See General Conditions
  - 2. Product data and samples are Shop Drawing information.
- B. Miscellaneous Submittals:
  - 1. Submittals other than Shop Drawings:
  - 2. Representative types of miscellaneous submittal items include but are not limited to:
    - a. Construction schedule.
    - b. Concrete, soil compaction, and pressure test reports.
    - c. Installed equipment and systems performance test reports.
    - d. Manufacturer's installation certification letters.
    - e. Instrumentation and control commissioning reports.
    - f. Warranties.
    - g. Service agreements.
    - h. Construction photographs.

**1.04 TRANSMITTALS**

- A. Shop Drawings and Operation and Maintenance Manuals:

1. Transmit all submittals to City Engineer.
  2. All transmittals must be from the Contractor and bear their approval stamp. Transmittals will not be received from or returned to subcontractors.
    - a. Shop drawing transmittal stamp shall read (Contractor's Name) has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval. Transmittals will not be received from or returned to subcontractors.
    - b. Operation and Maintenance Manual transmittal stamp may be Contractor's standard approval stamp.
  3. Provide submittal information defining specific equipment or materials utilized on the project. Generalized product information not clearly defining specific equipment or materials to be provided will be rejected.
  4. Calculations required in individual specification sections will be received for information purposes only and will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.
  5. Calculations required in individual specification sections are required as For-Information Only-For-Future-Use submittals. Calculations and other submittals identified as For-Information-Only-For Future-Use submittals shall be transmitted directly to the Engineer at:
  6. Submittal schedule:
    - a. Schedule of shop drawings and submittals:
      - 1) Submitted and approved within 20 days of receipt of Notice to Proceed.
      - 2) Submittal review comments will be provided within 10 days of receipt of complete submittal.
    - b. Shop drawings:
      - 1) Submittal and approval prior to 50 percent completion.
    - c. Operation and Maintenance Manuals and Equipment Record Sheets:
      - 1) Initial submittal within 60 days after date shop drawings are approved.
- B. Miscellaneous Submittals:
1. Transmit under Contractor's standard letter of transmittal or letterhead.
  2. Submit in triplicate or as specified in individual specification section.
  3. Transmit to:
  4. Provide copy of letter of transmittal to Owner's Resident Project Representative.
    - a. Exception for concrete, soils compaction and pressure test reports.
      - 1) Transmit one copy to Resident Project Engineer.
      - 2) Transmit one copy to location and individual indicated above for other miscellaneous submittals.

## **1.05 PREPARATION OF SUBMITTALS**

### **A. Packaging of Submittals**

1. Submittals for work items shall be fully complete and inclusive of all work within the specification section submitted as a single package with a detailed table of contents. Single submittals of miscellaneous general items will be returned for packaging within the Section

Submittal.

B. Shop Drawings:

1. Number transmittals consecutively.
2. Restrict each letter of transmittal to only one Specification Section or portion thereof.
3. Provide breakout of each transmittal contents on transmittal form. Each component thus defined will receive specific action by the Engineer. Define manufacturer, item, Contract Document tag number, and Constrict Drawings/Specification reference.
4. Do not change the scope of any resubmittal from the original transmittal scope.
5. For 8 ½ x 11 size sheets, provide digital copies of each page for Engineer plus the number required by the Contractor.
6. For items not covered in paragraph 1.04-A.6 submit one reproducible transparency and one print of each drawing until approval is obtained. Utilize mailing tube; do not fold. The Engineer will mark and return the reproducible to the Contractor for his reproduction and distribution.
7. Provide clear space (3”square) for Engineer stamping of each component defined in 1.04-A.4.
8. Transmittal contents:
  - a. Coordinate and identify shop drawing contents so that all items can be easily verified by the Engineer.
  - b. Identify equipment or material use, tag number, drawing detail, references, weight, and other project specific information.
  - c. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
  - d. Submit items like equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8 ½ x 11 pages. Indicate exact item or model and all options proposed.
  - e. Include legible scale details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout drawings, parts catalogs, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data. Arrange data and performance information in form at similar to that provided in Contract Documents. Provide, at minimum, the detail provided in the contract Documents.
  - f. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet.

C. Samples:

1. Identification:
  - a. Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, specification section or drawing detail reference, color, range, texture, finish and other pertinent data.
  - b. If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.

2. Include application specific brochures, and installation instructions.
3. Provide Contractor's stamp of approval on samples or transmittal form as indication of Contractor's checking and verification of dimensions and coordination with interrelated work.
4. Resubmit samples of rejected items.

#### **1.06 REVIEW AND RESUBMISSION REQUIREMENTS**

- A. The Project Manager will arrange for review by appropriate reviewer and return to Contractor as provided below within fourteen (14) calendar days after receipt or within fourteen (14) calendar days after receipt of all related information necessary for such review, whichever is later.
- B. Noted on the submittal, one (1) copy of product or materials data will be returned with the review status.
- C. Samples to be incorporated in the Work will be returned, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review. Other Samples will not be returned, but the same notice will be given with respect thereto, and such notice shall be considered a return of the Sample.
- D. Contractor shall revise and resubmit any Shop Drawings or Data as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Drawings, Data and Samples, within fourteen (14) calendar days after receipt thereof or within fourteen (14) calendar days after receipt of all related information necessary for such review.
- E. Contractor may proceed with any of the work covered by a Shop Drawing, Data, or a Sample upon its return if designated as no exception taken. Contractor may also proceed with the work covered by a Shop Drawing, Data or Sample provided the Contractor proceeds in accordance with the Architect's notes and comments.
- F. Contractor shall not begin any of the Work covered by a Shop Drawing, Data or Sample designated as revise and resubmit or rejected until a revision or correction thereof has been reviewed and returned.
- G. A Drawing, Data or Sample designated as revise and resubmit or rejected and requiring resubmittal shall be revised or corrected and resubmitted to the Project Manager no later than seven (7) calendar days after its return to Contractor.
- H. Neither the review nor the lack of review of any Shop Drawing, Data or Sample shall waive any of the requirements of the Contract, or relieve Contractor of any obligation thereunder.
- I. Approval of shop drawings does not relieve the Contractor of responsibility for any errors that may exist, because the Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.
- J. Samples may be retained for comparison purposes. Remove samples when directed. Include in bid all costs of furnishing and removing samples.
- G. Approved samples submitted or constructed, constitute criteria for judging completed work.

H. Finished work or items not equal to samples will be rejected.

**PART 2 PRODUCTS**

Not Applicable.

**PART 3 EXECUTION**

Not Applicable.

**PART 4 MEASUREMENT & PAYMENT**

A. **Measurement and Payment:** Full compensation for “Submittals” shall be considered as included in the contract unit prices paid for the various items of work performed and no additional compensation will be allowed.

**END OF SECTION 01 33 00**



**SECTION 01 50 00**  
**TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Criteria for temporary facilities and controls to be provided by the contractor.

**1.02 RELATED SECTIONS**

- A. Section 01 50 50                      Erosion and Sedimentation Control
- B. Section 01 56 39                      Tree Preservation and Pruning
- C. Section 31 10 00                      Site Clearing

**1.03 RELATED DOCUMENTS**

- A. The provisions of the Standard Specifications for Public Works Construction (SSWC) 2021 edition apply except as modified herein. Available through *Building News Publications*, Telephone #: (714) 517-0970.
- B. The Contractor shall be responsible for all specific safety requirements promulgated by any governmental authority, including the requirements of the Occupational Safety and Health Act of 1970 (OSHA) and CAL OSHA.

**1.04 IDENTIFICATION SIGN**

- A. Provide and maintain an identification sign in a prominent location approved by the City Engineer. Signs shall be constructed of 3/4" exterior marine plywood, 4' x 8', with 1" x 4" D.F. stiffeners around all edges. Sign shall be mounted 3 feet above grade on 4" x 4" posts and adequately braced to withstand wind pressures.
- B. Sign shall be constructed by a professional sign painter.
- C. Sign colors shall be as selected by the City Representative. Paints shall be exterior grade to maintain high quality appearance throughout construction period.
- D. Contractor shall be responsible for layout of sign subject to approval of the City Representative. Sign shall contain the following:

(PROJECT NAME, CLIENT)  
(COUNCIL MEMBERS' NAMES)  
(SCHEDULED OPENING DATE)  
(REPRESENTATIVE, CITY DEPARTMENT)  
(LANDSCAPE ARCHITECT' NAME)  
(GENERAL CONTRACTORS)

## **1.05 ACCESS AND FACILITIES**

### **A. Temporary Utilities**

1. Light, Power and Water
2. Furnish temporary water, light and power, complete with connecting piping, wiring, lamps, meters and similar equipment as required for the work. Install, maintain, and remove temporary lines upon completion of the work. All expenses in connection with temporary services and facilities shall be paid by the Contractor.
3. After the Notice of Completion has been filed, the City will be responsible for payment of water and electric bills rendered for utility service through the respective permanent meters.
4. Any and all refunds of monies resulting from the extension of any utility service shall accrue to the City, irrespective of the time that refunds are made or of the manner in which payment was made for the extension.

## **1.06 ACCESS**

- A. Provide and maintain an adequate access to the site of the project. Also provide temporary roads if any are required for prosecution of the work.

## **1.07 TEMPORARY FENCING**

- A. Contractor shall erect a temporary chain link fence around the entire perimeter of the construction area for his own security. Location and limits of fencing shall be approved by City Engineer at initial site meeting. Fence shall be a minimum 8'-0" in height and shall have appropriate access gates. Fence shall have a good appearance. At completion of project (or sooner), Contractor shall remove fence from property with City permission.

## **1.08 STORAGE SHEDS**

- A. Provide and maintain on the premises, where directed, watertight storage sheds for all materials which might be damaged by weather, including storage facilities for concrete test samples or other material samples required for the work.

## **1.09 SANITARY FACILITIES**

- A. The Contractor shall provide temporary toilet facilities which may consist of portable chemical toilets. Number of toilets shall be based on number of workers - 1 per 15 workers.
- B. Toilet facilities shall be kept supplied with toilet paper and be kept in a clean and sanitary condition until completion of the work and then be removed from the work site. Upon removal, that portion of the site shall be properly cleaned and graded

## **1.10 FIRE PROTECTION**

- A. Provide general temporary fire protection for the work under this contract.

#### **1.11 TRASH REMOVAL AND CLEANING**

- A. Provide trash receptacles for collecting debris. Remove debris from job site at regular intervals.

#### **PART 2 PRODUCTS**

Not Applicable.

#### **PART 3 EXECUTION**

Not Applicable.

#### **PART 4 MEASUREMENT & PAYMENT**

##### **4.01 TEMPORARY FACILITIES CONTROL**

- A. **Measurement:** Measurement of “Temporary Facilities Control” shall be per lump sum (LS).
- B. **Payment:** “Temporary Facilities Control”, including labor, materials, tools, equipment, and incidentals, will be paid in the *Lump Sum* price paid for “Mobilization”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, complete and in place, and no additional compensation shall be allowed.

**END OF SECTION 01 50 00**

**SECTION 01 50 50**  
**EROSION AND SEDIMENTATION CONTROL**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. The Contractor shall provide all materials, labor and equipment necessary to complete all work as specified herein, including but not limited to the following:
- B. Apply specified treatments to all cuts and fill slopes, soil stockpiles, and all disturbed areas.
- C. Install all temporary erosion control devices per Plans and Specifications.
- D. All other labor and materials reasonably incidental to the satisfactory completion of the work, including cleanup of the site.

**1.02 SECTION INCLUDES**

- A. Description of the requirements for providing and installing temporary erosion control structures as specified.
- B. Requirements for the contractor to provide a SWPPP.

**1.03 REGULATORY REQUIREMENTS:**

- A. State Regional Water Quality Control Board Order No. 2009-0009-DWQ, NPDES No. CA000002.
- B. California Stormwater Quality Association (CASQA) "Stormwater Best Management Practice Handbook for Construction".
- C. State Water Resources Control Board (SWRCB) standards.
- D. California Stormwater Quality Association "Stormwater Best Management Practice Handbook" for Construction and Industrial and Commercial Development, latest edition.
- E. Caltrans Standard Specifications, 2022

**1.04 CONTRACTOR SUBMITTALS**

- A. The Contractor shall submit, in accordance with Section 01 10 00, Supplemental General Requirements, manufacturer's letters of compliance and manufacturer's literature for the following items:
- B. Seed Mixes (or individual items)
- C. Mulches

- D. Binders/Tackifiers
- E. Fertilizer
- F. Humate
- G. Soil inoculates
- H. Straw (Weight receipts from scales shall be required)
- I. Erosion Control Blanket

**1.05 SITE CONDITION**

- A. It is the responsibility of the Contractor to visit the site to determine existing conditions including access to the site, the nature and extent of existing improvements upon adjacent public and private property, the nature of materials to be encountered, and other factors that may affect the work of this section.
- B. It is the responsibility of the Contractor to have finished the grading of the slopes, including track walking the areas to be treated with erosion control treatments.

**1.06 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. All products shall be delivered to the site in manufacturer's unopened standard containers bearing original labels showing quantity, analysis and name of manufacturer.
- B. All materials shall be stored in designated areas and in such a manner as to protect them from weather or other conditions that might damage or impair the effectiveness of the product.

**1.07 ANALYSIS OF SAMPLES AND TESTS**

- A. Samples: The Owner reserves the right to take and analyze samples of materials for conformity to the Specifications at any time. On request, seed shall delivered to Owner' Representative 30 days prior to seeding so seed can be tested. Seed samples shall be drawn in accordance with procedures outlined in Association of Official Seed Analysts.
- B. Rejected material: Rejected materials shall be removed immediately from the site at Contractor's expense. Contractor shall pay the cost of testing replacement materials.

**PART 2 - PRODUCTS**

**2.01 GENERAL**

- A. All products shall be in conformance with the Specifications listed below. Any changes to products to be used shall be approved, in writing, by the Owner or Owner's representative prior to job site delivery.

**2.02 SEED MIX**

- A. Seed shall conform to the provisions in Section 21-2.02F, "Seed," of the Standard Specifications. Individual seed species shall be measured and mixed in the presence of the Owner's Representative.
- B. Seed shall be delivered to the project site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.
- C. Composition:

<b>Species</b>	<b>Common Name</b>	<b>PLS lbs. /acre</b>
<i>Gazania</i>	<i>Trailing Gazania</i>	4 lbs. /acre

**NON-LEGUME SEED**

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Baccharis pilularis var. pilularis (Coyote Bush)	20	0.05
Artemisia californica (California Sagebrush)	25	0.5
Mimulus aurantiacus. (Sticky Monkeyflower)	25	.1
Elymus glaucus, (Blue Wildrye,)	40	9
Festuca idahoensis (Idaho Festuca)	35	4
Hordium brachyantherum californicum (Meadow Barley)	40	8
Regreen	60	45.0

- D. Quality
  1. All seed shall be in conformance with the California State Seed Law of the Department of Food and Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. In addition, the container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained.
  2. Prior to seeding at the request of the Owner, the Contractor shall provide a letter of certification, original Association of Official Seed Analysts (AOSA) seed test results, and calculations of PLS.
  3. All legume seed shall be pellet-inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 pounds of inoculant per one hundred pounds of seed.

**2.03 MULCH**

- A. Mulch shall be 100% wood hydroseed and shall be composed of wood fiber derived from whole wood chips with no growth or germination inhibiting substances, and shall be manufactured in such a manner that when thoroughly mixed with seed, fertilizer, organic stabilizer, and water, in the proportions specified, will form a homogeneous slurry which is capable of being sprayed to form a porous mat.
- B. The fibrous mulch in its air-dry state shall contain no more than 15% by weight of water. The fiber shall have a temporary green dye and shall be accompanied by a certificate of compliance stating that the fiber conforms to these Specifications.

**2.04 ORGANIC STABILIZER/TACKIFIER**

- A. Stabilizer and tackifier shall be an organic substance supplied in powder form and shall be psyllium-based and packed in clearly marked bags stating the contents of each package. The California Department of Food and Agriculture shall certify the material as an Auxiliary Soil Chemical.

**2.05 FERTILIZER**

- A. Fertilizer shall be of commercial quality, conform to the requirements of the California Department of Food and Agriculture Code, shall have a guaranteed analysis for nitrogen, phosphorus and potassium of 7-2-3. Products specified as slow-release shall have been tested and demonstrate a nearly linear release curve.

**2.06 HUMATE**

- A. Humate shall be OMRI listed and contain at least 40 % Humic acid. It shall be a natural granual humic acid based material that functions as an organic chelator and microbial stimulator. Humate shall not burn plant material and shall be non-toxic and non-staining.
- B. Humate Soil Conditioner

Humic Acids (from Leonardite)	40 .00 %
Organic matter	40 .00 % - 50.00%
Carbon	50.00 % - 60.00%
Nitrogen	0.05 % - 1%
Phosphoric Acid	0.07 %
Potash	0.13 %
Sulfur	0.21 %
Magnesium	0.18 %
Calcium	0.32 %
pH	4.0
Soluble Salts	1.8

**2.07 MYCORRHIZAL INOCULUM**

- A. Endo (arbuscular) mycorrhizal inoculum shall be registered by the California Department of Food and Agriculture and consist of spores, mycelium and mycorrhizal root fragments in a solid carrier suitable for handling by hydro-seeding. The carrier shall be the material in which the inoculum was originally produced, and may include organic materials, vermiculite, perlite, calcined clay, or other approved materials consistent with mechanical application and with good plant growth.
- B. Each endomycorrhizal inoculum shall carry a supplier's guarantee of 80,000 propagules minimum per kilogram. The minimum propagule count shall be shown on each label provided. If more than one fungal species is claimed by the supplier, the label shall include a guarantee for each species of mycorrhizal fungus claimed.

- C. Endomycorrhizal fungal species shall be suitable for the pH of the soil at the planting site. If the inoculum consists of a mixture of species, no more than 20% of the claimed propagule count shall consist of fungal species known to be unsuitable for the pH of the soil at the planting site.
- D. A sample of approximately 28 grams (one ounce) of inoculum will be taken from each inoculum container by the Owner's Representative. The number of propagules will be determined by laboratory testing. Propagules shall include live spores, mycelial fragments and viable mycorrhizal root fragments.
- E. Endomycorrhizal inoculum shall be stored, transported and applied at temperatures of less than 32° C (90° F).

**2.08 STRAW**

- A. Shall be derived from irrigated rice or clean cereal grain straw.
- B. The Contractor shall furnish evidence that clearance has been obtained from the County Agricultural Commissioner, as required by law, before straw from outside the County in which it is to be used is delivered to the site of the work.
- C. Straw that has been used for bedding is prohibited.

**2.09 EQUIPMENT**

- A. Equipment used for application of slurry shall be a commercial-type Hydro-Seeder and have a built-in agitation system with an operation capacity sufficient to agitate, suspend and homogeneously mix slurry.
- B. Tank capacity shall be a minimum of 1,500 gallons and shall be mounted on a truck to allow access to the site.
- C. Pump shall be able to generate 150 psi at the nozzle.
- D. Straw blowers: Equipment shall be specifically designed and manufactured for the application of straw and shall be of sufficient horsepower to break up and distribute straw at the specified application rate.

**2.10 WATER**

- A. Water shall be furnished by Owner and shall be made readily available at the sites indicated on the project map. Water shall be of potable quality.
- B. Contractor shall add 4-6 lbs. of Vulpia Microstachys or 20 lbs. of Regreen per acre if hydroseeding occurs in the fall or winter months.

**C. Hydroseed mix can be obtained from Pacific Coast Seed, Inc., (925) 373-4417.EROSION CONTROL BLANKETS**

- A. Erosion control must be Erosion Control Technology Council (ECTC) Type 2D and made of processed natural fibers that are mechanically, structurally, or chemically bound together to form a continuous matrix that is surrounded by 2 natural nets. Erosion control blanket must comply with the requirements shown in the following table:



**Erosion Control Blanket**

Quality characteristic	Test method	Requirement		
		Type A	Type B	Type C
Roll width (min, inches)	--	72		
Matrix (%)				
Straw/coconut		70/30	--	--
Woven coir (coconut fiber)	--	--	100	--
Wood excelsior (6 inches or longer)		--	--	80
USLE C-Factor for a 1:1 (H:V) unvegetated slope	--	≤ 0.20		
Shear stress (max, psf)	ASTM D6460	1.75		
Tensile strength (min, psf)	ASTM D5035	75		
Functional longevity (months)	--	12		

**2.12 SWPPP**

Provide a Stormwater Pollution Prevention Plan (SWPPP) developed by a Qualified SWPPP Developer (QSD) in compliance with the State of California Construction General Permit. Contractor shall pay all costs associated with development, engineering, and implementation of the SWPPP.

Furnish and install the products as specified in the SWPPP and as required by the SWRCB required to eliminate potential erosion and sedimentation during construction works. Products which shall be installed, but are not limited to, are the following:

- A. Siltation fences
- B. Curb inlet sediment barriers
- C. Fiber rolls
- D. Hydroseeding
- E. Wattle and/or Gravel bags
- F. Construction Entrances

**PART 3 - EXECUTION**

**3.01 SOIL PREPARATION**

- A. No soil amendments shall be required except as noted on the Plans.
- B. Verification: Contractor shall verify:
  - 1. That all areas to receive erosion control treatments are free of vegetation and other objectionable material.
  - 2. That grades are final for permanently treated areas and within reasonable standard for temporary treatments.

3. That all sloped areas are uniformly compacted: wherever possible, the surface compaction of the top 1 foot shall be 85% or less.

### 3.02 EROSION CONTROL BLANKET INSTALLATION

- A. Before placing the erosion control blankets, Contractor shall ensure the subgrade has been graded smooth and has no depressed voids. The subgrade must be free from obstructions, such as tree roots, projecting stones, or foreign matter greater than 1 inch in diameter. Overlap the end of the erosion control blanket by 24 inches. Use 18 inch staples staked at maximum of 4 feet on center in staggered pattern. Do not drive vehicles on the erosion control blanket.

### 3.03 HYDROSEEDING AREA

- A. Areas to receive erosion control treatments include all graded areas as shown on the site plan and other areas as determined by the Owner.
- B. Perform erosion control treatments on a section-by-section basis. On approval of the Owner, and as soon as possible after grading, complete treatments in the following order of priority: stream zones, graded slopes, non-trafficked road and parking areas, building pads and other flat areas.
- C. Contractor shall be available to re-treat areas disturbed by on-going activities.
- D. Preparation: All slurry preparation to be conducted at the job site.
  1. Water, mulch, fertilizer, compost, binder and other ingredients shall be added to the tank simultaneously so that the finished load is a homogenous mix of the specified ingredients.
  2. Seed shall be added last and shall be discharged within 2 hours. Loads held over 2 hours will be recharged with ½ the seed rate before application.
  3. Once fully loaded, the complete slurry shall be agitated for 3-5 minutes to allow for uniform mixing.
- E. Application: Apply specified slurry in a sweeping motion to form a uniform application.
  1. Step One - with hydroseeder apply:

a. Seed Mix Total	4 lbs./acre
b. 100% Cellulose Fiber Mulch	500 lbs./acre
c. Biosol 7-2-3 (Organic Fertilizer)	1,600 lbs./acre
d. AM120 (Mycorrhizal Inoculant)	60 lbs./acre
  2. Step Two - with straw blower apply:

a. Rice or Clean Cereal Grain Straw	4,000 lbs./acre
-------------------------------------	-----------------
  3. Step Three - with hydroseeder apply:

a. 100% Cellulose Fiber Mulch	500 lbs./acre
b. M-Binder	100 lbs./acre
  4. Under suitable conditions straw shall be uniformly spread at the specified rates. The straw may be pneumatically applied as long as the resulting straw is predominately 3 to 6 inches in length. The straw shall be treated with mulch and tackifier before it can blow off the site but in no case shall straw be left untreated for more than 24 hours. The Contractor will clean up areas of straw which are blown from the site, and the areas shall be retreated at no additional expense to the Owner.

- F. Protection: Contractor is to stay off treated areas.
- G. Unused Loads: If mixture remains in tank for more than 8 hours it shall be removed from the job site at Contractor's expense.
- H. Preliminary Inspection: Notify the Owner's Representative 48 hours in advance of all seeding. Inspection and favorable review of completed work shall begin the plant establishment period.

**3.04 PLANT ESTABLISHMENT MAINTENANCE**

- A. General plant maintenance shall immediately follow seeding and continue for **90 days**.
- B. Protect areas against all damage, including erosion and trespass, and provide proper safeguards. Maintain and keep in good repair all temporary barriers erected to prevent trespassing. Check all barrier and temporary fencing daily, and make immediate repairs or replacements.
- C. Repair all damage to seeded areas.
- D. Maintain constant moisture depth in soil to insure vigorous growth.

**3.05 FINAL INSPECTION AND ACCEPTANCE:**

- A. Final inspection will be conducted upon completion of maintenance, replacements and corrective work. Five (5) days' notice shall be given. If project improvements, corrective work, and maintenance have not been performed as specified and to the satisfaction of the Owner's Representative, maintenance shall continue at Contractor's expense until such time as work has been successfully completed.

**3.06 GUARANTEE AND REPLACEMENT**

- A. Guarantee all planting to be in a healthy, thriving condition until the end of the maintenance period or beyond that time until active growth is evident and for one year from date of acceptance.
- B. Replace all seeded areas not in vigorous condition as soon as directed by Owner's Representative. Seed mixture used for replacement must be of the same kind and quantity as specified in this section.

**3.07 CLEAN-UP**

- A. Erosion control work areas shall be maintained in a neat and orderly condition. Keep paved area free of erosion treatment, soil, and other debris.
- B. Overspray: Installing Contractor is responsible for washing or otherwise cleaning excess material off all areas not intended to receive treatment.
- C. Debris: Clean up and remove erosion control associated materials and debris from project site before Final Acceptance.

**3.08 GENERAL SWPPP**

- A. This project has activities disturbing more than one acre of soil. Thus, this project must comply

with the State Water Quality Control Board's requirements. The contractor shall complete a SWPPP, secure a Construction General Permit and comply with all the requirements specified herein and as shown on the plans.

- B. The SWPPP shall conform to Provisions in Section 13, "Water Pollution Control," of the Standard Specifications, the details, operating procedures, and maintenance guidelines of the California Regional Water Quality Control Board San Francisco Bay Region's "Guidelines for Construction Projects" (Guidelines), the California Regional Water Control Board San Francisco Bay Region's "Erosion and Sediment Control Field Manual" (Manual), the project plans and these Special Provisions.
- C. The Notice to Proceed may be withheld until the City Representative has reviewed and accepted the SWPPP.
- D. The Contractor shall prepare, implement and maintain the SWPPP for the project in full compliance with the revised state regulations to control the discharge of storm water pollutants. The SWPPP must be prepared by a Qualified SWPPP Developer (QSD) and monitored by a Qualified SWPPP Practitioner (QSP) as required by the State of California.
- E. The Contractor shall provide the monitoring or reporting required to comply with all the state regulations regarding the SWPPP for the project.
- F. Upon award of construction contract by the Contractor, the Contractor must do the following:
  - 1. Prepare and submit 2 copies of the SWPPP within 21 calendar days of execution of construction contract by the Contractor and allow 7 calendar days for the City Representative's review. If revisions are required, the City Representative provides comments and specifies the date that the review stopped.
  - 2. Change and resubmit the SWPPP within 7 calendar days of receipt of the City Representative's comments. The City Representative's review resumes when the complete SWPPP is resubmitted.
  - 3. When the City Representative approves the SWPPP, submit an electronic and 3 printed copies of the approved SWPPP and upload with all required data to the SMARTS Website.

### **3.09 ENFORCEMENT AND PENALTY FOR NON-COMPLIANCE**

- A. This section provides for the City to enforce and impose penalties for Contractor's non-compliance with the requirements of this section and all laws, regulations, rules, policies, plans, related to the SWPPP that are incorporated by reference. The City's exercise of these enforcement and penalty provisions in no way limits Contractor's contractual obligations, potential liability or obligation to defend and indemnify the City from enforcement or penalties imposed by local, State or Federal Government agencies, including the City acting in their capacities as regulatory agencies.

- B. For first time non-compliance, the Contractor will be notified through verbal communication to the Contractor's SWPPP Manager and follow-up with a written letter or email indicating that the construction site and/or project must be brought to compliance within 2 calendar days or first rain event or other deadline imposed by the City Representative, whichever comes first. No fine or penalty will be assessed at this point.
  
- C. If first time non-compliance is not resolved within 2 calendar days of first notification, the Contractor will be issued a second non-compliance notice. For second time non-compliance, whether for follow-up notice or new violation, the Contractor will be notified with a written letter or email indicating that the construction site and/or project must be brought to compliance within 2 calendar days of the notification date or the next forecasted rain event or deadline imposed by the City Representative, whichever comes first. If the Contractor fails to comply and does not bring the site into compliance within 2 calendar days of notice, a \$7,500 fine will be imposed on the Contractor for each day of non-compliance following the expiration of the 2 calendar days notification period. The imposed fine will be deducted from the monthly progress payment due to the Contractor.
  
- D. In addition, depending on the severity and timing of the violation, and the Contractor's responsiveness, the City may elect to do one or more of the following at any time independent of the above provisions for notice of first and second-time non-compliance:
  - 1. Issue a Stop Notice for the project. The Stop Notice will be enforced until the Contractor brings the site to compliance with SWPPP requirements. Each working day within the Stop Notice period will count as a construction workday towards the construction contract duration allowed for the project as specified in Section 4, "beginning of work, time of completion, and liquidated damages" of the specifications. All construction delay costs associated with the Contractor's failure to comply with the SWPPP requirements shall be the Contractor's responsibility and the Contractor shall not lay claim for time, money or otherwise against the City.
  
  - 2. Abate the portion of the construction site or project that is in violation. The City may at any time following non-compliance with a notice of first time non-compliance use City forces and/or hired contractor to implement the abatement. The intent of the abatement is to mitigate the violation expeditiously before the City will be fined and/or penalized by Local, State and/or Federal regulatory agencies for Contractor's non-compliance. The extent of abatement will be the minimum treatment measures necessary to bring the site into compliance. The actual costs of abatement, including but not limited to administrative and incidental costs and expenses, will be documented and deducted from the monthly progress payment due, withheld from retention or otherwise backcharged to the Contractor. The treatment measures implemented will then become the property and responsibility of the Contractor. The Contractor shall be responsible for adjusting the treatment as necessary in accordance with the Contractor's operation. The Contractor shall not lay claim for time, money, or otherwise against the City for inconvenience, obstruction to Contractor's operation, or delay as a result of the treatment installation.
  
- E. Furthermore, the Contractor shall defend and indemnify the City for any and all fines, claims, actions, assessments, penalties or administrative actions imposed by Local, State and/or Federal agencies, including the City acting in its capacity as a regulatory body, as a result of Contractor's

inability or failure to comply with the minimum storm water pollution prevention requirements of these Specifications, including, but not limited to the SWPPP, and any instruction from the City Representative or any regulatory entity.

- F. In compliance with the State and Federal regulations on construction storm water management and urban runoff pollution control, no pollutants will be allowed to enter the storm drainage system.
- G. Contractor shall follow the requirements of the Storm Water Pollution Prevention Plan (SWPPP) as provided by the City and prepared by the Qualified SWPPP Developer (QSD) for the project. The City will prepare and file the Notice of Intent and the Notice of Termination.
- H. The City will do all filing on the SMARTS system. The contractor shall provide all applicable Permit Registration Documents as defined in Attachment B and C of the Construction General Permit to the City in PDF format in a timely manner for submittal to the SMARTS system. In addition, the contractor shall provide all documentation required for annual reporting and the Notice of Termination to the City in PDF format in a timely manner for submittal to the SMARTS system.
- I. The Contractor shall implement, maintain and be responsible for the collection and input of data and for the effectiveness of the SWPPP measures in accordance with the above referenced Order for a Risk Level 1 construction site until the project is accepted by the City. This includes providing the Qualified SWPPP Practitioners. The Contractor shall maintain a rain gauge at the site and record daily (Monday through Friday) rain fall amounts until the project is accepted by the City. The contractor shall notify the City if the QSP is no longer associated with the work. The City shall be notified within 24 hours and a qualified replacement named within 72 hours. The QSP must meet the Permit certification requirements.
- J. If there is a Permit violation, the Contractor shall notify the City within 24 hours and corrections shall be made as necessary to comply with the Construction General Permit. Contractor is responsible for any fines, and additional sampling, testing and monitoring that result from their negligence to comply with the General Construction Permit requirements without any additional compensation by the City. If the Regional Water Quality Board inspects the site, the Contractor shall notify the City's Engineer within 24 hours and shall provide a written notice of any deficiencies noted and/or changes requested by the inspector.
- K. Violation of this provision shall cause the City to issue a stop-work notice and take necessary actions to require the Contractor to correct and comply with the regulations. All costs related to the stop-work action and corrective work to come into compliance shall be fully borne by the Contractor. The cost of corrective actions required of the Contractor shall be made without any additional compensation by the City.
- L. The Contractor shall prevent spillage when hauling on or adjacent to any public street or highway. In the event that spillage occurs, the Contractor shall remove all spillage and sweep, wash or otherwise clean such streets in accordance with City, County and/or State requirements.
- M. The Contractor shall take all precautions needed to prevent a dust nuisance to adjacent public and private properties and to prevent erosion and transportation of soil to downstream properties due to work under this contract. Any damage so caused by the Contractor's work shall be corrected or repaired by the Contractor.

**PART 4 - MEASUREMENT AND PAYMENT**

**4.01 MEASUREMENT AND PAYMENT**

- A. The contract unit price paid per lump sum for “SWPPP” shall include full compensation to create a SWPPP by a qualified SWPPP Developer (QSD), furnishing all labor, materials, tools, equipment, submittals and testing necessary to complete the installation of the Best Management Practices (BMPs), monitor and maintain the BMP’s as called out in the SWPPP and as shown on the Plans and specified herein.
- B. The contract unit price paid per lump sum for “Erosion Control” shall include full compensation for furnishing all labor, materials, tools, equipment, submittals and testing necessary to complete work as indicated on the plans, specified in the Standard Specifications and these technical specifications, and as directed by the Engineer, and no additional compensation will be allowed.

**PART 5 - PRODUCTS**

**5.01 GENERAL**

- A. All products shall be in conformance with the Specifications listed below. Any changes to products to be used shall be approved, in writing, by the Owner or Owner’s representative prior to job site delivery.

**5.02 SEED MIX**

- A. Seed shall conform to the provisions in Section 21-2.02F, "Seed," of the Standard Specifications. Individual seed species shall be measured and mixed in the presence of the Owner’s Representative.
- B. Seed shall be delivered to the project site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.
- C. Composition:

<b>Species</b>	<b>Common Name</b>	<b>PLS lbs. /acre</b>
<i>Gazania</i>	<i>Trailing Gazania</i>	<i>4 lbs. /acre</i>

**NON-LEGUME SEED**

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Baccharis pilularis var. pilularis (Coyote Bush)	20	0.05
Artemisia californica (California Sagebrush)	25	0.5
Mimulus aurantiacus. (Sticky Monkeyflower)	25	.1
Elymus glaucus, (Blue Wildrye,)	40	9
Festuca idahoensis (Idaho Festuca)	35	4

Hordium brachyantherum californicum (Meadow Barley)	40	8
Regreen	60	45.0

**D. Quality**

1. All seed shall be in conformance with the California State Seed Law of the Department of Food and Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer’s guarantee, and dates of test. In addition, the container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained.
2. Prior to seeding at the request of the Owner, the Contractor shall provide a letter of certification, original Association of Official Seed Analysts (AOSA) seed test results, and calculations of PLS.
3. All legume seed shall be pellet-inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 pounds of inoculant per one hundred pounds of seed.

**5.03 MULCH**

- A. Mulch shall be 100% wood hydroseed and shall be composed of wood fiber derived from whole wood chips with no growth or germination inhibiting substances and shall be manufactured in such a manner that when thoroughly mixed with seed, fertilizer, organic stabilizer, and water, in the proportions specified, will form a homogeneous slurry which is capable of being sprayed to form a porous mat.
- B. The fibrous mulch in its air-dry state shall contain no more than 15% by weight of water. The fiber shall have a temporary green dye and shall be accompanied by a certificate of compliance stating that the fiber conforms to these Specifications.

**5.04 ORGANIC STABILIZER/TACKIFIER**

- A. Stabilizer and tackifier shall be an organic substance supplied in powder form and shall be psyllium-based and packed in clearly marked bags stating the contents of each package. The California Department of Food and Agriculture shall certify the material as an Auxiliary Soil Chemical.

**5.05 FERTILIZER**

- A. Fertilizer shall be of commercial quality, conform to the requirements of the California Department of Food and Agriculture Code, shall have a guaranteed analysis for nitrogen, phosphorus and potassium of 7-2-3. Products specified as slow-release shall have been tested and demonstrate a nearly linear release curve.

**5.06 HUMATE**

- A. Humate shall be OMRI listed and contain at least 40 % Humic acid. It shall be a natural granular humic acid based material that functions as an organic chelator and microbial stimulator. Humate shall not burn plant material and shall be non-toxic and non-staining.
- B. Humate Soil Conditioner

Humic Acids (from Leonardite)	40 .00 %
Organic matter	40 .00 % - 50.00%



Carbon	50.00 % - 60.00%
Nitrogen	0.05 % - 1%
Phosphoric Acid	0.07 %
Potash	0.13 %
Sulfur	0.21 %
Magnesium	0.18 %
Calcium	0.32 %
pH	4.0
Soluble Salts	1.8

**5.07 MYCORRHIZAL INOCULUM**

- A. Endo (arbuscular) mycorrhizal inoculum shall be registered by the California Department of Food and Agriculture and consist of spores, mycelium and mycorrhizal root fragments in a solid carrier suitable for handling by hydro-seeding. The carrier shall be the material in which the inoculum was originally produced, and may include organic materials, vermiculite, perlite, calcined clay, or other approved materials consistent with mechanical application and with good plant growth.
- B. Each endomycorrhizal inoculum shall carry a supplier's guarantee of 80,000 propagules minimum per kilogram. The minimum propagule count shall be shown on each label provided. If more than one fungal species is claimed by the supplier, the label shall include a guarantee for each species of mycorrhizal fungus claimed.
- C. Endomycorrhizal fungal species shall be suitable for the pH of the soil at the planting site. If the inoculum consists of a mixture of species, no more than 20% of the claimed propagule count shall consist of fungal species known to be unsuitable for the pH of the soil at the planting site.
- D. A sample of approximately 28 grams (one ounce) of inoculum will be taken from each inoculum container by the Owner's Representative. The number of propagules will be determined by laboratory testing. Propagules shall include live spores, mycelial fragments and viable mycorrhizal root fragments.
- E. Endomycorrhizal inoculum shall be stored, transported and applied at temperatures of less than 32° C (90° F).

**5.08 STRAW**

- A. Shall be derived from irrigated rice or clean cereal grain straw.
- B. The Contractor shall furnish evidence that clearance has been obtained from the County Agricultural Commissioner, as required by law, before straw from outside the County in which it is to be used is delivered to the site of the work.
- C. Straw that has been used for bedding is prohibited.

**5.09 EQUIPMENT**

- A. Equipment used for application of slurry shall be a commercial-type Hydro-Seeder and have a built-in agitation system with an operation capacity sufficient to agitate, suspend and homogeneously mix slurry.
- B. Tank capacity shall be a minimum of 1,500 gallons and shall be mounted on a truck to allow access to the site.
- C. Pump shall be able to generate 150 psi at the nozzle.
- D. Straw blowers: Equipment shall be specifically designed and manufactured for the application of straw and shall be of sufficient horsepower to break up and distribute straw at the specified application rate.

**5.10 WATER**

- A. Water shall be furnished by Owner and shall be made readily available at the sites indicated on the project map. Water shall be of potable quality.
- B. Contractor shall add 4-6 lbs. of Vulpia Microstachys or 20 lbs. of Regreen per acre if hydroseeding occurs in the fall or winter months.
- C. Hydroseed mix can be obtained from Pacific Coast Seed, Inc., (925) 373-4417.

**EROSION CONTROL BLANKETS**

- A. Erosion control must be Erosion Control Technology Council (ECTC) Type 2D and made of processed natural fibers that are mechanically, structurally, or chemically bound together to form a continuous matrix that is surrounded by 2 natural nets. Erosion control blanket must comply with the requirements shown in the following table:

<b>Erosion Control Blanket</b>				
Quality characteristic	Test method	Requirement		
		Type A	Type B	Type C
Roll width (min, inches)	--	72		
Matrix (%)				
Straw/coconut		70/30	--	--
Woven coir (coconut fiber)	--	--	100	--
Wood excelsior (6 inches or longer)		--	--	80
USLE C-Factor for a 1:1 (H:V) unvegetated slope	--	≤ 0.20		
Shear stress (max, psf)	ASTM D6460	1.75		
Tensile strength (min, psf)	ASTM D5035	75		
Functional longevity (months)	--	12		

**5.12 SWPPP**

Provide a Stormwater Pollution Prevention Plan (SWPPP) developed by a Qualified SWPPP Developer (QSD) in compliance with the State of California Construction General Permit. Contractor shall pay all costs associated with development, engineering, and implementation of the SWPPP.

Furnish and install the products as specified in the SWPPP and as required by the SWRCB required to eliminate potential erosion and sedimentation during construction works. Products which shall be installed, but are not limited to, are the following:

- A. Siltation fences
- B. Curb inlet sediment barriers
- C. Fiber rolls
- D. Hydroseeding
- E. Wattle and/or Gravel bags
- F. Construction Entrances

## **PART 6 - EXECUTION**

### **6.01 SOIL PREPARATION**

- A. No soil amendments shall be required except as noted on the Plans.
- B. Verification: Contractor shall verify:
  - 1. That all areas to receive erosion control treatments are free of vegetation and other objectionable material.
  - 2. That grades are final for permanently treated areas and within reasonable standard for temporary treatments.
  - 3. That all sloped areas are uniformly compacted: wherever possible, the surface compaction of the top 1 foot shall be 85% or less.

### **6.02 EROSION CONTROL BLANKET INSTALLATION**

- A. Before placing the erosion control blankets, Contractor shall ensure the subgrade has been graded smooth and has no depressed voids. The subgrade must be free from obstructions, such as tree roots, projecting stones, or foreign matter greater than 1 inch in diameter. Overlap the end of the erosion control blanket by 24 inches. Use 18 inch staples staked at maximum of 4 feet on center in staggered pattern. Do not drive vehicles on the erosion control blanket.

### **6.03 HYDROSEEDING AREA**

- A. Areas to receive erosion control treatments include all graded areas as shown on the site plan and other areas as determined by the Owner.
- B. Perform erosion control treatments on a section by section basis. On approval of the Owner, and as soon as possible after grading, complete treatments in the following order of priority: stream zones, graded slopes, non-trafficked road and parking areas, building pads and other flat areas.
- C. Contractor shall be available to re-treat areas disturbed by on-going activities.

- D. Preparation: All slurry preparation to be conducted at the job site.
  - 1. Water, mulch, fertilizer, compost, binder and other ingredients shall be added to the tank simultaneously so that the finished load is a homogenous mix of the specified ingredients.
  - 2. Seed shall be added last and shall be discharged within 2 hours. Loads held over 2 hours will be recharged with ½ the seed rate before application.
  - 3. Once fully loaded, the complete slurry shall be agitated for 3-5 minutes to allow for uniform mixing.
  
- E. Application: Apply specified slurry in a sweeping motion to form a uniform application.
  - 1. Step One - with hydroseeder apply:
    - a. Seed Mix Total 4 lbs./acre
    - b. 100% Cellulose Fiber Mulch 500 lbs./acre
    - c. Biosol 7-2-3 (Organic Fertilizer) 1,600 lbs./acre
    - d. AM120 (Mycorrhizal Inoculant) 60 lbs./acre
  - 2. Step Two - with straw blower apply:
    - a. Rice or Clean Cereal Grain Straw 4,000 lbs./acre
  - 3. Step Three - with hydroseeder apply:
    - a. 100% Cellulose Fiber Mulch 500 lbs./acre
    - b. M-Binder 100 lbs./acre
  - 4. Under suitable conditions straw shall be uniformly spread at the specified rates. The straw may be pneumatically applied as long as the resulting straw is predominately 3 to 6 inches in length. The straw shall be treated with mulch and tackifier before it can blow off the site but in no case shall straw be left untreated for more than 24 hours. The Contractor will clean up areas of straw which are blown from the site, and the areas shall be retreated at no additional expense to the Owner.
  
- F. Protection: Contractor is to stay off treated areas.
  
- G. Unused Loads: If mixture remains in tank for more than 8 hours it shall be removed from the job site at Contractor's expense.
  
- H. Preliminary Inspection: Notify the Owner's Representative 48 hours in advance of all seeding. Inspection and favorable review of completed work shall begin the plant establishment period.

**6.04 PLANT ESTABLISHMENT MAINTENANCE**

- A. General plant maintenance shall immediately follow seeding and continue for **90 days**.
- B. Protect areas against all damage, including erosion and trespass, and provide proper safeguards. Maintain and keep in good repair all temporary barriers erected to prevent trespassing. Check all barrier and temporary fencing daily, and make immediate repairs or replacements
- C. Repair all damage to seeded areas.
- D. Maintain constant moisture depth in soil to insure vigorous growth.

**6.05 FINAL INSPECTION AND ACCEPTANCE:**

- A. Final inspection will be conducted upon completion of maintenance, replacements and corrective work. Five (5) days' notice shall be given. If project improvements, corrective work, and maintenance have not been performed as specified and to the satisfaction of the Owner's Representative, maintenance shall continue at Contractor's expense until such time as work has been successfully completed.

**6.06 GUARANTEE AND REPLACEMENT**

- A. Guarantee all planting to be in a healthy, thriving condition until the end of the maintenance period or beyond that time until active growth is evident and for one year from date of acceptance.
- B. Replace all seeded areas not in vigorous condition as soon as directed by Owner's Representative. Seed mixture used for replacement must be of the same kind and quantity as specified in this section.

**6.07 CLEAN-UP**

- A. Erosion control work areas shall be maintained in a neat and orderly condition. Keep paved area free of erosion treatment, soil, and other debris.
- B. Overspray: Installing Contractor is responsible for washing or otherwise cleaning excess material off all areas not intended to receive treatment.
- C. Debris: Clean up and remove erosion control associated materials and debris from project site before Final Acceptance.

**6.08 GENERAL SWPPP**

- A. This project has activities disturbing more than one acre of soil. Thus, this project must comply with the State Water Quality Control Board's requirements. The contractor shall complete a SWPPP, secure a Construction General Permit and comply with all the requirements specified herein and as shown on the plans.
- B. The SWPPP shall conform to Provisions in Section 13, "Water Pollution Control," of the Standard Specifications, the details, operating procedures, and maintenance guidelines of the California Regional Water Quality Control Board San Francisco Bay Region's "Guidelines for Construction Projects" (Guidelines), the California Regional Water Control Board San Francisco Bay Region's "Erosion and Sediment Control Field Manual" (Manual), the project plans and these Special Provisions.
- C. The Notice to Proceed may be withheld until the City Representative has reviewed and accepted the SWPPP.
- D. The Contractor shall prepare, implement, and maintain the SWPPP for the project in full compliance with the revised state regulations to control the discharge of storm water pollutants. The SWPPP must be prepared by a Qualified SWPPP Developer (QSD) and monitored by a

Qualified SWPPP Practitioner (QSP) as required by the State of California.

- E. The Contractor shall provide the monitoring or reporting required to comply with all the state regulations regarding the SWPPP for the project.
- F. Upon award of construction contract by the Contractor, the Contractor must do the following:
  - 1. Prepare and submit 2 copies of the SWPPP within 21 calendar days of execution of construction contract by the Contractor and allow 7 calendar days for the City Representative's review. If revisions are required, the City Representative provides comments and specifies the date that the review stopped.
  - 2. Change and resubmit the SWPPP within 7 calendar days of receipt of the City Representative's comments. The City Representative's review resumes when the complete SWPPP is resubmitted.
  - 3. When the City Representative approves the SWPPP, submit an electronic and 3 printed copies of the approved SWPPP and upload with all required data to the SMARTS Website.

#### **6.09 ENFORCEMENT AND PENALTY FOR NON-COMPLIANCE**

- A. This section provides for the City to enforce and impose penalties for Contractor's non-compliance with the requirements of this section and all laws, regulations, rules, policies, plans, related to the SWPPP that are incorporated by reference. The City's exercise of these enforcement and penalty provisions in no way limits Contractor's contractual obligations, potential liability or obligation to defend and indemnify the City from enforcement or penalties imposed by local, State or Federal Government agencies, including the City acting in their capacities as regulatory agencies.
- B. For first time non-compliance, the Contractor will be notified through verbal communication to the Contractor's SWPPP Manager and follow-up with a written letter or email indicating that the construction site and/or project must be brought to compliance within 2 calendar days or first rain event or other deadline imposed by the City Representative, whichever comes first. No fine or penalty will be assessed at this point.
- C. If first time non-compliance is not resolved within 2 calendar days of first notification, the Contractor will be issued a second non-compliance notice. For second time non-compliance, whether for follow-up notice or new violation, the Contractor will be notified with a written letter or email indicating that the construction site and/or project must be brought to compliance within 2 calendar days of the notification date or the next forecasted rain event or deadline imposed by the City Representative, whichever comes first. If the Contractor fails to comply and does not bring the site into compliance within 2 calendar days of notice, a \$7,500 fine will be imposed on the Contractor for each day of non-compliance following the expiration of the 2 calendar days notification period. The imposed fine will be deducted from the monthly progress payment due to the Contractor.

- D. In addition, depending on the severity and timing of the violation, and the Contractor's responsiveness, the City may elect to do one or more of the following at any time independent of the above provisions for notice of first and second-time non-compliance:
1. Issue a Stop Notice for the project. The Stop Notice will be enforced until the Contractor brings the site to compliance with SWPPP requirements. Each working day within the Stop Notice period will count as a construction work day towards the construction contract duration allowed for the project as specified in Section 4, "beginning of work, time of completion, and liquidated damages" of the specifications. All construction delay costs associated with Contractor's failure to comply with the SWPPP requirements shall be the Contractor's responsibility and the Contractor shall not lay claim for time, money or otherwise against the City.
  2. Abate the portion of the construction site or project that is in violation. The City may at any time following non-compliance with a notice of first time non-compliance use City forces and/or hired contractor to implement the abatement. The intent of the abatement is to mitigate the violation expeditiously before the City will be fined and/or penalized by Local, State and/or Federal regulatory agencies for Contractor's non-compliance. The extent of abatement will be the minimum treatment measures necessary to bring the site into compliance. The actual costs of abatement, including but not limited to administrative and incidental costs and expenses, will be documented and deducted from the monthly progress payment due, withheld from retention or otherwise backcharged to the Contractor. The treatment measures implemented will then become the property and responsibility of the Contractor. The Contractor shall be responsible for adjusting the treatment as necessary in accordance with the Contractor's operation. The Contractor shall not lay claim for time, money, or otherwise against the City for inconvenience, obstruction to Contractor's operation, or delay as a result of the treatment installation.
- E. Furthermore, the Contractor shall defend and indemnify the City for any and all fines, claims, actions, assessments, penalties or administrative actions imposed by Local, State and/or Federal agencies, including the City acting in its capacity as a regulatory body, as a result of Contractor's inability or failure to comply with the minimum storm water pollution prevention requirements of these Specifications, including, but not limited to the SWPPP, and any instruction from the City Representative or any regulatory entity.
- F. In compliance with the State and Federal regulations on construction storm water management and urban runoff pollution control, no pollutants will be allowed to enter the storm drainage system.
- G. Contractor shall follow the requirements of the Storm Water Pollution Prevention Plan (SWPPP) as provided by the City and prepared by the Qualified SWPPP Developer (QSD) for the project. The City will prepare and file the Notice of Intent and the Notice of Termination.
- H. The City will do all filing on the SMARTS system. The contractor shall provide all applicable Permit Registration Documents as defined in Attachment B and C of the Construction General Permit to the City in PDF format in a timely manner for submittal to the SMARTS system. In addition, the contractor shall provide all documentation required for annual reporting and the Notice of Termination to the City in PDF format in a timely manner for submittal to the SMARTS system.

- I. The Contractor shall implement, maintain and be responsible for the collection and input of data and for the effectiveness of the SWPPP measures in accordance with the above referenced Order for a Risk Level 1 construction site until the project is accepted by the City. This includes providing the Qualified SWPPP Practitioners. The Contractor shall maintain a rain gauge at the site and record daily (Monday through Friday) rain fall amounts until the project is accepted by the City. The contractor shall notify the City if the QSP is no longer associated with the work. The City shall be notified within 24 hours and a qualified replacement named within 72 hours. The QSP must meet the Permit certification requirements.
- J. If there is a Permit violation, the Contractor shall notify the City within 24 hours and corrections shall be made as necessary to comply with the Construction General Permit. Contractor is responsible for any fines, and additional sampling, testing and monitoring that result from their negligence to comply with the General Construction Permit requirements without any additional compensation by the City. If the Regional Water Quality Board inspects the site, the Contractor shall notify the City's Engineer within 24 hours and shall provide a written notice of any deficiencies noted and/or changes requested by the inspector.
- K. Violation of this provision shall cause the City to issue a stop-work notice and take necessary actions to require the Contractor to correct and comply with the regulations. All costs related to the stop-work action and corrective work to come into compliance shall be fully borne by the Contractor. The cost of corrective actions required of the Contractor shall be made without any additional compensation by the City.
- L. The Contractor shall prevent spillage when hauling on or adjacent to any public street or highway. In the event that spillage occurs, the Contractor shall remove all spillage and sweep, wash or otherwise clean such streets in accordance with City, County and/or State requirements.
- M. The Contractor shall take all precautions needed to prevent a dust nuisance to adjacent public and private properties and to prevent erosion and transportation of soil to downstream properties due to work under this contract. Any damage so caused by the Contractor's work shall be corrected or repaired by the Contractor.

## **PART 7 - MEASUREMENT AND PAYMENT**

### **7.01 MEASUREMENT AND PAYMENT**

- A. The contract unit price paid per lump sum for "SWPPP" shall include full compensation to create a SWPPP by a qualified SWPPP Developer (QSD), furnishing all labor, materials, tools, equipment, submittals and testing necessary to complete the installation of the Best Management Practices (BMPs), monitor and maintain the BMP's as called out in the SWPPP and as shown on the Plans and specified herein.
- B. The contract unit price paid per lump sum for "Erosion Control" shall include full compensation for furnishing all labor, materials, tools, equipment, submittals and testing necessary to complete work as indicated on the plans, specified in the Standard Specifications and these technical specifications, and as directed by the Engineer, and no additional compensation will be allowed.



**SECTION 01 55 26**  
**TRAFFIC CONTROL**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. Signs and Traffic Control shall consist of closing traffic lanes, sidewalks and paths in accordance with the provisions of Section 12, "Temporary Traffic Control," of the State Standard Specifications, the provisions under "Maintaining Traffic" of the Standard Plans, these Technical Specifications, and the latest edition of the California Manual on Uniform Traffic Control Devices (CAMUTCD).

**1.02 SECTION INCLUDES**

- A. Temporary Traffic Control

**1.03 RELATED DOCUMENTS**

- A. California MUTCD
  - 1. Latest edition of the California Manual on Uniform Traffic Control Devices

**1.04 SUBMITTALS**

- A. Temporary Traffic Control Plan
- B. Temporary Pedestrian Accessible Path Plan

**PART 2 - PRODUCTS**

**2.01 GENERAL**

- A. All products shall be in conformance with the Specifications listed below. Any changes to products to be used shall be approved, in writing, by the Owner or Owner's representative prior to job site delivery.

**PART 3 - EXECUTION**

**3.01 GENERAL**

- A. It is the Contractor's responsibility to provide safety with the least possible inconvenience to vehicular and pedestrian traffic during construction. The Contractor shall provide a continuous path of travel for pedestrians at all times. If it becomes necessary to provide a temporary pathway on the street-side of the sidewalk, the Contractor at his own costs shall install concrete K-rail as a barrier between moving traffic and pedestrians. At no time will cones, A-frame barricades, or

other delineators be acceptable to separate moving traffic from pedestrians.

- B. Contractor shall be responsible for all warning and detour signs. An adequate number of flag persons shall be employed to direct traffic around construction zones and to respond to unexpected traffic problems. If in the opinion of the Engineer additional flag persons or traffic control devices are needed at the site, the Contractor shall provide the necessary measures at no additional cost to the City. It shall be understood by the Contractor that field modifications are needed to fit field conditions which sometimes change during the project.
- C. Contractor shall assume for the purposes of bidding that two changeable message signs may be deployed concurrently beginning at least one week prior to the commencement of construction activity until project completion. Additional changeable message signs required by the City shall be included in the contract at the Contractor's expense.
- D. If during the construction operation, the closure of one lane of traffic is approved by the Engineer, then the contractor shall utilize the necessary construction zone signage, including a changeable message signs, during the lane closure operation.
- E. The provisions in this section will not relieve the Contractor from his responsibility to provide such additional devices or take such measures as may be necessary to comply with the provisions in Section 7-1.04, "Public Safety," of the State Standard Specifications.
- F. The Contractor shall be solely responsible for pedestrian and vehicular movement through the project area and shall assume full liability for any and all claims arising out of the construction of the project, including but not limited to claims for personal injury, damage to existing structures, loss of business, etc. The Contractor shall agree to hold the City and all its employees, representatives and consultants harmless from any and all such claims. No additional compensation shall be paid for any work that has to be performed outside normal working hours as a result of these Technical Specifications.
- G. All Traffic Plans shall have a professional wet stamp by a registered Civil Engineer in the State of California.

### **3.02 PUBLIC ACCESSIBILITY**

- A. The Contractor shall provide access to the public through the project site at all times. The Contractor shall provide access to adjacent properties at all times. The Contractor shall maintain access to properties and pedestrian access even after hours for the life of the construction. Temporary access ramps shall be installed to maintain access and shall be shown on the Contractors staging plan.
- B. The Contractor shall be responsible for designing working drawings, constructing and providing a safe and adequate continuous, accessible and safe path of travel around or through localized construction work zones and to each building, business and property utilized by the public. The Contractor shall use temporary asphalt, aggregate base, wood/metal ramps, signs, cones, barricades, flashers, and flaggers to direct and channel the public during and after construction. All proposed closures of a pedestrian access path shall be submitted in writing to the Engineer for review and approval. Advance warning shall be provided to the public should an access path be closed. All safe paths of travel shall be in compliance with applicable Americans with Disabilities Act Accessibility Guidelines (ADAAG), Americans with Disabilities Act (ADA) regulations and the California Manual on Uniform Traffic Control Devices (CAMUTCD).

### **3.03 MATERIALS**

- A. Materials used for public accessibility during construction includes, but is not limited to:
  - 1. Temporary Hot-mix Asphalt Concrete (cut back asphalt concrete not permitted)
  - 2. Temporary Wood Ramp
  - 3. Aluminum Modular Ramps. EZ-Access, or approved equal. Contact info: [www.ezaccess.com](http://www.ezaccess.com), Phone 800-451-1903.
  - 4. Four-foot-wide minimum walking surface with running slope not to exceed eight percent.
  - 5. Barricade materials: Delineators, A-Frames, Barrier Caution Tape, Fencing Material,
  - 6. Non-skid tape
  - 7. Four-inch timber, or equivalent, at the bottom of any railing to provide for the sight impaired

### **3.04 INSTALLATION**

- A. Temporary ramps shall be constructed so installation and removal will not damage existing pavement, curb and/or gutter.
- B. Ramps shall have a minimum four-foot-wide walking surface and a running slope not to exceed eight percent.
- C. Ramps shall meet existing surfaces without gaps. When required for drainage, Schedule 40 PVC pipe with minimum two-inch diameter shall be installed under or through ramp in gutter or flow line.
- D. Transitions between ramps and the street or sidewalk surfaces shall be smooth, firm and slip-resistant.
- E. Sides of the ramp shall be protected where drop-offs exceed six-inches.
- F. Ramps shall be provided to the public leading to businesses. Ramps at the corners of the intersections shall be made of temporary AC pavement to ensure that a smooth transition is provided for the public as well as auto traffic. All temporary wooden ramps shall be maintained throughout the construction project. The Contractor shall maintain the structural integrity of the ramps. No loose, splintered boards or nails will be acceptable.

### **3.05 MAINTENANCE OF A CLEAR AND ACCESSIBLE PUBLIC CORRIDOR**

- A. The Contractor shall maintain a four-foot accessible corridor that provides at least one safe path of travel for the public at all times for the duration of the project. Conversely, if a safe path of travel is not available, the Contractor shall post the sidewalk as being closed, however, access must still be maintained to each business. Signage shall be placed at the location of closure as well as the next intersection in both directions advising of the closure but noting that access is still available to all businesses. All proposed closures of a pedestrian access path shall be submitted in writing to the Engineer for review and approval.
- B. The Contractor shall provide a path to the businesses and residents, using aggregate base to backfill, after demolition of the concrete sidewalk, curb and gutter. The aggregate base shall be firmly packed to establish a safe and ADA compliant path, along the entire work zone.

### **3.06 INSTALLATION OF BARRICADES**

- A. Barricades, which will provide protection for the public from traffic or construction operations, shall be installed in the following locations:
  - 1. Between the access route and any adjacent construction site.
  - 2. Between the alternate circulation path and any adjacent construction site.
  - 3. Between the alternate circulation path and the vehicular way, if the alternate circulation path is diverted into the street.
  - 4. Between the alternate circulation path and any protruding objects, drop-offs, or other hazards to the public.
  - 5. At the down curb ramp of an intersection, if opposite up curb ramp is temporarily or completely blocked, and no adjacent alternative circulation path is provided.

### **3.07 SURFACING OF PUBLIC CORRIDORS**

- A. During construction, tripping hazards and barriers must be removed to maintain an accessible safe path of travel. The surface of the path of travel shall be skid resistant and free of irregularities.
- B. Opened crosswalks, ramps and walkways in general shall be kept free of debris and obstructions.

### **3.08 IDENTIFICATION OF SAFE PATH OF TRAVEL**

- A. If alternate circulation routes are provided for the public to bypass the construction site, the route shall be clearly defined and advance warning shall be provided to clearly delineate the alternate circulation route. Any change of level in a path of travel that is over ¼ inch (½” maximum) height must be beveled at 45 degrees to provide a smooth, non-tripping transition. The Engineer shall review and approve any public access limitations and notification requirements for pedestrians with mobility or vision impairments.
- B. When using A-frames for defining a path of travel, A-frames shall be placed end to end (no spacing between barricades) to provide a continuous guide for individuals using canes. A-frames shall be connected with 2x4’s that are continuous and are attached at the base of the barricade system between two to four-inches from the ground.
- C. Caution tapes shall not be used as barricades or to define a path of travel but may be used to highlight danger or in conjunction with barricades. Excavated areas shall be secured by means of barricades or temporary fences.
- D. The bottom three-inches of any fencing material used shall be made solid to act as a guide for canes used by the visually impaired. Wood, sheet metal, railings, or other approved material may be used at the bottom portion of the fence.
- E. Curb ramps leading to closed crosswalks shall be appropriately barricaded. Temporary ramps shall be provided at temporary crosswalks and shall be able to direct blind pedestrians to and through the temporary path of travel. R9-3a and R9-3b signs shall be mounted on the barricade to advise pedestrians of closed sidewalk and directed routes.
- F. No trucks or equipment shall be parked or obstructing the public path of travel at any time.

### **3.09 WARNING SIGNS**

- A. The Contractor shall provide warning signs for temporary ramps and barricades. Warning signs shall be located at both the near side and the far side of the intersection preceding a temporarily completely blocked public way.

### **3.10 RESTORATION OF PUBLIC ROUTES**

- A. After construction in complete, the site shall be restored to its former condition, or new condition as required.

### **3.11 CONSTRUCTION AREA SIGNS**

- A. Construction area signs shall be furnished, installed, maintained, and removed when no longer required in accordance with the provisions in Section 12, "Temporary Traffic Control," of the State Standard Specifications, the latest edition of the California Manual on Uniform Traffic Control Devices, and these Technical Specifications.
- B. The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least two working days, but not more than fourteen calendar days, prior to commencing any excavation for construction area sign posts. The regional notification centers include but are not limited to the following:

### **3.12 NOTIFICATION CENTER**

- A. Underground Service Alert - Northern California (USA)
- B. 1(800)227-2600 All excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes.
- C. Sign substrates for stationary mounted construction area signs may be fabricated from fiberglass reinforced plastic as specified under "Prequalified and Tested Signing and Delineation Materials" elsewhere in these Technical Specifications.
- D. Type-IV reflective sheeting for sign panels for portable construction area signs shall conform to the requirements specified under "Prequalified and Tested Signing and Delineation Materials" elsewhere in these Technical Specifications.

### **3.13 PUBLIC CONVENIENCE AND SAFETY**

- A. Adequate lighting shall be provided throughout the construction period in areas open to the public.
- B. The Contractor shall be fully responsible for accidents to the public and or damage to public and private property on the site of the work.
- C. The Contractor shall give special attention to provide continuous and uninterrupted traffic flow to and from the businesses on and adjacent to the work. The Contractor shall schedule and pursue operations in such a manner that undesirable construction conditions will be minimized.

- D. The Contractor shall provide watchpersons and flagpersons as well as provide and maintain fences, barriers, guardrails, and other safety devices adjacent to and on the site at or near all barriers as may be necessary to control traffic and prevent accidents to the public. The Contractor shall furnish, place, and maintain such devices as set forth in the current "Manual of Traffic Control for Construction and Maintenance Work Zones," issued by the California Department of Transportation. Flagpersons, while on duty, shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Flagging Instruction Handbook" issued by the California Department of Transportation.
- E. The Contractor shall maintain private entrances and sidewalk areas, and shall construct such detours as may be necessary to properly conduct the work and to provide entrances to private properties at all times. All temporary walking areas shall meet the American with Disability (ADA) requirements for clearances and obstructions. Any temporary paving, covers, etc. shall be constructed and installed in such a manner to meet the ADA requirements. In the event the Contractor fails to meet the ADA requirements, the City of San Rafael may make modifications to the walking areas at the Contractor's expense.
- F. All trenches shall be backfilled at the end of the day or temporary covers shall be maintained during non-working hours to avoid any safety issues for vehicles or pedestrians walking in the project areas.
- G. The Contractor shall make all arrangements with the property owners for the use of private land for detours and for any other purpose and shall save the City of San Rafael free from any liability incurred through the use or non-use of such private property.
- H. Upon favorable completion of the work, the Contractor shall remove all signs and traffic control devices from within the project limits to the satisfaction of the Engineer. At the end of the job, all signs, lights, barriers, etc. shall be removed from the construction sites. All sites shall be left clean and orderly.

### **3.14 CONTRACTOR'S RESPONSIBILITY FOR WORK**

- A. Until the formal acceptance of the work by the City of San Rafael, the Contractor shall have charge and care thereof and shall bear the risk of injury or damage to any part thereof and shall bear the risk of injury or damage to any part thereof by the action of the elements or for any other cause, whether arising from the execution or from non-execution of the work.
- B. Existing streets, including haul routes, either public or private, within the work area shall be maintained in safe and orderly conditions at all times. When ordered to do so by the Engineer, any deficiencies shall be immediately corrected to the satisfaction of the Engineer. If the Contractor fails to correct such deficiencies in a timely fashion, the City of San Rafael may have the necessary work performed at the Contractor's expense and/or stop any further work on the project until a safe and orderly condition has been restored. Before completion and acceptance of the work, the Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work required under the contract and shall bear the cost thereof. Inability to obtain labor, materials and/or equipment will not be considered an exception.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.1 MEASUREMENT**

- A. Traffic Control shall be measured by Lump Sum.

### **4.2 PAYMENT**

- A. The contract unit prices paid for the various items in “Traffic Control” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Traffic Control”, as required to maintain public accessible pathways and traffic circulation, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.
- B. The lump sum price paid for Traffic Control shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, including but not limited to, temporary striping and pavement markings, private property coordination as necessary, preparing and maintaining an adequate traffic control plan stamped by a registered Civil Engineer, placing, removing, storing, maintaining, moving to new locations, replacing, and disposing of the components of the temporary traffic control measures for pedestrians and vehicular traffic, as specified in the State Standard Specifications, these Technical Specifications, and the Right of Entry Permit and as directed by the Engineer.
- C. Full compensation for flagging cost shall be considered as included in “Traffic Control” and no additional compensation will be allowed therefore.

**END OF SECTION 01 55 26**

**SECTION 01 56 39**  
**TREE PRESERVATION AND PRUNING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Work Included: Furnish all labor, materials, equipment and apparatus not specifically mentioned herein or noted on the plans, but which are incidental and necessary to complete the work specified for the protection, preservation and/or repair of trees, including care, pruning, and trimming (limbs and roots) as required to construct improvements.
  
- B. Contractor shall protect from damage all existing vegetation determined by the City to remain on the project site and also on adjacent property (for trees overhanging the project site). Contractor shall be responsible for the repair any damage, including that to the adjacent property resulting from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care in performing the Work. If Contractor fails or refuses to repair the damage promptly and according to the City directions, the City may have the necessary work performed and charge the cost to Contractor.
  - 1. Tree and Plant Protection includes, but is not limited to the following:
    - a. The protection of the above and below-ground portions of trees including roots, trunks, branches and foliage. Protection of roots includes reduction and/or prevention of soil compaction caused by vehicles, equipment, materials or foot traffic.
    - b. Protective Fencing and Signage surrounding the Tree Protection Zone around the tree or group of trees.
    - c. Pre-Demolition and Construction meetings on site with the City.
    - d. Pre-work Clearance Pruning for demolition and construction.
    - e. Organic mulch placed in tree protection zones.
    - f. Irrigation of trees before and during demolition and construction.
    - g. Dealing with protection and preservation of tree roots relative to soil grubbing, grading, structure or pavement removal, excavations, etc.
    - h. Ongoing updating and consultation with the City regarding site work and potential tree impacts
  
- C. Monthly Tree Protection Inspections and Reports by the City.

**1.02 RELATED SECTIONS**

- A. Section 02 40 00                      Demolition
  
- B. Section 31 10 00                      Site Clearing
  
- C. Section 32 90 00                      Landscape Planting



- D. Section 31 20 00 Earth Moving

### 1.03 RELATED DOCUMENTS

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.
- B. References:
1. Arboriculture: The care of trees and shrubs by Dr. Richard Harris
  2. Pruning procedures: "Tree Pruning Guidelines", International Society of Arboriculture, Atlanta, GA, 2018 or current edition, conforms to ANSI-A300-tree pruning specifications and guidelines.
  3. ANSI A300 Pruning Standards. 2017 Edition. Ibid. (Covers tree care methodology).
  4. ANSI Z133.1 Safety Requirements for Arboricultural Operations. 2017 Edition. Ibid. (Covers safety).

### 1.04 DEFINITIONS

1. **Certified Arborist**: An Arborist certified through the ISA (International Society of Arboriculture) after passing a test demonstrating basic knowledge about urban trees and their management, fulfilling an ongoing continuing education requirement and paying regularly scheduled certification fees.
2. **Dripline (tree)**: The area under the total branch spread of the tree, all around the tree.
3. **Existing tree**: The trees existing on property prior to any demolition or construction for a project.
4. **Neighboring tree**: Existing trees on adjacent private property not owned by the City, but the dripline of which overhangs the City property.
5. **Qualified Tree Service**: A tree service with a supervising arborist who has the minimum certification level of ISA (International Society of Arboriculture) Certified Arborist, in a supervisory position on the job site during execution of the tree work. The tree service shall adhere to the most current of the following arboricultural industry tree care standards.
6. **Tree**: a woody perennial plant usually having one dominant trunk and a mature height greater than 15 feet. Multiple-trunk trees have more than one trunk.
7. **Tree Protection Zone (TPZ)**: The area inside the Tree Protection Fencing on a City project, containing the tree or tree trunks and below some or the entire canopy of the tree or beyond the canopy. The TPZ and Tree Protection Fencing remain in place prior to any work on site (including demolition) until the construction project is fully completed.
8. **Tree Service**: A company that performs tree pruning and tree removals as their main business.

### 1.05 QUALITY ASSURANCE

- A. All tree protection, preservation and pruning performed shall be executed by a Qualified Tree Service company having, in full-time employment, an Arborist certified by the International Society of Arboriculture (ISA). Certification must be verified. The Arborist must be directly

responsible for decisions made and should visit the work sites daily when trimming of tree limbs and roots are to be performed.

- B. Pruning shall be performed to the standards of the International Society of Arborists Pruning guidelines, and to ANSI A-300.
- C. Preconstruction Tree Preservation Meeting
  - 1. Contractor to provide 36 hour notice for Preconstruction Tree Preservation Meeting at Project site with the Project Manager and Landscape Architect prior to start of construction, including demolition.

#### **1.06 SUBMITTALS**

- A. Arborist certification
- B. Tree Pruning Schedule (provided by Qualified Tree Service Contractor): Written schedule detailing scope and extent of pruning of trees to remain and that interfere with or are affected by demolition or construction.

#### **1.07 TAGGING OF TREES TO BE PRESERVED**

- A. All preserved trees shall be flagged with a distinctive colored ribbon prior to Preconstruction Tree Preservation Meeting. After flagging and prior to commencement of any work, the Contractor shall notify the City Arborist who will verify that the correct trees are flagged.

#### **1.08 JOB CONDITIONS**

- A. The Contractor will be held responsible for any damage to trees or other plants, which are to remain during construction, including limb or branch breakage, tearing of bark along trunk or excessive root damage. Large roots greater than 3” in diameter and less than 12” below ground level shall not be cut without the City’s approval.
- B. The following practices are prohibited within Tree Protection Zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Placement of outhouses
  - 4. Foot traffic.
  - 5. Erection of sheds or structures.
  - 6. Impoundment of water.
  - 7. Equipment wash down.
  - 8. Grubbing of soil surface to remove organic matter.
  - 9. Disposal of chemicals, petroleum products, or other detrimental substances.
  - 10. Excavation, grading or other soil disturbance unless otherwise indicated.
  - 11. Attachment of signs to or wrapping materials around trees unless otherwise indicated on plans.

## **PART 2 - PRODUCTS**

### **2.01 TREE PROTECTION-ZONE FENCING**

- A. Fencing fixed in position and meeting the following requirements:
  - 1. Height of Fencing: 6-foot high metal cyclone mesh attached to 2-inch steel posts driven 18-24 inches into the ground and spaced no farther than 10 feet apart.

### **2.02 MULCH**

- A. Per planting specifications.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION AND PREPARATION**

- A. If at any time the Contractor judges that the protection of a tree designated to be saved is incompatible with work required, or if operations necessary threaten the health or structural stability of a tree, notify immediately the City and do no further work affecting the tree until a written agreement is reached concerning acceptable procedures.
- B. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion-and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree protection zones.
- C. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- D. Contractor shall install 8 or 9 inch diameter straw wattling roll on the uphill side of the protective fence to divert runoff from the construction site to the protected trees. The wattle shall be maintained until protective fence is removed from the project site.
- E. Under no circumstances shall the Contractor remove existing trees that are indicated not to be removed.
- F. Tree removal may not damage existing trees or vegetation to remain; consult with Owner's Representative regarding any conflicts.

### **3.02 TREE PROTECTION ZONES**

- A. Protection-Zone Fencing: Install Tree Protection Fencing along edges of Tree Protection Zones in a manner that will prevent people from easily entering protected area except for arborist inspection and tree maintenance. An 18-inch wide gap for arborist access and tree maintenance will be provided in each fenced off area.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
  2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to City.
  3. Access Gap in Fencing: Provide an 18-inch wide gap, with a standard steel post on each side of the gap, overlap fence fabric to close gap.
- B. Protection-Zone Signage: Install City specified Tree Protection Signs every 25 feet or in each cardinal direction, whichever is more, 6 inches from the top of the fence. Signs must be securely attached to fence with 4 plastic wire ties; one tie in each corner. Tree Protection Signs must be aluminum or corrugated plastic.
- C. Contractor shall repair or replace protected trees and other vegetation indicated to remain or be relocated that are damaged by construction operations at no additional cost to contract or City. The City Representative shall specify any repair work or replacement value for damaged trees.
- D. Maintain Tree Protection Fencing and signage in good condition as acceptable to City Arborist and remove when construction operations are complete and equipment and materials have been removed from the site. At sites where the excavation has taken place near trees to remain, and many living roots remain exposed to the air, the Contractor shall cover the exposed roots within 2 hours with sand, soil, moist burlap or other means acceptable to the City.
- E. Construction materials, debris, and supplies shall not be stored within the drip line or protective fencing area under any tree.
- F. Vehicles shall not be parked within the drip line or protective fencing area.
- G. Woodchips or another cushioning surface material approved by the City shall be placed over areas where roots are present and construction traffic occurs.

### 3.03 EXCAVATION

- A. General: Hand or air spade excavate at edge of Tree Protection Zones for grading, trenches and other soil disturbance adjacent to existing trees.
- B. No rototilling or other soil disturbance shall take place within Tree Protection Zones, before, during, or after demolition or construction, unless designated within construction documents.
- C. Trenching near Trees: Where utility trenches are required within or adjacent to Tree Protection Zones, air spade or hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut *large* (e.g. 2 inches in diameter or greater) roots; cut only smaller roots that interfere with installation of utilities.
- D. Open trenches are not to be routed beneath the dripline of trees that are to be preserved unless this is impossible to avoid; in which case damage may be reduced by careful placement by air spading or hand-digging of trenches to avoid large roots by tunneling under rather than cutting roots greater than 2 inches or greater in diameter.

### **3.04 TREE PRUNING**

- A. Remove branches that are in the path of temporary and permanent construction, or within the work zone margin beyond that construction. Where trees are concerned, minimize the work zone margin to the minimum possible to accomplish demolition or construction work. Any pruning will be completed by a Qualified Tree Service, but it is the contractor's responsibility to notify the City of any pruning that is necessary.
- B. Tree pruning shall be performed to balance the crown and eliminate hazards. The main work performed shall be to reduce the sail effect through thinning, reducing end weights, shortening long heavy limbs, removing deadwood, weak limbs and sucker growth. Limbs shall be pruned back to an appropriate lateral branch.
- C. All final cuts shall be made at the outer edge of the branch collar. The pruning work shall be performed in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards
- D. The Contractor shall be responsible for the preservation of all public and private property. Pruning includes the cutting of limbs, cleanup, removal and disposal of cuttings and debris. Elm logs must be properly disposed of per State Quarantine. Work shall be performed by a two-person crew with one climber, one ground person, a dumping chipper truck and chipper, and any other necessary saws, lines, tools and safety equipment. The work area shall have appropriate cones and signs for safe pedestrian and vehicle traffic.

### **3.05 ROOT PRUNING**

- A. Tree roots greater than 3" in diameter and less than 12" below ground level shall not be cut without approval of the City.
- B. Roots shall be cut clearly, as far from the trunk of the tree as possible. Root pruning shall be to a depth of 18".
- C. Root pruning shall be performed using a Vermeer Root Cutting Machine. Alternate equipment or techniques must be approved by the City.
- D. Root pruning shall be completed prior to base or subgrade preparation, or to any excavation adjacent to the tree.
- E. Root Pruning
  - 1. Prior to root cutting air spade or hand dig a trench along the edge of the excavation facing the protected tree(s), to the depth of the excavation. The trench must be at least 12 inches wide. Cut exposed roots that need to be removed cleanly back to the trench wall with sharp pruning tools. Do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots. Heavy equipment may be used to continue soil work but the equipment must not contact the roots that have been cut at the edge of the trench, or any soil or roots on the tree-side of the trench.
  - 2. Exposed roots must be covered with 2 layers of natural burlap or organic mulch that is kept moist until backfilled. The exposed trench wall must be sprayed with water and thoroughly moistened with water prior to placement of burlap.

3. Backfill as soon as possible according to requirements in Section 31 23 33- Trenching and Backfilling. Wet the backfill soil thoroughly as it is placed in the trench.

### **3.06 REGRADING**

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

### **3.07 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off City's property.

## **PART 4 - MEASUREMENT & PAYMENT**

- A. **Measurement:** Measurement of “Tree Preservation and Pruning” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for “Tree Preservation and Pruning” including “Tree Protection Fencing” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in “Tree Preservation and Pruning” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 01 56 39**

**SECTION 01 60 00**  
**PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

**1.02 DEFINITIONS**

- A. Products:
1. General: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  2. Named Products: Items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
  3. Materials: Components shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
  4. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

**1.03 QUALITY ASSURANCE**

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

**1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. General: Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

## **PART 2 - PRODUCTS**

### **2.01 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to [Section 01 25 00 - Substitution Procedures](#).

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION OF PRODUCTS:**

- A. General: Refer to [Section 01 70 00 – Execution](#).
- B. Product Handling: Assure that Work is manufactured and/or fabricated in ample time to not delay construction progress. Transport, handle, store and protect products in accordance with manufacturer's instructions.

**END OF SECTION 01 60 00**



**SECTION 01 70 00**  
**EXECUTION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This section includes requirements for field engineering, examination, preparation, execution, cleaning, and protecting installed construction.
- B. Field Engineering: Provide such field engineering services as are required for proper completion of the Work including, but not limited to:
  - 1. Establishing and maintaining lines and levels.
  - 2. Structural design of shores, forms, and similar items provided by the Contractor as part of the means and methods of construction.

**1.02 QUALITY ASSURANCE**

- A. Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specific requirements and the methods needed for proper performance of the work of this Section.

**1.03 SUBMITTALS**

- A. Comply with [Section 01 33 00 - Submittal Procedures](#).
- B. Upon request of the Project Manager, submit the following:
  - 1. Engineering qualifications of persons proposed to be engaged for field engineering services.
  - 2. Documentation verifying accuracy of field engineering work.
  - 3. Certification, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance with requirements of the Contract Documents. Documentation shall require surveyor's certification stamp.

**1.04 REFERENCE POINTS**

- A. In addition to the procedures directed by the Contractor for proper performance of the Contractor's responsibilities:
  - 1. Locate and protect control points before starting work on the site.
  - 2. Preserve permanent reference points during progress of the Work.
  - 3. Do not change or relocate reference points or items of the Work without specific approval from the Project Manager.

4. Notify and advise the Project Manager within twenty-four (24) hours when a reference point is lost or destroyed, or requires relocation because of other changes in the Work:
  - a. Upon direction of the Project Manager, require the field engineer to replace reference stakes and/or markers.
  - b. Locate such replacements according to the original survey control.

## **PART 2 - PRODUCTS**

- A. NOT USED

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

### **3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or manufacturer-recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

### **3.03 EXECUTION**

- A. Comply with manufacturer's installation instructions, performing each step-in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Project Manager before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

industry-recognized tolerances.

2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
  3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Project Manager for final decision.
- E. Allow for expansion of materials and/or movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
  2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
1. Refer questionable mounting heights choices to Project Manager for final decision.
  2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

### **3.04 CLEANING**

- A. Maintain Project Site, surrounding areas and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
- B. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project Site clean and ready for occupancy.
- C. Hazards Control:
1. Conduct cleaning and disposal operation in accord with legal requirements.
  2. Do not burn or bury rubbish and waste materials on Project Site.
  3. Do not dispose of volatile wastes in storm or sanitary drains.
  4. Store volatile wastes in covered metal containers, and remove from premises daily.
  5. Prevent accumulation of wastes which create hazardous conditions.
  6. Provide adequate ventilation during use of volatile or noxious substances. Ventilation shall

be other than ventilation system.

D. Materials:

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
2. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

E. During Construction:

1. Execute cleaning daily to ensure Project Site, Owner's premises, adjacent and public properties are maintained free from accumulations of waste materials and rubbish.
2. Wet down dry materials and rubbish to control dust.
3. At reasonable intervals during progress of Work, clean Project Site and public properties, and dispose of waste materials, debris and rubbish.
4. Provide on Project Site dump containers for collection of waste materials, debris and rubbish. Waste containers shall not be used for construction waste.
5. Remove waste materials, debris and rubbish from Owner's premises and legally dispose of off Owner's property.
6. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials.

**3.05 PROTECTING INSTALLED CONSTRUCTION**

- F. Protect installed Work and provide special protection where specified in individual Specification Sections.
- G. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- H. Prohibit traffic from landscaped areas.

**END OF SECTION 01 70 00**

**SECTION 01 71 13**  
**MOBILIZATION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes but not limited to:
1. mobilization and demobilization;
  2. preparatory work and activities those necessary for the movement of personnel, equipment, supplies, and incidentals to the job site;
  3. for the establishment of all offices, building, trailers, and other facilities necessary for work on the project;
  4. submittals, bonding and insurance requirements;
  5. public notifications in English and Spanish;
  6. contacting and notifying the utility companies;
  7. fabricating and installing project identification signs;
  8. private property owner agreement for storage facilities;
  9. and for all other work and activities which must be performed or costs incurred prior to beginning work on the various contract items on the project site.

**1.02 REFERENCES**

- A. Cal/OSHA – California Division of Occupation Safety and Health
- B. Underground Services Alert (USA)

**1.03 SUBMITTALS**

- A. [Section 01 33 00 - Submittal Procedures](#): Requirements for submittals.
- B. Measurement and Payment:
1. When mobilization is included as a bid item, measurement will be made as a percentage of the costs incurred according to the list submitted except that not more than 75% of the bid price shall be paid prior to the final estimate for payment being due, said remaining 25% paid upon completion of cleanup and removal and demobilization with final payment.

2. When the contract does not include a contract pay item for mobilization, full compensation for any necessary mobilization required shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefore.
3. The contract price paid for mobilization shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in mobilization and demobilization including the items listed in Part 1.1 of this Section as specified herein, and no additional compensation shall be made therefor.
4. Mobilization shall be considered as a non-adjustable contract item. Any contract change orders shall be considered as including full compensation for mobilization.

## **PART 2 - PRODUCTS**

NOT USED

## **PART 3 - EXECUTION**

### **3.01 MOBILIZATION**

- A. Mobilization shall consist of preparatory work and activities listed in Part 1.1 above.
- B. The Contractor shall insure that adequate existing sanitation facilities are available or the Contractor shall provide and maintain adequate sanitation facilities. All wastes and refuse from sanitary facilities provided by the Contractor's operations shall be disposed of away from the site in accordance with all laws and regulations pertaining thereto.
- C. Mobilization shall also include demobilization upon completion of work and cleanup of the site.
- D. The contractor shall provide all labor, materials, equipment and incidentals to prepare the site for the timely start and efficient completion of all work. This includes obtaining all necessary licenses and permits, providing required submittals including but not limited to a detailed project schedule.
- E. Mobilization shall also include notifications to all existing utility companies as shown on the Drawings as first order of work.

## **PART 4 - MEASUREMENT & PAYMENT**

- A. **Measurement and Payment:** The contract unit prices paid for the various items in "Mobilization" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Mobilization", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 01 71 13**

**SECTION 01 71 23**  
**FIELD ENGINEERING (CONSTRUCTION SURVEYING)**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The Contractor will retain the services of a registered Professional, authorized in the State of California to practice Land Surveying, to establish the alignment and elevation for site improvements shown on the Civil Improvement Drawings, and to provide a letter which documents the elevation of the building pads prior to building construction.
- B. The Contractor will contract with the Professional to establish project control and to provide one set of construction stakes, which in the Owner's judgment are necessary for the Contractor to complete the following improvements
  - 1. Site clearing and pavement saw cut lines.
  - 2. Establish site rough grade.
  - 3. Sanitary sewer and related structures outside of the building.
  - 4. Storm drain and related structures outside of the building which is larger than 6-inches in diameter.
  - 5. Water lines outside of the building which are larger than 4-inches in diameter.
  - 6. Curb and gutter.
  - 7. Final construction of the building pad.
  - 8. Building layout.
- C. The Contractor is responsible for establishing the alignment and elevation for site improvements which are not included as an Owner furnished service.

**1.02 RELATED SECTIONS**

- A. Section 31 20 00                      Earth Moving
- B. Section 32 05 23                      Cement & Concrete for Exterior Improvements
- C. Section 32 15 40                      Decomposed Granite
- D. Section 32 11 00                      Base Course
- E. Section 32 11 23                      Permeable Base (Single Stone) for Synthetic Turf
- F. Section 32 31 13                      Chain Link Fences and Gates

### **1.03 RELATED DOCUMENTS**

- A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

### **1.04 SUBMITTALS**

- A. Maintain a complete accurate log of work performed for which the contractor is responsible. Record and report deviations from the required lines and levels to the Owner's Representative. Submit Record Drawings and related documentation to the Owner's Representative.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. The Contractor shall supply all necessary materials required to perform work related to this section.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. The Contractor is responsible for protecting and preserving established survey control, construction stakes and property monuments. The Contractor will provide the Owner's Representative with at least five (5) days written notice before conducting work in areas where construction activity has the potential of damaging property monuments, so that the Professional authorized to practice Land Surveying can identify the location of the monument to perpetuate its location. Survey control points and property monuments which are disturbed during construction will be reset by the licensed professional at the Contractor's expense.

### **3.02 PROJECT SURVEY REQUIREMENTS**

- A. The Contractor is responsible for establishing lines and levels, locating and laying out:
  - 1. Batter boards for structures.
  - 2. Building foundations, column locations and floor levels.
  - 3. Utilities within the building perimeter.
  - 4. Mechanical and electrical work.

## **PART 4 - MEASUREMENT & PAYMENT**

- A. **Measurement:** Measurement of "Field Engineering" shall be by Lump Sum (LS).

- B. **Payment:** The contract lump sum price paid for "Field Engineering" shall include full  
Pickleweed Park  
San Rafael, California



compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in "Field Engineering" as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 01 71 23**

**SECTION 01 77 00**  
**CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This section describes contract closeout procedures including:
  - 1. Removal of temporary construction facilities
  - 2. Substantial completion
  - 3. Final completion
  - 4. Final cleaning
  - 5. Miscellaneous Project Record Submittals
  - 6. Release of claims

**1.02 REMOVAL OF TEMPORARY CONSTRUCTION FACILITIES**

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion Inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities.
- C. Restore permanent facilities used during construction to specified condition.

**1.03 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
  - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
  - 2. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
  - 3. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
- B. Advise the Project Manager of pending insurance changeover requirements.
- C. Submit warranty bonds, final certifications, and similar documents.

- D. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- E. Submit record drawings in PDF or hard copies in addition to CAD files, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
- F. Deliver tools, spare parts, extra stock, and similar items.
- G. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
- H. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
- I. Complete final cleanup requirements, including touchup painting.
- J. Touch up and otherwise repair and restore marred, exposed finishes.
- K. Inspection Procedures: On receipt of a request for inspection, the Project Manager will either proceed with inspection or advise the Contractor of unfilled requirements. The Project Manager will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
- L. The Project Manager will repeat inspection when requested and assured that the Work is substantially complete.
- M. Results of the completed inspection will form the basis of requirements for final acceptance.

#### **1.04 FINAL COMPLETION**

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
- B. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
- C. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
- D. Submit a certified copy of the Project Manager's final inspection list of items to be completed or corrected, endorsed and dated by the Project Manager. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Project Manager.
- E. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
- F. Submit consent of surety to final payment.

- G. Submit a final liquidated damages settlement statement.
- H. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- I. Re-inspection Procedure: The Project Manager will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Project Manager.
  - 1. Upon completion of re-inspection, the Project Manager will prepare a certificate of final acceptance. If the Work is incomplete, the Project Manager will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
  - 2. If necessary, re-inspection will be repeated.
- J. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Provide two (2) paper copies and a PDF. Mark appropriate identification on front and spine of each binder. Include the following types of information:
  - 1. Emergency instructions.
  - 2. Spare parts list.
  - 3. Copies of warranties.
  - 4. Wiring diagrams.
  - 5. Recommended "turn-around" cycles.
  - 6. Inspection procedures.
  - 7. Shop Drawings and Product Data.
  - 8. Fixture lamping schedule.

#### **1.05 FINAL CLEANING**

- A. Execute final cleaning prior to final inspection.
- B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment operated during construction, clean ducts, blowers and coils of units operated without filters during construction.
- D. Employ skilled workers for final cleaning.
- E. Clean Site; mechanically sweep paved areas.

- F. Remove waste and surplus materials, rubbish, and construction facilities from Site.

**1.06 MISCELLANEOUS PROJECT RECORD SUBMITTALS**

- A. Refer to Special Provisions or other Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Project Manager for City's records.

**1.07 RELEASE OF CLAIMS**

- A. Contract will not be closed out and final payment will not be made, subject to provisions of Section 7100 Public Contract Code until all pertinent aspects of [Division 00 - General Conditions regarding](#) undisputed/settled amounts are completed per requirements elsewhere in the Special Provisions and/or Specifications and executed by Contractor and City.
- B. Contractor shall submit Agreement and Release of Any and All Claims Form.

**END OF SECTION 01 77 00**

**SECTION 01 78 00**  
**CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

A. SUMMARY

1. This section describes contract closeout submittals including:
2. Project record documents
3. Project guarantee
4. Warranties

B. PROJECT RECORD DOCUMENTS

1. Project Record Documents required include:
2. Marked-up copies of Contract Drawings
3. Marked-up copies of Shop Drawings
  - a) Project Record Drawings
4. Marked-up copies of Special Provisions, Specifications, Addenda and Change Orders
5. Marked-up Project Data submittals
6. Record Samples
7. Field records for variable and concealed conditions
8. Record information on Work that is recorded only schematically
9. GPS As-built Survey
10. Warranty Bonds

C. Specific Project Record Documents requirements that expand requirements of this Section are included in the individual Sections of Divisions 2 through 48 (when provided).

D. General Project closeout requirements are included in [Section 01 77 00 - Closeout Requirements](#).

E. Maintenance of Documents and Samples:

1. Store Project Record Documents and samples in the field office apart from Contract Documents used for construction.
2. Do not permit Project Record Documents to be used for construction purposes.

3. Maintain Project Record Documents in good order, and in a clean, dry, legible condition.
  4. Make documents and samples available at all times for inspection by Architect and Project Manager.
- F. City will provide one set of reproducibles and one set of the construction drawing prints and one project manual for the Contractor's use and copying during construction.
- G. Mark-up Procedure: During the construction period, maintain a set of Contract Drawings and Shop Drawings for Project Record Document purposes.
- H. Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements which would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:
1. Dimensional changes to the Drawings
  2. Revisions to details shown on the Drawings
  3. Depths of foundations below the first floor
  4. Locations and depths of underground utilities
  5. Revisions to routing of piping and conduits
  6. Revisions to electrical circuitry
  7. Actual equipment locations
  8. Duct size and routing
  9. Locations of concealed internal utilities
  10. Changes made by Change Order
  11. Details not on original Contract Drawings
    - a) Mark completely and accurately Project Record Drawing prints of Contract Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.
    - b) Mark Project Record Drawing sets with red ink; use other colors to distinguish between changes for different categories of the Work at the same location.
    - c) Mark important additional information which was either shown schematically or omitted from original Drawings.
    - d) Note construction change directive numbers; alternate numbers; Change Order numbers and similar identification.

- e) Responsibility for Mark-up: Where feasible, the individual or entity who obtained Project Record Drawing data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on Project Record Drawings.
  - Accurately record information in an understandable and legible drawing technique.
  - Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.
  
- I. Preparation of Transparencies: Prior to inspection for Certification of Substantial Completion, review completed marked-up Project Record Drawings with the Project Manager. When authorized, prepare a full set of correct reproductables of Contract Drawings and Shop Drawings.
  - 1. Incorporate changes and additional information previously marked on print sets. Erase, redraw, and add details and notations where applicable. Identify and date each Drawing; include the printed designation "PROJECT RECORD DRAWINGS" in a prominent location on each Drawing.
  - 2. Refer instances of uncertainty to the Project Manager for resolution.
  - 3. Review of Reproducible: Before copying and distributing, submit corrected reproductibles and the original marked-up prints to the Project Manager for review. When acceptable, the Project Manager will initial and date each transparency, indicating acceptance of general scope of changes and additional information recorded, and of the quality of drafting.
    - a) Reproducibles and the original marked-up prints will be returned to the Contractor for organizing into sets, printing, binding, and final submittal.
  
- J. Copies and Distribution: After completing the preparation of reproducible Project Record Drawings, print one hard copy and a PDF of each Drawing, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets.
  - a) Organize and bind original marked-up set of prints that were maintained during the construction period in the same manner.
  - b) Organize Project Record Drawings reproductibles into sets matching the print sets. Place these sets in durable tube-type drawing containers with end caps.
  
- K. Distribution of Marked-Up Drawings and Transparencies: Submit the marked-up Project Record Drawings sets, reproductibles, and one copy to the Project Manager for City's records.
  
- L. Project Record Special Provisions and Specifications:
  - 1. During the construction period, maintain one copy of the Project Manual, including addenda and modifications issued, for Project Record Document purposes.
  - 2. Mark the Project Record Manual to indicate the actual installation where the installation



varies substantially from that indicated in Specifications and Modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installation that would be difficult to identify or measure and record later.

- a) In each Special Provisions and Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.
  - b) Record the name of the manufacturer, supplier and installer, and other information necessary to provide a record of selections made and to document coordination with Project Record Product Data submittals and maintenance manuals.
  - c) Note related Project Record Product Data, where applicable, for each principal product specified, indicate whether Project Record Product Data has been submitted in maintenance manual instead of submitted as Project Record Product Data.
- M. Upon completion of mark-up, submit Project Record Manual to the Project Manager for City's records.
- N. Project Record Product Data:
1. During the construction period, maintain one copy of each Project Record Product Data submittal for Project Record Document purposes.
  2. Mark Project Record Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Project Record Product Data submitted. Include significant changes in the product delivered to the site, and changes in manufacturer's instructions and recommendations for installation.
  3. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  4. Note related Change Orders and mark-ups of Project Record Drawings, where applicable.
  5. Upon completion of mark-up, submit a complete set of Project Record Product Data to the Project Manager for City's records.
  6. Where Project Record Product Data is required as part of maintenance manuals, submit marked-up Project Record Product Data as an insert in the manual, instead of submittal as Project Record Product Data.
- O. Material, Equipment and Finish Data:
1. Provide data for primary materials, equipment and finishes as required under each Special Provisions/Specification section.
  2. Submit one set prior to final inspection, bound in 8-1/2 inches by 11 inches three-ring binders with durable plastic covers and a PDF; provide typewritten table of contents for each volume.

3. Arrange by Special Provisions/Specification division and give names, addresses, and telephone numbers of subcontractors and suppliers. List:
  - a) Trade names.
  - b) Model or type numbers.
  - c) Assembly diagrams.
  - d) Operating instructions.
  - e) Cleaning instructions.
  - f) Maintenance instructions.
  - g) Recommended spare parts.
  - h) Product data.

P. Miscellaneous Project Record Submittals:

1. Refer to other Special Provisions/Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Project Manager for City's records. Field records documenting elevations and locations of completed improvements shall require Contractor-retained State of California Licensed surveyor's certification stamp. Categories of requirements resulting in miscellaneous records include, but are not limited to the following:
  - a) Field records on excavations and foundations
  - b) Field records on underground construction and similar work
  - c) Survey showing locations and elevations of underground lines
  - d) Invert elevations of drainage piping
  - e) Surveys establishing building lines and levels
  - f) Authorized measurements utilizing unit prices or allowances
  - g) Records of plant treatment
  - h) Ambient and substrate condition tests
  - i) Certifications received in lieu of labels on bulk products
  - j) Batch mixing and bulk delivery records

- k) Testing and qualification of tradespersons
  - l) Documented qualification of installation firms
  - m) Load and performance testing
  - n) Inspections and certifications by governing authorities
  - o) Leakage and water-penetration tests
  - p) Fire resistance and flame spread test results
  - q) Final inspection and correction procedures
- Q. GPS As-built Survey: Refer to [Section 01 71 23 - Construction Surveying](#) for As-Built GPS Survey.
- R. Periodic Review:
- 1. Make additions to the Project Record Documents as they occur.
  - 2. Make the Project Record Documents available to the Project Manager for periodic review. The Project Manager's review of the current status of Project Record Documents is a requisite to approval of requests for progress payment.
  - 3. Prior to submitting each request for progress payment, secure the Project manager's approval of the current status of the Project Record Documents.
  - 4. Prior to submitting request for final Payment, submit the final Project Record Documents to the Project Manager for approval.
- S. Submittal: At the completion of Project, deliver record documents to Project Manager.

#### **1.01 PROJECT GUARANTEE**

- A. Requirements for Contractor's guarantee of completed Work are included in [Division 00 - General Conditions](#). Contractor shall guarantee Work done under Contract against failures, leaks or breaks or other unsatisfactory conditions due to defective equipment, materials or workmanship, and perform repair work or replacement required, at Contractor's sole expense, for period of one year, unless otherwise subject to any special warranty periods of longer duration, from date of Final Acceptance.
- B. Neither recordation of final acceptance nor final certificate for payment nor provision of the Contract nor partial or entire use or occupancy of premises by City shall constitute acceptance of Work not done in accordance with Contract Documents nor relieve Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship.
- C. City may make repairs to defective Work as set forth in paragraph 10.C.3 of [Division 00 - General Conditions](#), if, within five (5) working days after mailing of written notice of defective work to Contractor or authorized agent, Contractor shall neglect to make or undertake repair with due diligence; provided, however, that in case of leak or emergency where, in opinion of City, delay would cause hazard to health or serious loss or damage, repairs may be made without notice being

sent to Contractor, and Contractor shall pay cost thereof.

- D. If, after installation, operation or use of materials or equipment to be furnished under Contract proves to be unsatisfactory to Project Manager, City shall have right to operate and use materials or equipment until it can, without damage to City, be taken out of service for correction or replacement. Period of use of defective materials or equipment pending correction or replacement shall in no way decrease guarantee period required for acceptable corrected or replaced items of materials or equipment.
- E. Nothing in this Section shall be construed to limit, relieve or release Contractor's, subcontractors' and equipment suppliers' liability to City for damages sustained as result of latent defects in equipment caused by negligence of suppliers' agents, employees or subcontractors. Stated in another manner, warranty contained in the Contract Documents shall not amount to, nor shall it be deemed to be, waiver by City of any rights or remedies (or time limits in which to enforce such rights or remedies) it may have for defective workmanship or defective materials under laws of this State pertaining to acts of negligence.

## **1.02 WARRANTIES**

- A. Execute Contractor's submittals and assemble warranty documents executed or supplied by subcontractors, suppliers, and manufacturers.
  - 1. Provide table of contents and assemble in 8-1/2 inches by 11 inches three-ring binder with durable plastic cover.
  - 2. Assemble in Special Provisions/Specification Section order.
    - a) Submit material prior to final application for payment.
  - 3. For equipment put into use with City's permission during construction, submit within ten (10) working days after first operation.
  - 4. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten (10) working days after acceptance, listing date of acceptance as start of warranty period.
  - 5. Warranties are intended to protect City against failure of work and against deficient, defective and faulty materials and workmanship, regardless of sources.
  - 6. Limitations: Warranties are not intended to cover failures which result from the following:
    - a) Unusual or abnormal phenomena of the elements
    - b) Vandalism after substantial completion
  - 7. Insurrection or acts of aggression including war.
- B. Related Damages and Losses: Remove and replace Work which is damaged as result of defective Work, or which must be removed and replaced to provide access for correction of warranted Work.

- C. Warranty Reinstatement: After correction of warranted Work, reinstate warranty for corrected Work to date of original warranty expiration or to a date not less than ninety (90) days after corrected Work was done, whichever is later.
- D. Replacement Cost: Replace or restore failing warranted items without regard to anticipated useful service lives.
- E. Warranty Forms: Submit drafts to Project Manager for approval prior to execution. Forms shall not detract from or confuse requirements or interpretations of Contract Documents.
- F. Warranty shall be countersigned by manufacturers.
- G. Where specified, warranty shall be countersigned by subcontractors and installers.
- H. Rejection of Warranties: City reserves right to reject unsolicited and coincidental product warranties which detract from or confuse requirements or interpretations of Contract Documents.
- I. Term of Warranties: For materials, equipment, systems and workmanship warranty period shall be one-year minimum from date of final completion of entire Work except where:
- J. Detailed specifications for certain materials, equipment or systems require longer warranty periods.
- K. Materials, equipment or systems are put into beneficial use of City prior to Final Completion as agreed to in writing by Project Manager.
- L. Warranty of Title: No material, supplies, or equipment for Work under Contract shall be purchased subject to any chattel mortgage, security agreement, or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all work to deliver premises, together with improvements and appurtenances constructed or placed thereon by Contractor, to City free from any claim, liens, security interest, or charges, and further agrees that neither Contractor nor any person, firm, or corporation furnishing any materials or labor for any Work covered by Contract shall have right to lien upon premises or improvement or appurtenances thereon. Nothing contained in this Paragraph, however, shall defeat or impair right of persons furnishing materials or labor under bond given by Contractor for their protection or any rights under law permitting persons to look to funds due Contractor in hands of City.

## **PART 2 - PRODUCTS**

- A. NOT USED

## **PART 3 - EXECUTION**

- A. NOT USED

**END OF SECTION 01 78 0**

**SECTION 01 78 23**  
**OPERATIONS AND MAINTENANCE DATA**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:
  - 1. General Conditions, including, without limitation, Completion of the Work;
  - 2. Contract Forms and Submittals.

**1.02 RELATED SECTIONS**

- A. Section 01 33 00                      Submittals

**1.03 RELATED REQUIREMENTS**

- A. Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

**1.04 FORMAT**

- A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").
- B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.
- C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.
- D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.
- E. Contractor shall provide tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.
- F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

- H. Digital Record: Contractor shall provide a full color PDF with all relevant data duplicated in digital format.

#### **1.05 CONTENTS, EACH VOLUME**

- A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, sub consultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of Products and systems, indexed to content of the volume.
- B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Contractor shall mark each sheet to clearly identify specific Products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Contractor shall supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.
- E. Text: The Contractor shall include any and all information as required to supplement Product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

#### **1.06 MANUAL FOR MATERIALS AND FINISHES**

- A. Building Products, Applied Materials, and Finishes: Contractor shall include Product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured Products.
- B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Contractor shall include Product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.
- E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

#### **1.07 MANUAL FOR EQUIPMENT AND SYSTEMS**

- A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting

conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

- B. Panel board Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.
- C. Contractor shall include color coded wiring diagrams as installed.
- D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Contractor shall include routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.
- G. Contractor shall include manufacturer's printed operation and maintenance instructions.
- H. Contractor shall include sequence of operation by controls manufacturer.
- I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Contractor shall provide control diagrams by controls manufacturer as installed.
- K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).
- O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

## **1.08 SUBMITTAL**

- A. Concurrent with the Schedule of Submittals as indicated in the General Conditions, Contractor shall submit to the City for review two (2) copies of a preliminary draft of proposed formats and outlines of the contents of the Manual.



- B. For equipment, or component parts of equipment put into service during construction and to be operated by City, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.
- C. On or before the Contractor submits its final application for payment, Contractor shall submit two (2) copies of a complete Manual in final form. The City will provide comments to Contractor and Contractor must revise the content of the Manual as required by City prior to City's approval of Contractor's final Application for Payment.
- D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after receiving City comments. Failure to do so will be a basis for the City withholding funds sufficient to protect itself for Contractor's failure to provide a final Manual to the District

## **PART 2 - PRODUCTS**

Not Applicable.

## **PART 3 - EXECUTION**

Not Applicable.

## **PART 4 - MEASUREMENT & PAYMENT**

- A. **Measurement and Payment:** Full compensation for "Operations and Maintenance Data" shall be considered as included in the contract unit prices paid for the various items of work performed and no additional compensation will be allowed.

**END OF SECTION 01 78 23**

**SECTION 01 78 36**  
**WARRANTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:
  - 1. General Conditions, including, without limitation, Warranty/Guarantee/Indemnity;
  - 2. Special Conditions; and
  - 3. Operation and Maintenance Data

**1.02 RELATED SECTIONS**

- A. Section 01 33 00                      Submittals
- B. Section 01 78 23                      Operations and Maintenance Data

**1.03 RELATED REQUIREMENTS**

- A. Contractor shall submit under the provisions of Section 01 33 00.

**1.04 FORMAT**

- A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.
- B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.
- C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the Product or work item is specified.
- D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractors, suppliers, and/or manufacturers, with name, address, and telephone number of each responsible principals.

## 1.05 PREPARATION

- A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item or work. Except for items put into use with City permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.
- B. Contractor shall verify that warranties are in proper form, contain full information, and are notarized, when required.
- C. Contractor shall co-execute submittals when required.
- D. Contractor shall retain warranties until time specified for submittal.

## 1.06 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during construction with the City of San Rafael's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.
- B. On or before the Contractor submits its final application for payment, Contractor shall submit all warranties and related documents in final form. The City of San Rafael will provide comments to Contractor and Contractor must revise the content of the warranties as required by District prior to City of San Rafael's approval of Contractor's final Application for Payment.
- C. For items of Work that are not completed until after the date of Completion, Contractor shall provide an updated warranty for those items of Work within ten (10) days after acceptance, listing the date of acceptance as start of warranty period.

## PART 2 - PRODUCTS

Not Applicable.

## PART 3 - EXECUTION

Not Applicable.

## PART 4 - MEASUREMENT & PAYMENT

- A. **Measurement and Payment:** Full compensation for "Warranties" shall be considered as included in the contract unit prices paid for the various items of work performed and no additional compensation will be allowed.

**END OF SECTION 01 78 36**

**SECTION 01 78 39**  
**RECORD DOCUMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Criteria for producing record documents required for this construction project.
- B. Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:
  - 1. General Conditions, including, without limitation, Documents on Work and Completion of Work.

**1.02 RELATED SECTIONS**

- A. Section 01 33 00                      Submittals
- B. Section 01 78 23                      Operations and Maintenance Data
- C. Section 01 78 36                      Warranties

**1.03 RECORD DRAWINGS**

- A. General:
  - 1. "Record Drawings" may also be referred to in the Contract Documents as "As-Built Drawings."
  - 2. As indicated in the Contract Documents, City will provide Contractor with one set of reproducible plans of the original Contract Drawings.
  - 3. Contractor shall maintain (1) set of marked-up plans and shall transfer all changes and information to those marked-up plans, and maintain a digital copy, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector a digital copy of the Project Record Drawings ("As-Built") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Built shall be available at the Project Site. The Contractor shall submit a digital copy at the conclusion of the Project following review of the blue line prints.
  - 4. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.
  - 5. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor.
  - 6. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

#### **1.04 RECORD DRAWING INFORMATION**

- A. Contractor shall record the following information:
  - 1. Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.
  - 2. Actual numbering of each electrical circuit.
  - 3. Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.
  - 4. Locations of all items, not necessarily concealed, which vary from the Contract Documents.
  - 5. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
  - 6. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub outs, invert elevations, etc.
  - 7. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.
- B. In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.
- C. Contractor shall provide additional drawings as necessary for clarification.
- D. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

#### **1.05 RECORD SPECIFICATIONS**

- A. Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

#### **1.06 MAINTENANCE OF RECORD DOCUMENTS**

- A. Contractor shall store Record Documents apart from documents used for construction as follows:
  - 1. Maintain the records in an organized way in the original format, electronic and hard copy, conducive to professional review and audit.
- B. Contractor shall not use Record Documents for construction purposes.

### **PART 2 - PRODUCTS**

Not Applicable.

### **PART 3 - EXECUTION**

Not Applicable.

**PART 4 - MEASUREMENT & PAYMENT**

- A. **Measurement and Payment:** Full compensation for “Record Documents” shall be considered as included in the contract unit prices paid for the various items of work performed and no additional compensation will be allowed.

**END OF SECTION 01 78 39**

**SECTION 02 40 00**  
**DEMOLITION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Removing above- and below-grade site improvements within limits indicated.
- B. Disconnecting, capping or sealing, and abandoning site utilities in place.
- C. Disconnecting, capping or sealing, and removing site utilities.
- D. Disposing of objectionable material.

**1.02 RELATED SECTIONS**

- A. Section 31 00 00 – Site Clearing.
- B. Section 31 20 00 – Earth Moving.
- C. Section 31 23 00 – Excavation and Fill.
- D. Section 31 23 33 – Trenching and Backfilling
- E. Section 32 12 00 – Asphalt Paving.
- F. Section 32 05 23 – Cement and Concrete for Exterior Improvements.
- G. Section 32 90 00 – Planting.
- H. Section 33 46 00 – Subdrainage.

**1.03 DEFINITIONS**

- A. ANSI: American National Standards Institute.
- B. CAL-OSHA: California Occupational Safety and Health Administration.

**1.04 PROJECT CONDITIONS**

- A. Except for materials indicated to be stockpiled or to remain the Owner's property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store where indicated on the Plans or where designated by the Owner. Avoid damaging materials designated for salvage.
- C.

- D. Unidentified Materials: If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the Owner. If necessary, the Owner will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.

## **PART 2 - PRODUCTS**

### **2.01 SOIL MATERIALS**

- A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 23 00 – Excavation and Fill.
- B. Backfill excavations resulting from demolition operations for planting areas shall conform to Section 32 90 00 – Planting, and Section 31 23 00 – Excavation and Fill.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Protect and maintain benchmarks and survey control points during construction.
- B. Protect existing site improvements to remain during construction.

### **3.02 RESTORATION**

- A. Restore damaged improvements to their original condition, as acceptable to the Owner.

### **3.03 UTILITIES**

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.
- B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless authorized in writing by the Owner, and then only after arranging to provide temporary utility services according to requirements indicated.
- D. Coordinate utility interruptions with utility company affected.
- E. Do not proceed with utility interruptions without the permission of the Owner and utility company affected. Notify Owner and utility company affected two working days prior to utility interruptions.
- F. Excavate and remove underground utilities that are indicated to be removed.



- G. Fill abandoned piping with cement slurry.
- H. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick.

### **3.04 SITE IMPROVEMENTS**

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.
- C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
- D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. If saw cut falls within 30-inches of a construction joint, expansions joint, score mark or edge, remove material to joint, mark or edge.
- E. Remove all contaminated soils including but not limited to all soils with concrete debris, aggregate base and asphalt created and disturbed by construction to the full depth as required in all areas to receive planting. All work for excavation, off haul and export and import soils shall be included within the contract price and no additional payments shall be made.

### **3.05 BACKFILL**

- A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 23 00 – Excavation and Fill.
- B. Place and compact material in excavations and depressions in areas to receive planting in conformance with Section 32 90 00 – Planting and Section 31 23 00 – Excavation and Fill.

### **3.06 SITE IMPROVEMENTS**

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

### **3.07 DISPOSAL**

- A. Remove surplus obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner's property.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Measurement of “Remove & Dispose of Concrete Sidewalk” shall be per square foot (SF).
- B. Measurement of “Remove & Dispose of Concrete Curb” shall be by the Linear Foot (LF).
- C. Measurement of “Remove & Dispose of Concrete Asphalt Concrete” shall be per square foot (SF).
- D. Measurement of “Remove & Dispose of Fence” shall be by the Linear Foot (LF).
- E. Measurement of “Remove & Dispose of Baseball Backstops” shall be by Lump Sum (LS).
- F. Measurement of “Remove & Dispose of Existing Restroom” shall be by Lump Sum (LS).
- G. Measurement of “Remove & Dispose Storm Drain Pipe” shall be by the Linear Foot (LF).
- H. Measurement of “Remove & Dispose of Storm Drain Structures” shall be per each (EA).
- I. Measurement of “Pipe Abandonment (6” SD)” shall be by the Linear Foot (LF).
- J. Measurement of “Pipe Abandonment (8” SD)” shall be by the Linear Foot (LF).
- K. Measurement of “Pipe Abandonment (10” SD)” shall be by the Linear Foot (LF).
- L. Measurement of “Pipe Abandonment (12” SD)” shall be by the Linear Foot (LF).

### **4.02 PAYMENT**

- A. The contract unit prices paid for the various items in “Demolition” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the “Demolition”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.
- B. The contract lump sum price paid for “Remove & Dispose of Baseball Backstops” and “Remove and Disposed of Existing Restroom” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.
- C. “Remove & Dispose of Concrete Curb” includes removing of vertical curb, and curb and gutter as shown on the Plans and as directed by the Engineer and no additional compensation will be allowed therefor.
- D. “Remove & Dispose of Existing Restroom” includes removing of existing water and sewer connection lines as shown on the Plans in order to facilitate future improvements and as directed by the Engineer and no additional compensation will be allowed therefor.

**END OF SECTION 02 40 00**

**SECTION 03 30 00**  
**SITE CONCRETE WORK**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Provide, precast walls, building pads, footings, and foundations, complete and in place, as shown and specified. The work includes but is not limited to:
  - 1. Final subgrade preparation and paving base
  - 2. Concrete building pads, precast wall, and foundations.
  - 3. Concrete footings for site mechanical, carpentry, and electrical items as shown.

**1.02 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Divisions 1 Specifications Sections, apply to this section.
- B. Related Work:
  - 1. Section 31 20 00: Earth Moving
  - 2. Section 02 40 00: Demolition
  - 3. Section 32 84 00: Irrigation System
  - 4. Section 03 05 23: Cement and Concrete for Exterior Improvements

**1.03 QUALITY ASSURANCE**

- A. Materials and methods of construction shall comply with the following standards:
  - 1. American Society of Testing and Materials, (ASTM).
  - 2. American Concrete Institute, (ACI).
  - 3. California Building Code (CBC)
  - 4. State Standard Specifications, California Department of Transportation.
  - 5. American National Standards Institute, (ANSI).
  - 6. Bay Area Air Quality Management District, Sandblasting Guidelines.
- B. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source and each admixture from the same manufacturer.
- D. Maintain field records of time, date of placing, curing and removal of forms of concrete in each portion of work.

- E. Samples:
  - 1. Sample panel precast wall: Before ordering material for concrete, provide sample panel, minimum 2'x2' of each color and finish, using specified materials. Show color, texture, pattern, edging, and joint treatments.
    - a. Where applicable, the approved sample panel may be a portion of the work and remain in place. Location as directed by the Owner's Representative. Contractor will be required to provide additional panels as necessary, until approved.

#### **1.04 SUBMITTALS**

- A. Submit concrete mix designs to Owner's Representative. Obtain approval before placing concrete.
- B. Product data:
  - 1. Submit complete materials list of items proposed for the work. Identify materials source.
  - 2. Submit admixture, curing compound, retarder, and accessory item product data, if used.
  - 3. Submit material certificates for aggregates, reinforcing, and joint fillers.
- C. Submit concrete delivery tickets. Show the following:
  - 1. Batch number.
  - 2. Mix by class or sack content with maximum size aggregate.
  - 3. Admixtures.
  - 4. Slump.
  - 5. Time of loading.
- D. Submit concrete test reports.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- A. Work notification: Notify Owner's Representative at least 24 hours prior to installation of concrete.
- B. Establish and maintain required lines and grade elevations. All concrete shall slope to drain with no ponding of water.
- C. Do not install concrete work over wet, saturated, muddy, or frozen subgrade.
- D. Do not install concrete when air temperature is below 40 degrees F. Use of calcium chloride, salt, or any other admixture to prevent concrete from freezing is prohibited.
- E. When temperatures is between 85 and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when temperatures is above 90 degrees F, reduce mixing and delivery to 60 minutes.
- F. Protect adjacent work.
- G. Provide temporary barricades and warning lights as required for protection of project work and public safety.

## **PART 2 - PRODUCTS**

### **2.01 FORMWORK**

- A. Furnish formwork and form accessories according to ACI 301-10.
- B. Wood or metal formwork shall be of sufficient strength to resist concrete placement pressure and to maintain horizontal and vertical alignment during concrete placement. Provide forms straight, free of defects and distortion, and height equal to full depth of concrete work.
  - 1. Provide 2" nominal thickness, surfaced plank wood forms for straight sections. Use flexible metal, 1" lumber or plywood forms to form radius bends.

### **2.02 STEEL REINFORCEMENT**

- A. Reinforcing steel: ASTM A615 or A706, new domestic deformed steel bars.
- B. Smooth Steel Dowels: ASTM A36

### **2.03 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C150, Type 1, natural color, unless otherwise noted.
- B. Aggregate: Provide ASTM C33 normal weight aggregates, 3/4" maximum size, clean, uncoated crushed stone or gravel coarse aggregate free of materials which cause staining or rust spots; fine aggregate shall be clean natural sand.
- C. Water: Clean, fresh, and potable.

### **2.04 ADMIXTURES**

- A. Calcium Chloride: Do not use calcium chloride in concrete, unless specifically specified by Engineer.
- B. Water-reducing admixture: ASTM C494.
- C. Use of additional admixtures is accepted based upon approval by Engineer.

### **2.05 CONCRETE MIXES**

- A. Concrete Bath Plant shall comply with requirements of ASTM C94 and be currently certified per NRMCA Plan Certification Checklist Section 3. Batch mixing at site not acceptable.
- B. For all non-road site concrete: Use Portland Cement Concrete containing not less than 564 pounds of Portland Cement per cubic yard, with a compressive strength of not less than 3000 p.s.i. at 28 days.

- C. Exposure categories and classes for typical concrete per ACI 318 shall be: F0, S0, W1, C1. Concrete materials and mixes shall confirm to the requirements of ACI 318 section 19.3 for the indicated exposure categories and classes.
- D. Indicate water added to mix at job site on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements.
- E. Retempering of concrete will not be permitted.

## **2.06 GLARE REDUCING AGENTS**

- A. Lampblack in dry form, in accordance with the requirements of ASTM D209-81 “Standard Specifications for Lampblack”, in proportion from ½ to ¾ of a pound per cubic yard of concrete.
- B. An approved liquid or semi-paste black colorant intended for use integrally in concrete mixes. The proportion required generally from 10 to 40 ounces liquid measure per cubic yard of concrete, may be affected by the colorant used. Curing, in this case, shall be by the pigmented curing compound method.

## **2.07 ACCESSORIES**

- A. Granular base: Class II Aggregate Base, clean and uncoated.
- B. Joint Filler: ASTM D1751, premolded non-extruding asphalt-impregnated fiberboard, thickness indicated.
- C. Curing compound: ASTM C309, non-yellowing, non-staining liquid membrane-forming type containing a fugitive dye. Chlorinated rubber compounds not acceptable for exterior use.
- D. Joint Sealants: Two-component polysulfide or polyurethane elastomeric type complying with Federal Specifications TT-S-00227, self-leveling, designed for foot traffic in pedestrian areas. All vehicular areas shall have traffic rated joint sealant. Available from Sikaflex, Sikaflex 2 NS TG, Color: to match adjacent paving.
- E. Form release agent: Non-staining chemical form release agent free of oils, waxes, and other materials harmful to concrete.
- F. Reveals/Chamfer strips: Shall be plastic or polyvinyl coated for easy release. Available from Barker Steel, [www.barker.com](http://www.barker.com), or approved equal.
- G. Provide all stirrups, ties, anchors, shown or required to be cast into precast members.
- H. Bolts, Nuts, and Washers: ASTM A307. Provide hot-dip galvanized fasteners for exterior use. Paint to match adjacent metal work.
- I. Waterproofing at walls shall be Tremco 250-GC, or approved equal.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine subgrades and installation conditions. Immediately inform the Owner's Representative of any discrepancy between the Drawings and Specifications and actual conditions and secure approval to proceed. Do not start concrete work until unsatisfactory conditions are corrected.

### **3.02 PREPARATION**

- A. Proof roll the subgrade and do all necessary rolling and compacting to obtain firm, even subgrade surface. Fill and consolidate depressed areas. Remove uncompactable materials, replace with clean fill and compact to 90% of the maximum dry density in accordance with ASTM D1557-70.
- B. Provide minimum 4" depth of compacted base material at walks. Compact base to 95% of the maximum dry density in accordance with Geotech Report.
- C. Remove loose material and debris from base surface before placing concrete.
- D. Install, align, and level forms. Stake and brace forms in place. Maintain following grade and alignment tolerances:
  - 1. Top of form: Maximum 1/8" in 10'-0".
  - 2. Vertical face: Maximum 1/2" in 10'-0".
- E. Coat form surfaces in contact with concrete with form release agent. Clean forms after each use and coat with form release agent as necessary to assure separation from concrete without damage.
- F. Install, set, and build-in work furnished under other specification sections. Provide adequate notification for installation of necessary items.
- G. Install pipe sleeves for irrigation system furnished under Section 32 84 00. Stake location of irrigation sleeves.

### **3.03 PLACING REINFORCEMENT**

- A. Place all reinforcement as shown on the drawings. Place accurately and securely fasten and support reinforcement to prevent displacement before or during pouring. Hang footing bars from forms. Support wire mesh with suitable metal cradles.
- B. Clean, bend and place reinforcement in accordance with current requirements of the ACI Manual of Concrete Practice.
- C. Reinforcement Splices:
  - Welded wire fabric - one mesh minimum.
  - Reinforcing bars – unless otherwise noted, 48 bar diameter minimum and 62 for horizontal reinforcing with more than 12" of new concrete placed below bar.

### 3.04 TESTING

- A. Provide slump test on first load of concrete delivered each day and whenever requested due to changes in consistency or appearance of concrete.

### 3.05 INSTALLATION

- A. Concrete placement:
  - 1. Comply with ACI 304 "Guide for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.
  - 2. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing. In cold weather comply with ACI 306, "Cold Weather Concreting". In hot weather comply with ACI 305, "Hot Weather Concreting".
  - 3. Moisten base to provide a uniform dampened condition at the time concrete is placed. Verify structures are at required finish elevation and alignment before placing concrete.
  - 4. Place and spread concrete to the full depth of the forms. Use only square-end shovels or concrete rakes for hand-spreading and consolidating operations to prevent segregation of aggregate and dislocation of reinforcement.
  - 5. Place concrete in a continuous operation between expansion joints. Provide construction joints where sections cannot be placed continuously.
  - 6. Place concrete as indicated on the plans in one course, monolith construction, for the full width and depth of concrete work.
  - 7. Strike-off and bull-float concrete after consolidating. Level ridges and fill voids. Check surface with a 10'-0" straightedge. Fill depressions and refloat repaired areas. Darby the concrete surface to provide a smooth level surface ready for finishing.
- B. Joints:
  - 1. Provide expansion joints using premolded joint filler at concrete work abutting curbs, walls, structures, walks, and other fixed objects.
    - a. Expansion joints shall be formed provided at the location and intervals as shown on the plans and details.
    - b. Approved joint material shall be placed with top edge 1/4 inch below the paved surface, and shall be securely held in place to prevent movement. Joint and other edges shall be formed in the fresh concrete using an edging tool to provide a smooth uniform impression. All edges shall be struck before and after brooming.
    - c. After the curing period, expansion joints shall be carefully cleaned and filled with approved joint sealant to just below adjacent paved surface in such a manner as to avoid spilling on paved surfaces or overflow from joint.
    - d. Install joint fillers full-width and depth of joint. Recess top edge below finish grade for joint sealants.
    - e. Provide joint fillers in single lengths for the full slab width, whenever possible. Fasten joint filler sections together when multiple lengths are required.
    - f. Protect the top edge of the joint filler during concrete placement.
  - 2. Score Joints:
    - a. Score joints shall be formed in the fresh concrete using a jointer to cut the groove so that a smooth uniform impression is obtained. All joints shall be struck before and after brooming. See plans and details for size and locations.



C. Dowels:

3. All new concrete walkways shall be doweled into new and existing concrete walk ways and curbing. See plans and details for size and location.

D. Finishes:

1. Broom Finish: Shall be obtained by drawing a stiff bristled broom across a floated finish. Direction of brooming to be perpendicular to direction of work or otherwise shown on drawings.
2. Sand Blast Finish:
  - a. Perform in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish.
  - b. Depth of Cut: Use an abrasive grit of the proper type and gradation to expose the aggregate and surrounding matrix surfaces to match approved sample panel.
    - 1) Light Cut: Approx. 1/16 inch depth.
    - 2) Medium Cut: Approx. 1/8 inch to 3/16 inch depth.
    - 3) Heavy Cut: Approx. 1/2" to 3/4" depth.
  - c. Blast corners and edge patterns carefully, using backup boards, in order to maintain a uniform corner or edge line.
  - d. Use same nozzle, nozzle pressure and blasting technique as used for sample panel.
  - e. Maintain control of abrasive grit and concrete dust in each area of blasting. Clean up and remove all expended abrasive grit, concrete dust, and debris at the end of each day of blasting operations.

E. Curing:

1. Cure concrete with a clear, non-staining liquid membrane-forming compound. Spray apply in accordance with manufacturer's recommended coverage rate. Apply curing compound immediately after completing surface finish.

### **3.06 TOLERANCES**

- A. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"

### **3.07 PROTECTION**

- A. Protect concrete work from damage due to construction and vehicular traffic until Final acceptance. Exclude construction and vehicular traffic from concrete pavements for at least 14 days.
- B. Protection: Protect precast concrete items from chipping, spalling, cracking, or other damage until the Work is accepted by the Owner.

### 3.08 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from concrete operations.
- B. Sweep concrete sidewalks and pavement; wash free of stains, discoloration, dirt, and other foreign material immediately prior to final acceptance.

## **PART 4 - MEASUREMENT AND PAYMENT**

### 4.01 MEASUREMENT & PAYMENT

- A. Concrete forming, Concrete Form liners, Portland cement, dowels, aggregates, curing, admixtures, finishing, sealants, waterproofing, reinforcement, saw cutting, joints, mockups, testing and analysis of materials, mix designs, batching, mixing, transportation, inspection, testing, repairs, and replacements will not be measured separately for payment. All costs in connection therewith will be incidental to and included with the applicable items of work.
- B. Footings will not be measured separately for payment but will be considered as included in the Contract unit price for the work performed, as indicated in the Bid Schedule of the Bid Form for all applicable work.

### 4.02 PRECAST WALLS

- A. **Measurement:** "Precast Walls" will be measured for payment by the linear foot (LF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.
- B. **Payment:** Full compensation for "Precast Walls" will be paid for at the indicated contract unit prices and no additional compensation will be allowed therefore.

### 4.02 BUILDING PADS

- C. **Measurement:** "Building Pads" will be measured for payment by the linear foot (SF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.
- D. **Payment:** Full compensation for "Building Pads" will be paid for at the indicated contract unit prices and no additional compensation will be allowed therefor.

### 4.03 FOOTINGS

- A. **Measurement:** "Footings" will be measured for payment by the linear foot (SF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.

- B. **Payment:** Full compensation for “Footings” will be paid for at the indicated contract unit prices and no additional compensation will be allowed therefor.

**4.04 CONCRETE MOWBANDS**

- A. **Measurement:** “Mowband” will be measured for payment by the linear foot (LF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.
- B. **Payment:** Full compensation for “Concrete Curb” will be paid for at the indicated contract unit prices and no additional compensation will be allowed therefor.

**ND OF SECTION 03 30 00**

**precast walls, building pads, footings, and foundations**

**SECTION 03 34 00**  
**LOW DENSITY CELLULAR CONCRETE**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Work shall include all labor, materials, and equipment to furnish and install free draining open-cell, Low Density Cellular Concrete (LDCC) at the locations shown in the plans in accordance with the details in the plans and this specification.

**1.02 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Divisions 1 Specifications Sections, apply to this section.
- B. Related Work:
  - 1. Section 31 20 00: Earth Moving
  - 2. Section 02 40 00: Demolition
  - 3. Section 32 84 00: Irrigation System
  - 4. Section 03 05 23: Cement and Concrete for Exterior Improvements
  - 5. Section 03 30 00: Site Concrete Work

**1.03 QUALITY ASSURANCE**

- A. Materials and methods of construction shall comply with the following standards:
  - 1. American Society of Testing and Materials, (ASTM).
  - 2. American Concrete Institute, (ACI).
  - 3. California Building Code (CBC)
  - 4. State Standard Specifications, California Department of Transportation.
  - 5. American National Standards Institute, (ANSI).
- B. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source and each admixture from the same manufacturer.
- D. Maintain field records of time and date of placing of LDCC in each portion of work.

#### **1.04 SUBMITTALS**

- A. Submit concrete mix designs to Owner's Representative. Obtain approval before placing concrete.
- B. Product data:
  - 1. Submit complete materials list of items proposed for the work. Identify materials source.
  - 2. Submit admixture and accessory item product data, if used.
- C. Submit LDCC test reports for compressive strength and dry density for proposed mixes.
- D. Description of equipment and placement methods.

### **PART 2 - PRODUCTS**

#### **2.01 LDCC MATERIALS**

- A. Portland Cement: ASTM C150, Type I, II or III.
- B. Fly Ash: Class C or Fy and compatible with foaming agent.
- C. Foam: ASTM C796.
- D. Admixtures for water reducing, retarding, accelerating, anti-washout and other specific properties may be used when specifically approved by the manufacturer of the preformed foam.
- E. Water: Clean, fresh, and potable.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Examine subgrades and installation conditions. Immediately inform the Owner's Representative of any discrepancy between the Drawings and Specifications and actual conditions and secure approval to proceed. Do not start concrete work until unsatisfactory conditions are corrected.

#### **3.02 PREPARATION**

- A. Remove loose material and debris from base surface before placing LDCC.
- B. Install, securely set, and build-in work furnished under other specification sections. Provide adequate notification for installation of necessary items.
- C. There shall be no standing water in the area to be filled. If necessary, dewatering shall be continuous during placement of materials.
- D. Placement shall not be allowed on frozen ground.

- E. LDCC shall be produced utilizing specialized automated proportioning, mixing, and foam producing equipment capable of meeting the specified properties.
- F. Avoid excessive handling of the material. After sufficient missing of the foam with slurry, LDCC shall be conveyed promptly in its final location.
- G. All equipment used to furnish the LDCC must be approved by the manufacturer.

### **3.03 TESTING**

- A. Provide 28-day compressive strength testing per ASTM C495. Test at least two (2) specimens per each 500 cubic yards placed.
- B. Contractor shall record and measure wet cast densities at the point of placement hourly.

### **3.04 INSTALLATION**

- A. Place LDCC in such a manner so that minimal consolidation of material occurs during or after placement. Placement of Pervious LDCC shall not exceed depths as recommended by the manufacturer.
- B. LDCC shall not be vibrated or disturbed. Vehicles, equipment, backfills or other loadings on the fill material shall not be permitted until the material has attained the design compressive strength.

### **3.05 TOLERANCES**

- A. Final surface of Pervious LDCC shall be within +/- 0.2 feet of the plan elevations.

### **3.06 PROTECTION**

- B. LDCC shall not be vibrated or disturbed. Vehicles, equipment, backfills or other loadings on the fill material shall not be permitted until the material has attained the design compressive strength.

**END OF SECTION 03 34 00**

**SECTION 12 93 00**  
**SITE FURNISHINGS AND ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. The scope of work outlined in this Section includes the following items of work, as detailed in these Contract Specifications, as shown on the Contract Drawings or reasonably implied therefrom. Furnish all labor, materials, equipment and services necessary to provide and construct, repair, or install the site elements, complete in place, as shown and specified, including, but not limited to:
1. Bench
  2. Bike Rack
  3. Drinking Fountain
  4. Redwood Header
  5. Trex Header @ Synthetic Turf
  6. Picnic Table
  7. Trash Receptacle
  8. Recycling Receptacle
  9. Basketball Standard
  10. Play Equipment
  11. Fitness Equipment
  12. Soccer Goal
  13. Storage Containers
  14. Gazebo
  15. Restroom
  16. Park Sign
  17. Site Signage
  18. Removable Bollard

**1.02 RELATED SECTIONS**

- |    |                  |   |
|----|------------------|---|
| A. | Section 32 05 23 | Cement and Concrete for Exterior Improvements |
| B. | Section 32 15 40 | Decomposed Granite                            |
| C. | Section 32 31 13 | Chain Link Fences and Gates                   |
| D. | Section 32 18 16 | Playground Protective Surfacing               |

**1.03 RELATED DOCUMENTS**

- A. Contractor shall provide a single submittal PDF containing all product data as noted below for

review at a single time. Missing submittals or shop drawings shall be grounds for rejection.

- B. The General and Supplementary Conditions and General Requirements apply to the work herein specified.

#### **1.04 SUBMITTALS**

- A. Submit shop drawings where noted to the City for approval before installing any manufactured items. Plans shall include dimensions, color, finish, structural design (custom items), and connection details.
- B. Submit catalog cuts, samples, manufacturer's literature, and warranties of all manufactured items in this section to the City for approval before installation.
  - 1. Provide color samples, brushouts, or charts for all items. Final colors to be selected by City and a sample submitted for approval.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURED ITEMS**

- A. Bench: Per Plans
- B. Bike Rack: Per Plans
- C. Drinking Fountain: Per Plans
- D. Redwood Header: Per plans and these specifications
- E. Trex Header @ Synthetic Turf: Per plans and these specifications
- F. Picnic Table: Per Plans
- G. Trash Receptacle: Per Plans
- H. Recycling Receptacle: Per Plans
- I. Basketball Standard: Per Plans
- J. Play Equipment: Per Plans
- K. Fitness Equipment: Per Plans
- L. Soccer Goals: Per Plans
- M. Storage Container: Per Plans
- N. Gazebo: Per Plans
- O. Restroom: Owner Furnished, Contractor installed
- P. Park Sign: Per Plans



- Q. Site Signage: Per Plans
- R. Removable Bollard: Per Plans

## **2.01 MISCELLANEOUS MATERIALS**

- A. All other materials for site elements shall be as specified on the plans and these specifications.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Examination: Verify that conditions are satisfactory for installation of each item of site elements. If unsatisfactory conditions exist, do not begin installation until such conditions have been corrected.
- B. Headers:
  - 1. Install headers true to line and grade as indicated in the Drawings.
  - 2. Sharp radii may be constructed of laminated material to the thickness of header board indicated on the Drawings.
  - 3. Stakes shall be a minimum 18 inches long (increase length as necessary per soil conditions for solid anchorage) at 4 feet on center.
  - 4. Double stake corners and splices.
  - 5. Securely nail stakes to headers with galvanized nails, 16 penny.
- C. Picnic Tables, Benches and Receptacles:
  - 1. Install directly onto concrete. Install with concrete footing in Asphalt & Decomposed Granite areas sim Detail 3 L-4.7. Use manufacturer's recommended mounting hardware.
- D. Basketball Standards:
  - 1. Installation per manufacturer and plans.
- E. Play Equipment:
  - 1. Installation per manufacturer.
- F. Fitness Equipment:
  - 1. Installation per manufacturer.
- G. Storage Container:
  - 1. Installation per manufacturer.
- H. Restroom:
  - 1. Owner Furnished.
  - 2. Site preparation Contractor in coordination with manufacturer.
  - 3. Contractor shall be on site at time of delivery and installation by manufacturer.
  - 4. Contractor is responsible for plumbing, electrical and mechanical system hookups after restroom if placed on site.

- I. Park Sign:
  - 1. Installation per manufacturer and plans.
- J. Site Signage:
  - 1. Installation per plans.
- K. Removable Bollard:
  - 1. Installation per plans.

**3.02 DEFECTIVE WORK**

- A. All products purchased by the contractor which are damaged, scratched, chipped, bent, defaced, of poor finish, or not installed per these specifications shall be replaced by the contractor at no cost to the City of San Rafael.
- B. All products purchased by the City which are delivered to the site damaged, scratch, chipped, bent, defaced, of poor finish shall be immediately flagged by the contractor and the City notified. A member of Public Works or Landscape Architect shall be on site at time of delivery for product acceptance. Any damage to the product post acceptance, shall be replaced by the contractor at not cost to the City of San Rafael.

**3.03 GUARANTEE**

- A. At completion of project, Contractor shall provide City with written guarantee from each manufacturer identifying the nature of warranty for each product component.
- B. Contractor shall provide City with two (2) bound maintenance manuals identifying each piece of equipment on manufacturer’s recommended maintenance program including, but not limited to, daily, weekly, and monthly check lists.
- C. Contractor to provide City with minimum of two (2) gallons each type and color of paint used on apparatus with recommended surface preparation and application guidelines.

**PART 4 - MEASUREMENT & PAYMENT**

**4.01 BENCHES**

- A. **Measurement:** Measurement of “Benches” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Benches” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Benches”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**4.02 BIKE RACKS**

- A. **Measurement:** Measurement of “Bike Racks” shall be per each (EA).

- B. **Payment:** The contract unit prices paid for the various items in “Bike Racks” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Bike Racks”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### 4.03 DRINKING FOUNTAINS

- A. **Measurement:** Measurement of “Drinking Fountains” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Drinking Fountains” shall include full compensation for furnishing all labor, materials, tools, equipment, testing costs, and incidentals, and for doing all work involved in the installation of “Drinking Fountains”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### 4.04 TRASH AND RECYCLING RECEPTACLES

- A. **Measurement:** Measurement of “Trash and Recycling Receptacles” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Trash and Recycling Receptacles” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Trash and Recycling Receptacles”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### 4.05 BASKETBALL STANDARDS

- A. **Measurement:** Measurement of “Basketball Standards” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Basketball Standards” shall include full compensation for furnishing all labor, materials, tools, equipment, structural engineering, and incidentals, and for doing all work involved in the installation of “Basketball Standards”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### 4.06 PLAY EQUIPMENT

- A. **Measurement:** Measurement of “Play Equipment” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for “Play Equipment” shall include full compensation for furnishing all labor, materials, tools, equipment, certification, structural engineering, and incidentals, and for doing all work involved in “Play Equipment” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### 4.07 FITNESS EQUIPMENT

- A. **Measurement:** Measurement of “Fitness Equipment” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for “Fitness Equipment” shall include full compensation for furnishing all labor, materials, tools, equipment, certification, structural

engineering, and incidentals, and for doing all work involved in “Play Equipment” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### **4.08 STORAGE CONTAINERS**

- A. **Measurement:** Measurement of “Storage Containers” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Storage Containers” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Storage Containers”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.09 RESTROOM SITE PREP AND FINISHING**

- A. **Measurement:** Measurement of “Restroom” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for “Restroom” shall include full compensation for furnishing all labor, materials, tools, equipment, structural engineering, and incidentals, and for doing all prep and finish work involved in “Restroom” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### **4.10 GAZEBO**

- A. **Measurement:** Measurement of “Gazebo” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for “Gazebo” shall include full compensation for furnishing all labor, materials, tools, equipment, structural engineering, and incidentals, and for doing all work involved in “Gazebo” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### **4.11 PARK SIGN**

- A. **Measurement:** Measurement of “Park Sign” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for “Park Sign” shall include full compensation for furnishing all labor, materials, tools, equipment, structural engineering, and incidentals, and for doing all work involved in “Park Sign” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### **4.12 SITE SIGNAGE**

- A. **Measurement:** Measurement of “Park Signage” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for “Park Signage” shall include full compensation for furnishing all labor, materials, tools, equipment, structural engineering, and incidentals, and for doing all work involved in “Park Sign” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### **4.13 REMOVABLE BOLLARD**

- C. **Measurement:** Measurement of “Removable Bollard” shall be by Per Each (PE).
- D. **Payment:** The contract lump sum price paid for “Removable Bollard” shall include full compensation for furnishing all labor, materials, tools, equipment, structural engineering, and incidentals, and for doing all work involved in “Removable Bollard” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### **4.14 SOCCER GOAL**

- E. **Measurement:** Measurement of “Soccer Goal” shall be by Per Each (PE).
- F. **Payment:** The contract lump sum price paid for “Soccer Goal” shall include full compensation for furnishing all labor, materials, tools, equipment, structural engineering, and incidentals, and for doing all work involved in “Soccer Goal” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 12 93 00**

**SECTION 26 05 00**  
**GENERAL REQUIREMENTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 DESCRIPTION OF WORK:**

- A. The work of this Section consists of providing all required labor, supervision, materials and equipment (except equipment furnished by the Owner to be installed by the Contractor) to satisfactorily complete the work shown on the drawings and/or specified in all Sections of Division 26 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete and fully operating facility. The work shall include but not be limited to the following:
1. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

**1.02 RELATED WORK:**

- A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 1 and apply to all Sections of Division 26.

**1.03 STANDARDS AND CODES:**

- A. All work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
1. California Electrical Code (CEC)
  2. National Fire Protection Association (NFPA):
    - a. 70 National Electrical Code (NEC)
  3. American National Standards Institute (ANSI) Publications:
    - a. C2-02 National Electrical Safety Code
  4. Code of Federal Regulations (CFR):
    - a. 29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)
  5. Electronics Industries Association / Telecommunications Industries Association (EIA / TIA)
  6. Institute of Electrical and Electronics Engineers (IEEE)
  7. National Electrical Testing Association (NETA):
    - a. Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, Standard ATS
  8. National Electrical Manufacturers Association (NEMA)
  9. Occupational Safety and Health Act (OSHA) Standards
  10. State of California Public Utilities Commission:
    - a. General Order 128 Rules for Construction of Underground Electric Supply and Communication Systems
  11. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.
  12. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Safety labeling and listing by other

organizations, such as ETL Testing Laboratories, may be substituted for UL labeling and listing if acceptable to the Owner. Provide service entrance labels for all equipment required by the NEC to have such labels.

#### **1.04 SUBMITTALS:**

- A. As specified in Division 1. Submit to the Engineer shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Obtain approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review.
- B. Submittals are required for all items, regardless of whether they are furnished as specified or are substituted.
- C. Submittals shall be provided prior to the purchasing and installation of the item(s) being submitted. Any work done prior to the final approval of the submittal shall be done at risk and any modifications, changes, or re-work that may be required resulting from the final submittal review shall be provided by the Contractor at no additional cost to the project.
- D. Information to be submitted includes manufacturer's name, trade name, equipment model number, nameplate data, equipment drawings including: size, layout dimensions and capacity, manufacturer's descriptive literature of cataloged products, diagrams, fault and coordination study, seismic calculations, test data, and performance and characteristic curves as applicable. Furnish project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contract compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.
- E. If submittal information includes multiple products, items being submitted for approval shall be clearly identified and Items not to be used on the project shall be clearly marked out. Submittals consisting of manufacturer's catalogs without clearly marking out items not being used will be returned as not reviewed.
- F. Organize submittals for equipment and items related to each specification section together as a package.
- G. Submit submittal packages in digital PDF format.
  - 1. Certificates of Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this contract. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements that imply the item does not meet requirements specified, such as "as good as", "achieve the same end use and results as materials formulated in accordance with the referenced publications;" or "equal or exceed the service and performance of the specified material." Certifications shall state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official, authorized to sign certificates of conformance.
- H. Substitutions:
  - 1. The equipment included in the Contract Documents is used to establish standards of quality,

- utility, size, and appearance. Equipment which in the opinion of the Engineer is equal in quality, utility, size, and appearance will be approved as substitutions to that specified.
- a. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are approved by the Engineer prior to bidding.
2. Substitutions will be accepted for review where there is a reasonable reason for the substitution. Reasonable reasons include:
    - a. Cost savings to the Owner. Include deductive change order with submittal.
    - b. A product with features providing additional benefits to the end user.
    - c. Improved finished environment, lay out of the final installation, or space savings over the specified equipment.
    - d. Delivery considerations.
    - e. Owner's specific requests.
  3. Where items are noted as "or equal", a product of equal design, construction and performance will be considered.
  4. Any item proposed as a substitute shall be accompanied by the following:
    - a. Drawings and/or data giving sizes, capacities, all pertinent test data, catalog cut sheets, product information, and all other necessary information required to substantiate that the product is equal or exceeds that specified.
    - b. A summary sheet noting each performance characteristic noted in the specification section or elsewhere in the contract documents of the specified product and the corresponding performance characteristics of the proposed substitution. The summary sheet shall contain the following information:
      - 1) Reason for Substitution Request
      - 2) Pertinent Performance Characteristics
      - 3) Specified Product Values
      - 4) Substituted Product Values
    - c. Any substitution request that does not include the above information shall be rejected.
    - d. Refer to the end of this specification section for an example form to be used for substituted products. A Microsoft Word version of the form can be provided to the Contractor for their use upon request.
  5. Substitutions shall be equal, in the opinion of the Engineer, to the specified equipment. The burden of proof of such shall rest with the Contractor. When the Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted equipment to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Plans or Specifications.
  6. Contractor shall be responsible for coordination of the substituted products with other trades. Provide all additional connectivity, equipment, increased wire/conduit size, installation hardware, testing, and other miscellaneous appurtenances as required for a complete and fully functional installation.
  7. Only one substitution will be considered for each product specified.
  8. Alternate manufacturers must be submitted for approval 10 days prior to bid date unless noted otherwise in Division 1.
  9. The Contractor shall be responsible for all expenses in connection with the substitution materials, process, and equipment, including the effect of his/her substitution on him/her, his/her sub-Contractor's or other Contractor's work. No substitution shall be permitted without written authorization of the Engineer. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the Engineer are at the sole risk of the Contractor.

I. Change Orders:



1. Where a change to the contract documents would result in a credit due to the Owner or a value add change to the project, provide a detailed change order request for the Engineer to review.
2. It shall be understood that the Engineer's review of costs associated with the change order shall not constitute approval of the change order or their associated costs. The Engineer's review shall be intended to assist the Owner in evaluating the costs associated with the change only. Final approval or rejection of the change order shall be at the discretion of the Owner.
3. Change order requests shall include the following information:
  - a. Description of the change
  - b. Reference to the document or written direction to make the change:
    - 1) In the case of design-team directed changes, reference the drawing/sketch number or RFI number.
    - 2) In the case of Owner-directed changes, reference the email, memo, or other written direction from the Owner and provide a copy of the direction.
  - c. Detailed cost breakdown for the change:
    - 1) Line item for each material noting:
      - (a) Material used (e.g. 3/4" EMT)
      - (b) Total quantity (e.g. 200lf)
      - (c) Unit cost (e.g. \$2/lf)
      - (d) Total materials cost (e.g. \$400)
      - (e) Unit labor hours (e.g. 6hrs/100lf)
      - (f) Total labor hours (e.g. 12hrs)
      - (g) Hourly rate (e.g. \$90/hr)
      - (h) Total labor cost (e.g. \$1,080)
    - 2) Total labor hours for each position (e.g. Journeyman vs. Superintendent)
    - 3) Total materials cost
    - 4) Overhead
    - 5) Profit
    - 6) Total change order value (positive for value added changes, negative for credits)

J. Closeout Submittals:

1. As-built drawings: Submit As-Built Record documents as in accordance with section 3.05 below.
2. Cost analysis: Submit final cost information including original bid and any change orders broken down by system, material and labor costs (as applicable):
  - a. Power distribution
  - b. Lighting and lighting controls
  - c. Low Voltage systems
3. Operation and Maintenance Manuals: Furnish O & M Manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 1. Electrical O & M Manuals shall be provided in a single transmittal and shall include as a minimum:
  - a. Copies of equipment supplied on the project.
  - b. Instruction manuals including operation instructions and maintenance requirements/recommendations.
  - c. List of suppliers for all equipment with addresses and telephone numbers.
  - d. List of service support for all equipment with addresses and telephone numbers.
  - e. Copies of all test reports required in Division 26 specification sections.
  - f. Spare Parts: For each piece of equipment, submit a list of recommended spare parts. Include part numbers and the name, address, and telephone number of the supplier.
  - g. Other closeout documentation and test results as required under other sections of the specifications.

- h. Warranty for all work, equipment, and systems, including Contractor's general warranty.
- i. All warranties begin as per the Contract, Division 1 or final acceptance of the Work by the Owner, Architect, Engineer, and Authority Having Jurisdiction, which ever is later.
  - 1) Lamps, drivers, and ballasts are to be covered as per specification 26 50 00.
  - 2) Manufacturer's Warrantees and Guarantees that are longer than the base contract/specified amount are to be provided with the manuals.
  - 3) The Contractor is responsible for all Warranty and Guarantee work whether or not the Manufacturer also Warrantees and Guarantees the product.

**1.05 CONTRACT DOCUMENTS:**

- A. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for the installations.
  - 1. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Engineer for favorable review.
  - 2. All drawings and divisions of these specifications shall be considered as whole. This Contractor shall report any apparent discrepancies prior to submitting bids.
  - 3. Should there be a conflict or discrepancy between the drawings and specifications, or between different drawings sheets, or between different specification sections, the most expensive option shall be required, at the discretion of the Engineer.
- B. Drawings:
  - 1. The Drawings shall govern the general layout of the completed construction:
    - a. Locations of equipment, inserts, anchors, panels, pullboxes, manholes, conduits, stub-ups, fittings, power and convenience outlets, lighting fixtures and ground connections are approximate unless dimensioned; verify locations with the Engineer prior to installation. Field verify scaled dimensions on Drawings.
    - b. The general arrangement and location of existing conduits, piping, apparatus, etc., is shown as existing on drawings or specified. The drawings and specifications are for the assistance and guidance of the Contractor, exact locations, distances and elevations are governed by actual field conditions. Extreme accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The Contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Engineer.

**1.06 COORDINATION:**

- A. Coordinate the electrical work with the other trades, code authorities, utilities and the Engineer:
  - 1. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.
  - 2. Coordinate does not mean to only send a Request For Information. Coordinate implies that the Contractor is to take the lead in bringing all of the necessary organizations together to coordinate the work and to provide for the associated costs.
- B. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities:
  - 1. Include costs for work during non-normal working hours and temporary facilities as may be required.

2. Include costs as necessary for sub-Contractors as necessary to accomplish the specified work.
- C. When two trades join together in an area, make certain that no electrical work is omitted. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.
- D. Operations:
1. Perform all work in compliance with Division 1:
    - a. Keep the number and duration of power shutdown periods to a minimum.
    - b. All shutdowns which would interfere with the operations of Owner's equipment or facilities shall be coordinated with the Owner a minimum of 15 days in advance.
      - 1) Where Owner's equipment or facilities must remain operational during the shutdown, provide sufficient means to temporarily backup the interrupted services for the duration of the interruption.
    - c. Show all proposed shutdowns and their expected duration on the construction schedule.
      - 1) If the construction schedule is created and maintained by others, make sure that the associated information is incorporated.
      - 2) Failure by the Contractor to properly schedule and plan for such activities is not a basis for additional compensation.
    - d. Carry out shutdown only after the Engineer has favorably reviewed the schedule. Submit power/communications interruption schedule 15 days prior to date of interruption. Failure to provide schedule with adequate review time may result in rescheduling of the work at the Contractor's expense.
- E. Construction Power:
1. See Division 1 Temporary Utilities.
- F. Storage:
1. Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from sun, weather, condensation, dust, water, or construction operations.
- G. Damaged Products:
1. Notify the Engineer in writing in the event that any equipment or material is damaged. Obtain approval from the Engineer and Manufacturer before making repairs to damaged products.
- H. Order material in such a timely manner and after approval of the same so as to insure that the approved material is available to be installed on site in a timely manner. Additional costs or substitutions necessitated because the Contractor failed to order material in a timely manner are not reimbursable. Costs associated with processing of paperwork by the Owner and design consultants resultant of such failures to coordinate the work by the Contractor shall have such costs reimbursed by the Contractor.

## 1.07 LOCATIONS:

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located.
1. Dry Locations:
    - a. All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.

2. Wet Locations:
  - a. All locations exposed to the weather or contact with water (such as kitchen areas subject to directional water spray as a means of cleaning surfaces), whether under a roof or not, unless otherwise designated on the Drawings.

## **1.08 SAFETY AND INDEMNITY:**

- A. Lock out Requirements:
  1. Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147
- B. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and properly during performance of the work. This requirement will apply continually and not be limited to normal working hours.
  1. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.
  2. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer, their Consultants or their officers, agents and employees.

## **PART 2 - PRODUCTS**

### **2.01 STANDARD OF QUALITY:**

- A. Material and Equipment: Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.
- B. Service Support: Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.
- C. Manufacturer's Recommendations: Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

### **2.02 FASTENERS:**

- A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized

after fabrication or stainless steel.

### **2.03 FINISH REQUIREMENTS:**

- A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.
- B. In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION:**

- A. Ensure that all equipment and materials fit properly in their installation.
- B. Perform any required work to correct improperly fit installation at no additional expense to the Owner.
- C. Equipment Installation:
  - 1. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
  - 2. In all rooms with concrete floors, install all floor mounted equipment on reinforced concrete pads as shown. Insure that pads are seismically secured to the building structure. The Contractor, suppliers, and fabricators shall take this requirement into consideration when designing, fabricating, and installing panels and other enclosures so that height above the floor of the operating handles of electrical devices meets the requirements of these Specifications and applicable codes.
  - 3. Mount all metal panels which are mounted on or abutting concrete walls or any outside walls a minimum of ¼ inch from the wall, and paint the back sides of the panels with Bituminous Coating, Rust-oleum C9578 Coal Tar Epoxy Coating or approved equal. Film thickness shall be 10 mils minimum.
- D. Cutting, Drilling and Welding:
  - 1. Provide the required cutting, drilling welding that is required for the electrical construction work. Comply with Division 1 requirements.
  - 2. Structural members shall not be cut or drilled, except after approval by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.
  - 3. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel. Where welding is required, it shall be accomplished by tradesmen certified to do such work. Provide fire and other protection as appropriate.

### **3.02 FIELD TESTS:**

- A. Test shall be in accordance with Acceptance Testing specifications issued by the National Electrical Testing Association (NETA).
- B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all circuits and components, and demonstrate as ready for service. Perform each operational check

three times to ensure the circuit and components are working properly. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Engineer prior to any test so that the tests may be witnessed.

- C. Provide instruments, other equipment, temporary facilities as may be necessary, and material required for the tests. These shall be of the type designed for the type of tests to be performed and shall be calibrated by a recognized testing laboratory within three months prior to testing.
- D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.
- E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Engineer. Repair and re-test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.
- F. Perform calibration and adjustment on all equipment. Where the values for adjustment are not shown on the Drawings, obtain the proper values from the Engineer.
- G. Maintain records of each test and submit five copies to the Engineer when testing is complete. All tests shall be witnessed by the Owner and/or Engineer at their discretion. These records shall include:
  - 1. Name of equipment tested.
  - 2. Date of report.
  - 3. Date of test.
  - 4. Description of test setup.
  - 5. Identification and rating of test equipment.
  - 6. Test results and data.
  - 7. Name of person performing test.
  - 8. Owner or Engineer's initials.
- H. Items requiring testing as a minimum:
  - 1. Ground field grid.
  - 2. Circuit Breakers.

### **3.03 PAINTING OF EQUIPMENT:**

- A. Factory Applied: Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.
- B. Field Applied: Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

### **3.04 RECORDS:**

- A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the record "as built" condition. After completion of the work, the Contractor shall neatly and carefully mark

the work as actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:

1. Drawings and associated as-built changes shall be completed in AutoCAD or Revit and submitted in CAD/Revit as well as PDF format. Documents with hand-written changes or with RFI responses and field sketches pasted on shall not be acceptable. Engineer shall make digital backgrounds of original contract documents available for Contractor's use upon request.
2. Cable Size and Type: Provide the size and type of each cable installed on the project.
3. Substructure: Where the location of duct lines, adjacent utilities, cable boxes, and manholes are found to be different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.
4. Record (As Built) Drawings: At the completion of the Work the Contractor shall provide a set of record "as built" drawings over to the Owner for his use.
  - a. Record drawings are required to be transmitted within 30 days of beneficial occupancy.
  - b. Transmittal and approval process:
    - 1) Contractor is to transmit one digital copy for review and comment.
    - 2) After acceptance of the above, the Contractor is to transmit three printed sets and one digital reproducible set.
    - 3) Contractor to provide information on their company in the margin of record drawings along with the date of the revisions and the associated revision number.

### **3.05 POSTED OPERATING INSTRUCTIONS:**

- A. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
  1. Single line diagrams, wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment at each major piece of distribution equipment.
  2. Start up, proper adjustments, operating, lubrication and shutdown procedures.
  3. Safety precautions.
  4. The procedure in the event of equipment failure.
  5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.
- B. Instruction to Owner's Personnel:
  1. Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or systems has been accepted and turned over to the Owner for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for field instruction with equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.
  2. Contractor shall video record all training sessions and shall provide the Owner with a copy of the recording at the conclusion of the training. Recording shall be in digital video format (MP4, AVI, or similar) and shall be provided on USB stick or DVD labeled with the Contractor's

- contact information, the training topic, and date of training.
3. Contractor shall maintain an attendance sheet from each session which contains the following information:
    - a. Attendees with associated arrival and departure time.
    - b. Topics covered.
    - c. Information provided.
    - d. Signatures of attendees taken at the completion of the session.

**3.06 CLEAN UP:**

- A. Thoroughly clean all soiled surfaces of installed equipment and materials, including, but not limited to, removal of all dirt, dust, debris, and unused construction materials.
- B. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Engineer.

- (1)
- (2) **Substitution Request Form**
- (3)
- (4) Project Name: \_\_\_\_\_
- (5) Request Date: \_\_\_\_\_
- (6)
- (7) Submittal Name: \_\_\_\_\_
- (8) Submittal Number: \_\_\_\_\_
- (9)
- (10) Reason for Substitution Request (check all that apply):
- (11)

	Reason	Additional Information
<input type="checkbox"/>	Cost savings to the owner	<i>(Note cost savings here)</i>
<input type="checkbox"/>	A product with features providing additional benefits to the end user	<i>(Note benefits here)</i>
<input type="checkbox"/>	Improved finished environment, lay out of the final installation, or space savings over the specified equipment	<i>(Note benefits here)</i>
<input type="checkbox"/>	Delivery considerations	<i>(Note schedule savings here)</i>
<input type="checkbox"/>	Owner's specific requests	<i>(Note requested change and who made request here)</i>

(12)



(13) Product Data Information (provide one line per performance characteristic):

<b>Property</b>	<b>Specified</b>	<b>Substitution</b>	<b>Meets</b>	<b>Exceeds</b>
<i>(e.g. Thermal Rating)</i>	<i>(e.g. 90° C)</i>	<i>(e.g. 90° C)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>

(14)

**END OF SECTION**

**SECTION 26 05 05**  
**SELECTIVE DEMOLITION FOR ELECTRICAL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical demolition.

**PART 2 - PRODUCTS**

**2.01 MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual sections.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Architect before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

**3.02 PREPARATION**

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
  1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
  2. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
  1. Notify Owner before partially or completely disabling system.
  2. Notify local fire service.
  3. Make notifications at least 24 hours in advance.
  4. Make temporary connections to maintain service in areas adjacent to work area.
- F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
  1. Notify Owner at least 24 hours before partially or completely disabling system.
  2. Notify telephone utility company at least 24 hours before partially or completely disabling system.
  3. Make temporary connections to maintain service in areas adjacent to work area.

### **3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
  1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
  2. PCB- and DEHP-containing lighting ballasts.
  3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.

- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- I. Repair adjacent construction and finishes damaged during demolition and extension work.
- J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

### **3.04 CLEANING AND REPAIR**

- A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

### **3.05 MEASUREMENT AND PAYMENT:**

- A. Measurement:
  - 1. Measurement of "Selective Demolition" shall be by Lump Sum (LS).
- B. Payment:
  - 2. The contract lump sum price paid for "Selected Demolition", including demolition of all electrical components required for the scope of the project, shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in demolition of the existing electrical systems as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 26 05 05**

**SECTION 26 05 19**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Service entrance cable.
- D. Wiring connectors.
- E. Electrical tape.
- F. Heat shrink tubing.
- G. Oxide inhibiting compound.
- H. Wire pulling lubricant.
- I. Cable ties.
- J. Firestop sleeves.

**1.02 RELATED SECTIONS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REGULATORY REQUIREMENTS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Most Recent Edition, Including All Revisions.
- O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- R. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- S. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- T. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

## **1.05 SUBMITTALS**

- A. See Section 01 33 00 - Submittals, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

## **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. 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. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

## **1.02 FIELD CONDITIONS**

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Landscape Architect and obtain direction before proceeding with work.

## **PART 2 - PRODUCTS**

### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.

- D. Armored cable is not permitted.
- E. Metal-clad cable is not permitted.

## **2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- H. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
- I. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
  - 2. Control Circuits: 14 AWG.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 208Y/120 V, 3 Phase, 4 Wire System:



- 1) Phase A: Black.
  - 2) Phase B: Red.
  - 3) Phase C: Blue.
  - 4) Neutral/Grounded: White.
- b. Equipment Ground, All Systems: Green.
  - c. For control circuits, comply with manufacturer's recommended color code.

### **2.03 SINGLE CONDUCTOR BUILDING WIRE**

- A. Manufacturers:
  1. Copper Building Wire:
    - a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
    - b. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
    - c. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
  1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
  1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 6 AWG and Larger: Type XHHW-2.
    - b. Installed Underground: Type XHHW-2.
    - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

### **2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE**

- A. Manufacturers:
  1. Copper Building Wire:
    - a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
    - b. General Cable Technologies Corporation; \_\_\_\_: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
    - c. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:

- 2. Feeders and Branch Circuits:
  - a. Size 10 AWG and Smaller: Solid.
  - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 6 AWG and Larger: Type XHHW-2.
    - b. Installed Underground: Type XHHW-2.
    - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

## **2.05 SERVICE ENTRANCE CABLE**

- A. Manufacturers:
  - 1. Copper Service Entrance Cable:
    - a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
    - b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
    - c. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- B. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.
- C. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.
- D. Conductor Stranding: Stranded.
- E. Insulation Voltage Rating: 600 V.

## **2.06 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors.
- D. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Where over-sized conductors are larger than the equipment terminations can

- accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
3. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
  5. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
  6. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - c. NSI Industries LLC: [www.nsiindustries.com/#sle](http://www.nsiindustries.com/#sle).
- H. Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. IlSCO: [www.ilSCO.com/#sle](http://www.ilSCO.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. IlSCO: [www.ilSCO.com/#sle](http://www.ilSCO.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).

## **2.07 ACCESSORIES**

- A. Electrical Tape:
1. Manufacturers:
    - a) 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
  2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
  3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature

- environment up to 221 degrees F.
- 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
- 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
- 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
  - 1. Manufacturers:
    - a) 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b) Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - c) Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
  - 1. Manufacturers:
    - a) Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b) Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - c) IlSCO: [www.ilsco.com/#sle](http://www.ilsco.com/#sle).
- D. Wire Pulling Lubricant:
  - 1. Manufacturers:
    - a) 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b) American Polywater Corporation: [www.polywater.com/#sle](http://www.polywater.com/#sle).
    - c) Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
  - 2. Listed and labeled as complying with UL 267.
  - 3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  - 4. Suitable for use at installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.
  - 1. Manufacturers:
    - a) Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
  - 1. Products:
    - a) Menzies Metal Products; Electrical Roof Stack and Cap: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
    - b) Menzies Metal Products; Electrical Retro Box: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
  - 1. Products:
    - a) HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.

- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### **3.03 INSTALLATION**

- A. Circuiting Requirements:
  - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
  - 2. When circuit destination is indicated without specific routing, determine exact routing required.
  - 3. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power- limited circuits in accordance with NFPA 70.
  - 4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  - 5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
  - 6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
- E. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Exposed Cable Installation (only where specifically permitted):
  - 1. Route cables parallel or perpendicular to building structural members and surfaces.
  - 2. Protect cables from physical damage.

- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
  - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
  - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- I. Terminate cables using suitable fittings.
- J. Install conductors with a minimum of 12 inches of slack at each outlet.
- K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- M. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
- N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
  - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- O. Insulate ends of spare conductors using vinyl insulating electrical tape.
- P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally

colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

- Q. Identify conductors and cables in accordance with Section 26 05 53.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

### **3.04 FIELD QUALITY OF CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
  - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

### **3.05 MEASUREMENT AND PAYMENT:**

- A. Measurement:
  - 1. Measurement of "Low Voltage Electrical Power Conductors and Cables" shall be by the Linear Foot (LF).
- B. Payment:
  - 2. The contract unit prices paid for the various items in "Low Voltage Electrical Power Conductors and Cables" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Low Voltage Electrical Power Conductors and Cables", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 26 05 19**

**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Ground plate electrodes.
- G. Ground access wells.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:



1. Verify exact locations of underground metal water service pipe entrances to building.
2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

4. Do not install ground rod electrodes until final backfill and compaction is complete.

## **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Field quality control test reports.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

## **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. 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. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## **PART 2 - PRODUCTS**

### **2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point- to-point" methods.
- F. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  - 3. Concrete-Encased Electrode:
    - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
  - 4. Ground Rod Electrode(s):
    - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
    - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
    - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
    - d. Provide ground access well for each electrode.
  - 5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
  - 6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system

grounding to this ground bar.

- a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
- b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
- c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

G. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.
2. Provide equipment grounding conductor routed with supply conductors.
3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
  - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
  - b. Metal gas piping.
8. Provide bonding for metal building frame.

J. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or

- structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    - b. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    - c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

## 2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
  1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
  1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use exothermic welded connections for accessible connections.
  4. Manufacturers - Exothermic Welded Connections:
- D. Ground Bars:
  1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: As indicated.
  3. Holes for Connections: As indicated or as required for connections to be made.
  4. Manufacturers:
- E. Ground Rod Electrodes:
  1. Comply with NEMA GR 1.
  2. Material: Copper-bonded (copper-clad) steel.
  3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
  4. Manufacturers:
- F. Ground Plate Electrodes:
  1. Material: Copper.
  2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
- G. Ground Access Wells:
  1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.

2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
  1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
  2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
- D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.
- E. Make grounding and bonding connections using specified connectors.
  3. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  4. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  5. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

- F. Identify grounding and bonding system components in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

### **3.04 MEASUREMENT AND PAYMENT**

- A. Measurement:
  - 1. Measurement of "Grounding and Bonding" shall be by Lump Sum (LS).
- B. Payment:
  - 2. The contract lump sum price paid for "Grounding and Bonding", including all miscellaneous appurtenances required for a complete grounding and bonding system, shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in grounding and bonding of the electrical systems as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 26 05 26**

**SECTION 26 05 33.1**  
**CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Flexible metal conduit (FMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Galvanized steel electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. High-density polyethylene (HDPE) conduit.

**1.02 RELATED SECTIONS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- H. Section 27 05 33.13 - Conduit for Communications Systems.

**1.03 REGULATORY REQUIREMENTS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

- D. ASTM D1002 - Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal); 2010 (Reapproved 2019).
- E. ASTM D1598 - Standard Test Methods for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure; 2021.
- F. ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings; 2018.
- G. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.
- H. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing; 2016.
- I. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing; 2016a (Reapproved 2022).
- J. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); 2016.
- K. ASTM F2176 - Standard Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct; 2017.
- L. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- M. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- N. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
- O. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- P. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- Q. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- R. NEMA TC 7 - Solid-Wall Coilable and Straight Electrical Polyethylene Conduit; 2021.
- S. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- T. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- U. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- V. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- W. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.



- X. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Y. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.
- Z. UL 746C - Polymeric Materials – Use in Electrical Equipment Evaluations; Current Edition, Including All Revisions.
- AA. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- BB. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- CC. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- DD. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
  3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

#### **1.06 QUALITY ASSURANCE**

- A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  - 1. Under Slab on Grade: Use rigid PVC conduit.
  - 2. Exterior, Direct-Buried: Use rigid PVC conduit or HDPE.
  - 3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
  - 4. Where rigid polyvinyl chloride (PVC) conduit or high-density polyethylene (HDPE) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) where emerging from underground.
  - 5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows for bends.
  - 6. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
  - 7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges.
- D. Embedded Within Concrete:
  - 1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use rigid PVC conduit.
  - 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use rigid PVC conduit.
  - 3. Within Concrete Walls Above Ground: Use rigid PVC conduit.
  - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) where emerging from concrete.
  - 5. Where galvanized steel electrical metallic tubing (EMT) or galvanized steel rigid metal conduit (RMC) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to

authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

- E. Concealed Within Hollow Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC).
- I. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
  - 1. Locations subject to physical damage include, but are not limited to:
    - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
    - b. Where exposed below 20 feet in warehouse areas.
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- M. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
  - 1. Maximum Length: 6 feet.
- N. Flexible Connections to Vibrating Equipment:
  - 1. Dry Locations: Use flexible metal conduit (FMC).
  - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
  - 3. Maximum Length: 6 feet unless otherwise indicated.
  - 4. Vibrating equipment includes, but is not limited to:
    - a. Transformers.
    - b. Motors.

## **2.02 CONDUIT GENERAL REQUIREMENTS**

- A. Comply with NFPA 70.
- B. Electrical Service Conduits: See Section 26 21 00 for additional requirements.
- C. Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.
- D. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 3/4 inch (21 mm) trade size.

2. Underground, Interior: 1 inch (27 mm) trade size.
  3. Underground, Exterior: 1-inch trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

### **2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  2. Western Tube, a division of Zekelman Industries: [www.westerntube.com/#sle](http://www.westerntube.com/#sle).
  3. Wheatland Tube, a division of Zekelman Industries: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
- B. Conduit with integral fittings, such as Allied Tube and Conduit's "Kwik-Couple" are not permitted.
- C. Interior conduits shall be color-coded based on the wiring or system type they serve. Paint shall be factory applied by the manufacturer
1. Normal Power Systems: No color
  2. Emergency and Standby Power Systems: Yellow
  3. Fire Alarm: Red
  4. Security: Orange
  5. Telephone and Data: Blue
  6. Audio/Visual: Purple
  7. Other Low Voltage: Green
- D. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- E. Fittings:
1. Manufacturers:
    - a. ABB; T&B: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.us/#sle](http://www.alliedeg.us/#sle).
    - c. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
  4. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

### **2.04 FLEXIBLE METAL CONDUIT (FMC)**

- A. Manufacturers:

1. AFC Cable Systems, a division of Atkore International: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
- B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- C. Fittings:
  1. Manufacturers:
    - a. ABB; T&B: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

## **2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Manufacturers:
  1. AFC Cable Systems, a division of Atkore International: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
  1. Manufacturers:
    - a. ABB; T&B: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

## **2.06 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  1. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  2. Western Tube, a division of Zekelman Industries: [www.westerntube.com/#sle](http://www.westerntube.com/#sle).
  3. Wheatland Tube, a division of Zekelman Industries: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
- B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Conduits with integral fittings similar to Allied Tube & Conduit's "Kwik-Fit" shall not be used.
- D. Interior conduits shall be color-coded based on the wiring or system type they serve. Paint shall be factory applied by the manufacturer
  1. Normal Power Systems: No color
  2. Emergency and Standby Power Systems: Yellow
  3. Fire Alarm: Red

4. Security: Orange
5. Telephone and Data: Blue
6. Audio/Visual: Purple
7. Other Low Voltage: Green

E. Fittings:

1. Manufacturers:
  - a. ABB; T&B: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
  - b. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.us/#sle](http://www.alliedeg.us/#sle).
  - c. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
  - a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression/gland or set-screw type.
  - a. Do not use indenter type connectors and couplings.

## 2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:

1. ABB; Carlon: [www.carlon.com/#sle](http://www.carlon.com/#sle).
2. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
3. Cantex Inc: [www.cantexinc.com/#sle](http://www.cantexinc.com/#sle).

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

1. Expansion fittings similar to Carlon's "E945" series shall not be used.
2. Manufacturer: Same as manufacturer of conduit to be connected.
3. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## 2.08 HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT

A. Manufacturers:

1. ABB; Carlon: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
2. Blue Diamond Industries, LLC: [www.bdiky.com/#sle](http://www.bdiky.com/#sle).
3. Eastern Wire + Conduit, a division of Atkore International: [www.easternwire.com/#sle](http://www.easternwire.com/#sle).

B. Description: NFPA 70, Type HDPE high-density polyethylene solid-wall conduit complying with ASTM F2160 and NEMA TC 7; list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.

C. Joining Methods: Approved by HDPE conduit manufacturer.

D. Mechanical Fittings: Comply with ASTM F2176; list and label as complying with UL 651A.

E. Butt Heat Fusion Fittings: Comply with ASTM D3261.

- F. Socket Fusion Fittings: Comply with ASTM D2683.
- G. Electrofusion Fittings: Comply with ASTM F1055.

## 2.09 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Adhesive for HDPE Conduit:
  - 1. Specifically designed for bonding dissimilar materials in lieu of transition fittings, including but not limited to polyethylene, fiberglass, PVC, aluminum, and steel; UL 746C recognized.
  - 2. Approved by adhesive manufacturer for use with materials to be joined.
  - 3. Adhesive Shear Strength: Not less than 100 psi, when tested in accordance with ASTM D1002.
  - 4. Hydrostatic Pressure Resistance: No leaks, when tested in accordance with ASTM D1598 at 120 psi for 1,000 hours and when tested in accordance with ASTM D1599 at 250 psi.
  - 5. Products:
    - a. American Polywater Corporation; Polywater BonDuit Conduit Adhesive: [www.polywater.com/#sle](http://www.polywater.com/#sle).
- E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.
- F. Foam Conduit Sealant:
  - 1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
  - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  - 3. Rated to hold minimum of 10 ft water head pressure.
  - 4. Products:
    - a. American Polywater Corporation; Polywater AFT Foam Duct Sealant: [www.polywater.com/#sle](http://www.polywater.com/#sle).
    - b. American Polywater Corporation; Polywater FST Foam Duct Sealant: [www.polywater.com/#sle](http://www.polywater.com/#sle).
- G. Conduit Mechanical Seals:
  - 1. Listed as complying with UL 514B.
  - 2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
  - 3. Suitable for sealing around conductors/cables to be installed.
  - 4. Products:
    - a. American Polywater Corporation; PHRD SG Mechanical Seals: [www.polywater-haufftechnik.com/#sle](http://www.polywater-haufftechnik.com/#sle).
- H. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.
- I. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
  2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
  3. Products:
    - a. American Polywater Corporation; PZVR Cement-Coated Concrete Wall Sleeves: [www.polywater-haufftechnik.com/#sle](http://www.polywater-haufftechnik.com/#sle).
    - b. American Polywater Corporation; PHSD Mechanical Seals: [www.polywater-haufftechnik.com/#sle](http://www.polywater-haufftechnik.com/#sle).
    - c. American Polywater Corporation; PHSI 150 Varia Double Wall Inserts: [www.polywater-haufftechnik.com/#sle](http://www.polywater-haufftechnik.com/#sle).
    - d. American Polywater Corporation; PGKD Modular Seals: [www.polywater-haufftechnik.com/#sle](http://www.polywater-haufftechnik.com/#sle).
- J. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
1. Products:
    - a. Alta Products, LLC; Sigrist Pipe Chase Housing, Curbs, and Exit Seals: [www.altaproductsllc.com/#sle](http://www.altaproductsllc.com/#sle).
    - b. Menzies Metal Products; Electrical Roof Stack and Cap: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
    - c. Menzies Metal Products; Electrical Retro Box: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
- K. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
1. Products:
    - a. Quickflash Weatherproofing Products, Inc: [www.quickflashproducts.com/#sle](http://www.quickflashproducts.com/#sle).
- L. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.
1. Products:
    - a. Advance Products & Systems, LLC; Duct Bank Spacers: [www.apsonline.com/#sle](http://www.apsonline.com/#sle)
- M. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
1. Products:
    - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).
- N. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for casing and conduit/duct arrangement to be installed.
1. Products:
    - a. Advance Products & Systems, LLC; Bore Spacers: [www.apsonline.com/#sle](http://www.apsonline.com/#sle).



## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated without specific routing, determine exact routing required.
  - 3. Conceal conduits unless specifically indicated to be exposed.
  - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  - 5. Unless otherwise approved, do not route exposed conduits:
    - a. Across floors.
    - b. Across top of parapet walls.
    - c. Across building exterior surfaces.
  - 6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
  - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
  - 8. For power conduits, arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
  - 9. For low voltage conduits, arrange conduit to provide no more than the equivalent of two 90 degree bends between pull points.
  - 10. Arrange conduit to provide no more than 150 feet between pull points.
  - 11. Route conduits above water and drain piping where possible.
  - 12. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  - 13. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
  - 14. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.

- b. Hot water piping.
  - c. Flues.
15. Group parallel conduits in same area on common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
  - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain

- roof warranty.
  - 7. Provide metal escutcheon plates for conduit penetrations exposed to public view.
  - 8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.
- J. Underground Installation:
- 1. Provide trenching and backfilling; see Section 31 23 16.13.
  - 2. Minimum Cover, Unless Otherwise Indicated or Required:
    - a. Underground, Exterior: 18 inches.
    - b. Under Slab on Grade: 12 inches to bottom of slab.
- K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
- 1. Secure conduits to prevent floating or movement during pouring of concrete.
- L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
- 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  - 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  - 3. Where conduits are subject to earth movement by settlement or frost.
- M. Conduit Sealing:
- 1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
    - a. Where conduits enter building from outside.
    - b. Where service conduits enter building from underground distribution system.
    - c. Where conduits enter building from underground.
    - d. Where conduits may transport moisture to contact live parts.
  - 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
    - a. Where conduits pass from outdoors into conditioned interior spaces.
    - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
    - c. Where conduits penetrate coolers or freezers.
  - 3. Where conduits cross boundaries of hazardous/classified locations, provide identified/listed sealing fittings or conduit mechanical seals as approved by authorities having jurisdiction; locate as indicated or in accordance with NFPA 70.
- N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- O. Provide grounding and bonding; see Section 26 05 26.
- P. Identify conduits; see Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

### **3.04 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

### **3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

## **PART 4 MEASUREMENT AND PAYMENT:**

### **4.01 CONDUIT FOR ELECTRICAL SYSTEMS**

#### **A. Measurement:**

- 1. Measurement of "Conduit for Electrical Systems" shall be by the Linear Foot (LF).

#### **B. Payment:**

- 1. The contract unit prices paid for the various items in "Conduit for Electrical Systems" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Conduit for Electrical Systems", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.02 CONDUIT FOR CAMERAS**

#### **A. Measurement:**

- 1. Measurement of "Conduit for Cameras" shall be by the Linear Foot (LF).

#### **B. Payment:**

- 1. The contract unit prices paid for the various items in "Conduit for Cameras" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Conduit for Cameras", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION**

**SECTION 26 05 33.16**  
**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Boxes for hazardous (classified) locations.
- E. Floor boxes.
- F. Underground boxes/enclosures.
- G. Accessories.

**1.02 RELATED SECTIONS**

- A. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 27 26 - Wiring Devices:
  - 1. Wall plates.
  - 2. Access floor boxes.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specifications for Underground Enclosure Integrity; 2017.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  6. Coordinate the work with other trades to preserve insulation integrity.
  7. Coordinate the work with other trades to provide walls suitable for installation of flush- mounted boxes where indicated.
  8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and

enclosures, floor boxes, and underground boxes/enclosures.

1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- B. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Keys for Lockable Enclosures: Two of each different key.

## **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. 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. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## **PART 2 - PRODUCTS**

### **2.01 BOXES**

- A. General Requirements:
  1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit is used.
  4. Use suitable concrete type boxes where flush-mounted in concrete.
  5. Use suitable masonry type boxes where flush-mounted in masonry walls.

6. Use raised covers suitable for the type of wall construction and device configuration where required.
  7. Use shallow boxes where required by the type of wall construction.
  8. Do not use "through-wall" boxes designed for access from both sides of wall.
  9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  12. Gangable or sectional boxes shall not be permitted.
  13. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    - b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    - c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
  14. Wall Plates: Comply with Section 26 27 26.
  15. Manufacturers:
    - a. Hubbell Incorporated; RACO Products: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
  5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
  6. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com/#sle](http://www.hoffmanonline.com/#sle).
    - c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com/#sle](http://www.hubbell-wiegmann.com/#sle).
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
1. Recessed Wall Enclosure for Tele/Data Cabling: In-wall recessed enclosure for the installation of power and low voltage devices to feed residential units.
    - a. 14" wide by 42" tall by 3.75" deep flame-resistant ABS plastic enclosure.



- b. Multiple 1" and 2" knockouts on the top and bottom of the enclosure for conduit terminations.
  - c. Single-gang knockouts on the bottom of the enclosure for installation of up to (2) single-gang j-boxes for power or low voltage.
  - d. Vented, hinged, and lockable door
  - e. Accessories:
    - 1) Rubber Grommets: Provide 1" and 2" grommets for each knockout removed
    - 2) Universal Shelf Bracket: Provide mounting bracket with holes for mounting and velcroing equipment in place. Provide one bracket per data switch, router, hub, or other miscellaneous equipment as required.
    - 3) Velcro: Provide 1/2" wide velcro as required to secure equipment and wiring in place, lengths as required.
    - 4) CATV Mounting Plate: Provide bracket for secure mounting of F-type CATV connectors, quantity as required.
    - 5) Tele/Data Mounting Bracket: Provide bracket for mounting of tele/data patch panels or bracket for installation of QuickPort style telephone and data connectors.
  - f. Manufacturer: Leviton 42" Wireless Structured Media Center, model #49605-42P with 5L000-L0K and manufacturer's accessories
2. Recessed Enclosure for Wireless Access Points: In-wall, non-metallic, recessed enclosure for the installation of Wireless Access Points.
- a. 14" wide by 14" tall by 4" deep flame-resistant ABS plastic enclosure.
  - b. Multiple 1" and 2" knockouts on the top and bottom of the enclosure for conduit terminations.
  - c. Single-gang knockouts on the bottom of the enclosure for installation of up to (2) single gang j-boxes for power or low voltage.
  - d. Vented, hinged, and lockable door.
  - e. Manufacturers: Leviton 14" Wireless Structured Media Center, model #49605-14P with 5L000-L0K
3. Recessed Wall Boxes: In-wall recessed box for the installation of power and low voltage devices behind flat panel displays.
- a. Provide quantity of gangs as required to feed all power and low voltage devices as shown on plans.
  - b. Low voltage j-box shall accommodate standard Decora style devices in addition to manufacturer's Intelligent Plate Solutions (IPS) devices. Refer to plans for types and quantities of connectors.
  - c. Box shall sit flush with wall, with cover provided over box opening. Cover shall be provided with cable pass-thru.
  - d. Cover color shall be white, unless otherwise noted.
  - e. Manufacturers:
    - 1) FSR Inc; PWB-100 Series: [www.fsrinc.com/](http://www.fsrinc.com/)
4. Recessed Ceiling Boxes: Recessed in-ceiling box for installation of power and low voltage devices to serve a ceiling mounted AV equipment.
- a. Enclosure shall come standard with (5) 120V outlets, with two duplex and one single outlet. Duplex outlets shall be located within enclosure, single outlet shall be located at the ceiling plane on the exterior of the box.

- b. Enclosure shall be intended for installation in standard T-bar ceiling grid, with optional mounting kit option for drywall installation. Housing shall be constructed of steel. Provide ceiling tile, cut to size and finish to match adjacent ceiling, for installation in door of enclosure.
  - c. Enclosure shall be provided with optional fan kit.
  - d. Where the installed enclosure is intended to serve a projector, provide projector pole mount option. Pole mount shall be 1-1/2" National Pipe Thread (NPT) fitting, capable of supporting up to 50lbs.
  - e. Provide cable mounting kit for mounting of enclosure to ceiling structure above.
  - f. Provide additional threaded rod mounting kit as required for mounting conditions. Threaded rod kit shall accept 1/4" and 3/8" threaded rod at four hangar bracket locations.
  - g. Manufacturers:
    - 1) Ceiling Enclosure: FSR Inc.; CB-12P with CB-12FAN and CB-MNT1 series : [www.fsrinc.com/](http://www.fsrinc.com/)
5. Wood Floors - Flush Floor Boxes:
- a. Cast iron, watertight body, with fully adjustable height settings to allow for installation flush with flooring.
  - b. Sizes from one to three gangs for multiple power or low voltage feeds. Provide quantity of boxes and gangs as required to feed all devices as noted on plans
  - c. Provide brass carpet plate to transition from adjacent floor surface to floor box, size as required to accommodate quantity of gangs in each box
  - d. Provide brass GFCI style, gasketed, hinged cover plate with flathead-screw style means of securing cover in the closed position.
  - e. Knockouts: 3/4" or 1" Conduit hubs, one per side, per gang.
  - f. Manufacturer:
    - 1) Steel City 60W series floor box, P64 series brass carpet plate, P-64-GFCI cover plate ; [www.tnb.com/](http://www.tnb.com/)
6. Wood Floors - Recessed Floor Boxes:
- a. Welded steel housing, with 1/8" steel cover, suitable for installation in wood floors.
  - b. Cover shall have hinged access door with integrated cable pass thru window. Pass- thru window opens down into box to avoid tripping hazards.
  - c. Configurable gang plate dividers and compartment dividers. Provide arrangement of interior compartments as required to accommodate all devices indicated on plans and to separate voltages.
  - d. Provide manufacturer's brackets as required to accommodate all power and low voltage devices within each floor box.
  - e. Manufacturer:
    - 1) Single Gang: FSR Inc. FL-1200 and Four Gang: FSR Inc. FL-1550 ; [www.fsrinc.com](http://www.fsrinc.com)
7. Concrete Floors - Flush Floor Boxes:
- a. Cast iron, watertight body, with fully adjustable height settings to allow for installation flush with flooring
  - b. Sizes from one to four gangs for multiple power or low voltage feeds. Sizes from one to three gangs for shallow boxes. Provide quantity of boxes and gangs as required to feed all devices as noted on plans

- c. Provide brass GFCI style, gasketed, hinged cover plate with flathead-screw style means of securing cover in the closed position.
  - d. Knockouts: 3/4" or 1" Conduit hubs, one per side, per gang.
  - e. Provide shallow boxes where required by field installation conditions or as required by Structural Engineer.
  - f. Manufacturer:
    - 1) Steel City 640 series floor box, P-64-GFCI cover plate ; [www.tnb.com/](http://www.tnb.com/)
8. Concrete Floors - Recessed Floor Boxes:
- a. 11-gauge steel housing, suitable for installation in poured concrete floor applications.
  - b. Cover shall have hinged access door with solid metal "U" handle and integrated cable pass thru window. Pass-thru window opens down into box to avoid tripping hazards.
  - c. Transformable box bottom (for eight gang configurations only) with fully configurable gang plate dividers, compartment dividers, and center dividers. Provide arrangement of interior compartments as required to accommodate all devices indicated on plans and to separate voltages.
  - d. Provide manufacturer's brackets as required to accommodate all power and low voltage devices within each floor box.
  - e. Provide optional mitered brass carpet edging for installations in carpeted areas.
  - f. For areas with concrete, wood, or tile floors, install box such that finished floor is flush with the top edge of the box cover. Provide shim kit to install top of box flush with top of finished floor.
  - g. Provide manufacturer's concrete pour pan as required for proper installation.
  - h. Manufacturer:
    - 1) FSR Inc. FL-500-P series floor box, with FL-500P-BLP-C U-Access tile and carpet cover ; [www.fsrinc.com/](http://www.fsrinc.com/)
9. Exterior Floor Boxes:
- a. Outdoor ground boxes shall have been examined and tested by Underwriters Laboratories Inc. to meet NEMA 6P and IP68 requirements to be safe to use even during inclement weather and bear the UL Listing Mark.
  - b. Outdoor ground boxes shall be designed to trap and maintain an air pocket to protect the devices, plugs and connections from water, snow, and ice. Boxes shall be constructed from UV rated chemical resistant materials. Boxes designed to ANSI/SCTE 77 with a Tier 5 rating to hold up to 5000 lbs of load. Boxes install flush to finished ground reducing tripping hazards. Box shall have a diving bell concept to maintain an air pocket and keep water away from connections. Box shall have an egress door that will auto-adjust to cable diameter and auto-lock in the closed position when no cables are exiting the box.
  - c. Provide quantity of enclosures as required to accommodate all devices noted on plans.
  - d. Provide manufacturer's brackets as required to accommodate all power and low voltage devices within each floor box.
  - e. Box covers shall come with pre-wired and installed electrical devices. Refer to plans for configuration of devices in each box.
    - 1) General: Single service 2-gang ground box manufactured from UV rated nonmetallic material. Box accepts up to two 1-1/4" trade size PVC conduit feeds. Boxes designed to be installed separately or ganged together for greater capacity and flexibility. Accepts optional cover assembly (see options below). Box assemblies include main box body, installation cap, and installation plate.

- 2) 125V, 20A, 1P Devices: Assembly prewired with two (2) 20A L5-20R weather-resistant duplex receptacles. Cover assembly includes flange, cover, junction box, (2) 20A 5-20R receptacles, SOOW cord, wet location wire connectors, key, and mounting hardware.
  - 3) 125V, 30A, 1P Devices: Assembly prewired with one (1) 30A L5-30R 120V corrosion-resistant duplex receptacle. Cover assembly includes flange, cover, junction box, SOOW cord, L5-30R receptacle, wet location wire connectors, key, and mounting hardware.
  - 4) 250V, 30A, 2P Devices: Assembly prewired with one (1) 30A L6-30R 208V corrosion-resistant duplex receptacle. Cover assembly includes flange, cover, junction box, SOOW cord, L6-30R receptacle, wet location wire connectors, key, and mounting hardware.
  - 5) Low Voltage Devices: Assembly designed to accept up to 12 communication ports or eight (8) manufacturer's audio/visual devices. Cover assembly includes flange, cover, junction box, corrugated conduit assembly, (1) 12 port communication mounting plate, (1) 8 port manufacturer's audio/video mounting plate, key, and mounting hardware.
- f. Manufacturer:
- 1) Enclosure: Legrand XB814 series ; [www.legrand.com/](http://www.legrand.com/)
  - 2) Interior: 125V, 20A, 1P Devices: Legrand XB814C520BK, 125V, 30A, 1P Devices: Legrand XB814CL530BK, 250V, 30A, 2P Devices: Legrand XB814CL630BK, and Low Voltage Devices: Legrand XB814CLVBK
10. Recessed Poke-Thrus: In-floor, round enclosure to provide access to power and data devices in a recessed enclosure such that plugs are not exposed when in-use.
- a. Poke-thru assembly: Assembly shall consist of an insert and an activation cover.
  - b. Insert body shall recess the devices a minimum of 2-3/4 inches and have a polyester based backing enamel finished interior; ivory color. Furnish with necessary channels to provide complete separation of power and communication services. Provide quantity of compartments that allow for up to three (3) duplex receptacles that can be wired as a standard receptacle or isolated ground and/or twelve (12) communication ports and/or up to ten (10) AV devices.
  - c. Activation Cover shall be manufactured of die-cast aluminum alloy; finished in brass. Provide with two gaskets to go under the trim flange to maintain scrub water tightness. Provide cover with spring-loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible.
  - d. Provide activation unit with locations to mount communication connectors as required to support all devices shown on plans. Mount connectors using a mounting bracket capable of accepting data jack insert modules or discrete keystone connectors.
  - e. Manufacturers:
    - 1) Legrand Wiremold 6AT ; [www.legrand.com/](http://www.legrand.com/)
11. Flush Poke-Thrus: In-floor, round enclosure to provide connections to hardwired modular furniture systems.
- a. Furniture Feed Poke-Thru Assembly consists of an insert and activation cover.
  - b. Insert body shall have the necessary channels to provide complete separation of power and communication services. There shall be one (1) 3/4-inch trade size channel for power and one (1) 1-1/2-inch trade size channel for communication cabling.

- c. The activation cover shall provide two (2) conduit openings to feed modular furniture applications and provide a flush appearance. The activation cover trim flange shall be one-piece and be manufactured of die-cast aluminum alloy and be capable of being powder coated or plated. Coated finish is to be textured, two-stage epoxy paint in brass. The activation cover shall be 8-1/4 inches in diameter and shall be gasketed.
  - d. The activation cover insert shall provide one (1) 3/4-inch NPSM threaded opening for power and one (1) 1-1/2-inch NPSM threaded opening for communication to feed modular furniture workstations. Conduit closure plugs shall be provided for each unused opening.
  - e. Manufacturers:
    - 1) Legrand Wiremold 4FATC ; [www.legrand.com/](http://www.legrand.com/)
- E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
12. Manufacturers:
- a. Appleton, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - b. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
  - c. Hubbell Incorporated; Killark Products: [www.hubbell-killark.com/#sle](http://www.hubbell-killark.com/#sle).
- F. Underground Boxes/Enclosures:
13. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
14. Size: As indicated on drawings.
15. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
16. Provide logo on cover to indicate type of service. Covers shall read as follows for each system type:
- a. Power Systems: "ELECTRICAL "
  - b. Site Lighting and/or Pole Lighting: "LIGHTING"
  - c. Fire Alarm Systems: "FIRE ALARM"
  - d. Other Low Voltage Systems: "COMMUNICATIONS"
  - e. Utility: Per utility company requirements
17. Applications:
- a. Sidewalks/paved areas 6'-0" wide and smaller and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
  - b. Parking Lots, Sidewalks/paved areas larger than 6'-0" wide, and in Areas Subject Only To Occasional Vehicular Traffic: Use reinforced concrete enclosures with galvanized steel checker plate lids, with HS20-44 rating.
  - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
18. Polymer Concrete and Reinforced Concrete Underground Boxes/Enclosures: Comply with SCTE 77 and HS20-44.
- a. Manufacturers:
- 1) Oldcastle Precast, Inc: [www.oldcastleprecast.com/#sle](http://www.oldcastleprecast.com/#sle).

- b. Combination fiberglass/polymer concrete boxes/enclosures are not acceptable. Use all-polymer concrete boxes/enclosures.

## **2.02 ACCESSORIES**

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.
  - 1. Manufacturers:
    - a. Quickflash Weatherproofing Products, Inc: [www.quickflashproducts.com/#sle](http://www.quickflashproducts.com/#sle).

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes so that wall plates do not span different building finishes.
  - 4. Locate boxes so that wall plates do not cross masonry joints.
  - 5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  7. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
  8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
  9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
  10. Outlet boxes shall be installed at the locations and elevations shown on the drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.
  11. Locate switch outlet boxes on the latch side of doorways unless otherwise indicated.
  12. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
  13. Outlet boxes shall not be installed back to back nor shall through-wall boxes be permitted.
  14. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.
  15. For outlets mounted above counters, benches or backsplashes, coordinate location and mounting heights with built-in units. Adjust mounting height with required location for equipment served.
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide required seismic controls in accordance with Section 26 05 48.
  3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  5. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated

- raised cover is flush with finished surface.
    - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- N. Underground Boxes/Enclosures:
  - 1. Install enclosure on gravel base, minimum 6 inches deep.
  - 2. Flush-mount enclosures located in concrete or paved areas.
  - 3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
  - 4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- Q. Close unused box openings.
- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use. Leave no unused openings in any box. Install close-up plugs as required to seal all openings and removed knockouts.
- S. Provide grounding and bonding in accordance with Section 26 05 26.
- T. Identify boxes in accordance with Section 26 05 53.
- U. Poke-Thrus
  - 1. Coordinate coring of all poke-thru locations, and/or locations for pre-drilled holes, with Structural Engineer prior to installation. Size of poke-thru core shall be per manufacturer requirements.

### **3.03 CLEANING**

- 1. X-ray all pre- and post-tensioned slabs prior to core-drilling to ensure no tendons are damaged during installation. Notify Engineer of any conflicting locations.
- A. Exterior In-Grade Floor Boxes
  - 1. Examine conditions under which outdoor ground boxes are to be installed. Notify the Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.
  - 2. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
  - 3. Boxes shall be located in approximate locations as shown on plans. Exact location shall be in well-drained areas, away from inlets and outfalls. Boxes shall not be located in low areas or in areas prone to accumulate standing water. Notify Engineer prior to rough-in and install of any



- potential water infiltration issues or concerns.
  - 4. Adjacent grade shall be within 1% of level.
  - 5. Provide a pre-installation call and/or site meeting with the manufacturer to discuss proper installation methodologies. Call shall be a minimum of ½ hour and shall cover the following:
    - a. Site specific issues
    - b. Requirements for preparation of box installation
    - c. Installation requirements
- B. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.04 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**3.05 MEASUREMENT AND PAYMENT:**

**A. Measurement:**

- 1. Measurement of “Boxes for Electrical Systems” shall per each (EA).

**B. Payment:**

- 2. The contract unit prices paid for the various items in “Boxes for Electrical Systems” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Boxes for Electrical Systems”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 26 05 33.16**

**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 26 05 36 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.
- C. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.
- D. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.
- E. Section 26 31 00 - Photovoltaic Collectors: Additional identification requirements for photovoltaic systems.
- F. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having

Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

#### **1.05 SUBMITTALS**

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

#### **1.06 QUALITY ASSURANCE**

A. Comply with requirements of NFPA 70.

#### **1.07 FIELD CONDITIONS**

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

### **PART 2 - PRODUCTS**

#### **2.01 IDENTIFICATION REQUIREMENTS**

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Switchboards:

- 1) Identify ampere rating.
- 2) Identify voltage and phase.
- 3) Identify power source and circuit number. Include location when not within sight of equipment.
- 4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Panelboards:

- 1) Identify ampere rating.
- 2) Identify voltage and phase.
- 3) Identify power source and circuit number. Include location when not within sight of equipment.
- 4) Identify main overcurrent protective device. Use identification label for panelboards

- with a door. For power distribution panelboards without a door, use identification nameplate.
- 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
- 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- c. Transformers:
  - 1) Identify kVA rating.
  - 2) Identify voltage and phase for primary and secondary.
  - 3) Identify power source and circuit number. Include power source location when not within sight of equipment.
  - 4) Identify load(s) served. Include load location when not within sight of equipment.
- d. Enclosed switches, circuit breakers, and motor controllers:
  - 1) Identify voltage and phase.
  - 2) Identify power source and circuit number. Include power source location when not within sight of equipment.
  - 3) Identify load(s) served. Include load location when not within sight of equipment.
- e. Time Switches:
  - 1) Identify load(s) served and associated circuits controlled. Include location.
- f. Centralized Emergency Lighting Inverters:
  - 1) Identify input and output voltage and phase.
  - 2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
  - 3) Identify load(s) served. Include location.
- g. Transfer Switches:
  - 1) Identify voltage and phase.
  - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
  - 3) Identify load(s) served. Include location when not within sight of equipment.
  - 4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
  - 5) Identify type of loads served (e.g. Required Emergency, Required Standby, Optional Standby)
- h. Electricity Meters:
  - 1) Identify load(s) metered.
  - 2) Unique meter identifier, use identification label.
- 2. Service Equipment:
  - a. Use identification nameplate to identify each service disconnecting means.
  - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
- 3. Emergency System Equipment:
  - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
  - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
  - c. Use identification nameplate to identify emergency operating instructions for

emergency system equipment.

4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
6. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
7. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
8. Use field-painted floor markings or floor marking tape to identify required equipment working clearances.
9. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
  - a. Service equipment.
  - b. Industrial control panels.
  - c. Motor control centers.
  - d. Elevator control panels.
10. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.
11. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
12. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

**B. Identification for Conductors and Cables:**

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

**C. Identification for Raceways:**

1. Use voltage markers to identify highest voltage present for accessible conduits 2 inch (53 mm) trade size and larger at maximum intervals of 20 feet.
2. Use factory-painted conduits or field painted conduits to identify systems other than normal power system for accessible conduits. Refer to section 26 05 33.13 for color coding and additional requirements.
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
5. Use underground warning tape to identify underground raceways.

**D. Identification for Cable Tray: Comply with Section 26 05 36.**

- E. Identification for Boxes:
  - 1. Use voltage markers to identify highest voltage present.
  - 2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    - a. For exposed boxes in public areas, use only identification labels.
  - 3. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
  
- F. Identification for Devices:
  - 1. Identification for Communications Devices: Comply with Section 27 10 00.
  - 2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
  - 3. Use identification label to identify fire alarm system devices.
    - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
  - 4. Use identification label to identify serving branch circuit for all receptacles.
  - 5. Use identification label to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
  
- G. Identification for Luminaires:
  - 1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.
  
- H. Identification for Photovoltaic Systems: Comply with Section 26 31 00

## 2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
  - 1. Manufacturers:
    - a. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
    - b. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 2. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
    - b. Outdoor Locations: Use plastic or aluminum nameplates suitable for exterior use.
  - 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
  - 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
  - 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
  
- B. Identification Labels:
  - 1. Manufacturers:
    - a. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
    - b. Brother International Corporation: [www.brother-usa.com/#sle](http://www.brother-usa.com/#sle).
    - c. Panduit Corp: [www.panduit.com/#sle](http://www.panduit.com/#sle).
  - 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and

abrasion resistant.

- a. Use only for indoor locations.
  3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
  2. Legend:
    - a. System designation where applicable:
      - 1) Emergency Power System: Identify with text "EMERGENCY".
      - 2) Standby Power System: Identify with text "STANDBY"
      - 3) Fire Alarm System: Identify with text "FIRE ALARM".
    - b. Equipment designation or other approved description.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    - a. System Designation: 1 inch.
    - b. Equipment Designation: 1/2 inch.
  5. Color:
    - a. Normal Power System: White text on black background.
    - b. Emergency Power System: White text on red background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/4 inch.
  5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/2 inch.
  5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Power source and circuit number or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.
- G. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Load controlled or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.

- H. Format for Fire Alarm Device Identification:
  - 1. Minimum Size: 3/8 inch by 1.5 inches.
  - 2. Legend: Designation indicated and device zone or address.
  - 3. Text: All capitalized unless otherwise indicated.
  - 4. Minimum Text Height: 3/16 inch.
  - 5. Color: Red text on white background.

## **2.03 WIRE AND CABLE MARKERS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  - 2. HellermannTyton: [www.hellermanntyton.com/#sle](http://www.hellermanntyton.com/#sle).
  - 3. Panduit Corp: [www.panduit.com/#sle](http://www.panduit.com/#sle).
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

## **2.04 VOLTAGE MARKERS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  - 2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  - 3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
  - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
  - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
  - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
  - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
  - 1. Markers for Voltage Identification: Highest voltage present.
  - 2. Markers for System Identification:



a. Emergency Power System: Text "EMERGENCY".

F. Color: Black text on orange background unless otherwise indicated.

## **2.05 UNDERGROUND WARNING TAPE**

B. Manufacturers:

1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).

C. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

E. Legend: Type of service, continuously repeated over full length of tape.

F. Color:

1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

## **2.06 FLOOR MARKING TAPE**

G. Manufacturers:

1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).

H. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

## **2.07 WARNING SIGNS AND LABELS**

I. Manufacturers:

1. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
2. Clarion Safety Systems, LLC: [www.clarionsafety.com/#sle](http://www.clarionsafety.com/#sle).
3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).

J. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

K. Warning Signs:

1. Materials:
  - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
  - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

L. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using

- materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  3. Minimum Size: 2 by 4 inches unless otherwise indicated.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  1. Surface-Mounted Equipment: Enclosure front.
  2. Flush-Mounted Equipment: Inside of equipment door.
  3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  4. Elevated Equipment: Legible from the floor or working platform.
  5. Branch Devices: Adjacent to device.
  6. Interior Components: Legible from the point of access.
  7. Conduits: Legible from the floor.
  8. Boxes: Outside face of cover.
  9. Conductors and Cables: Legible from the point of access.
  10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

#### **3.03 FIELD QUALITY CONTROL**

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

**SECTION 26 05 83**  
**WIRING CONNECTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

**1.02 RELATED SECTIONS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cable.
- B. Section 26 05 33.13 - Conduit for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 27 26 - Wiring Devices.
- E. Section 26 28 16.16 - Enclosed Switches.

**1.03 REFERENCE STANDARDS**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

**1.05 SUBMITTALS**

- A. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Comply with NEMA WD 1.
  - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 27 26.
- D. Flexible Conduit: As specified in Section 26 05 33.13.
- E. Wire and Cable: As specified in Section 26 05 19.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

### **3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete

equipment wiring requirements.

- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**3.03 MEASUREMENT AND PAYMENT:**

**A. Measurement:**

- 1. Measurement of “Wiring Connections” shall per each (EA).

**B. Payment:**

- 1. The contract unit prices paid for the various items in “Wiring Connections” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Wiring Connections”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 26 05 83**

**SECTION 26 27 26**  
**WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

**1.02 RELATED SECTIONS**

- A. Section 26 05 33.16 - Boxes for Electrical Systems.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 05 83 - Wiring Connections: Cords and plugs for equipment.

**1.03 REGULATORY REQUIREMENTS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

- L. UL 1310 - Class 2 Power Units Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings. Switches shall be located on the strike side of the door, unless otherwise noted, and shall not be obstructed by the door when it is in the open position.
  - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install wiring devices until final surface finishes and painting are complete.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Operation and Maintenance Data:
  - 1. GFCI Receptacles: Include information on status indicators.
- D. Project Record Documents: Record actual installed locations of wiring devices.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
  - 2. Extra Wall Plates: One of each style, size, and finish.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.
- D. 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 PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

## **PART 2 - PRODUCTS**

### **2.01 WIRING DEVICE APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide tamper resistant receptacles for receptacles installed in dwelling units, kindergarten classrooms, and daycare facilities.
- E. Provide GFCI protection for receptacles installed within 6 feet of sinks.
- F. Provide GFCI protection for receptacles installed in kitchens.
- G. Provide GFCI protection for receptacles serving electric drinking fountains.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.

### **2.02 WIRING DEVICE FINISHES**

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
- C. Wiring Devices Installed in Finished Spaces: White with stainless steel wall plate.
- D. Wiring Devices Installed in Unfinished Spaces: White with galvanized steel wall plate.
- E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

### **2.03 WALL SWITCHES**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for



back wiring with separate ground terminal screw.

- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

## 2.04 RECEPTACLES

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  - 2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
  - 3. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
  - 4. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
  - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    - a. Provide test and reset buttons of same color as device.
  - 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  - 3. Combination AFCI and GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as a combination GFCI/AFCI protective device and complying with UL 498, UL 943, and UL 1699A.
  - 4. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
  - 5. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

- E. USB Charging Devices:
  - 1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
    - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
    - b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
  - 2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (One Type-A and One Type-C) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.
  - 3. USB Charging Noncombination Devices: Four-port (Two Type-A and Two Type-C); rectangular decorator style.

## **2.05 WALL PLATES**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com/#sle](http://www.hubbell-wiring.com/#sle).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- F. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.
- G. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.

- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
  - 1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  - 2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
  - 4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

- K. Install wall switches with OFF position down.
- L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- O. Identify wiring devices in accordance with Section 26 05 53.

### **3.04 FIELD QUALITY CONTROL**

- A. Inspect each wiring device for damage and defects.
- B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- C. Test each receptacle to verify operation and proper polarity.
- D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.07 MEASUREMENT & PAYMENT**

#### **A. Measurement:**

1. Measurement of "Wiring Devices" shall per each (EA).

#### **B. Payment:**

1. The contract unit prices paid for the various items in "Wiring Devices" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Wiring Devices", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 26 27 26**

**SECTION 26 56 00**  
**EXTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Ballasts.
- C. Poles and accessories.
- D. Luminaire accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.

**1.03 REFERENCE STANDARDS**

- A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2017.
- B. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 2013 (Corrigendum 2019).
- C. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- D. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- E. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- F. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- G. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

- H. IES RP-8 - Recommended Practice: Lighting Roadway and Parking Facilities; 2021.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- J. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- K. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2020.
- L. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).
- M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- O. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.
- P. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

#### **1.05 SUBMITTALS**

- A. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
  - 2. Provide photometric calculations where luminaires are proposed for substitution.
  - 3. Provide structural calculations for each pole proposed for substitution.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
    - b. Include IES LM-79 test report upon request.
  - 2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

- C. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
- D. Field Quality Control Reports.
  - 1. Include test report indicating measured illumination levels.
- E. 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 starting of product.
- F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
- H. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- 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. 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. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

#### **1.08 WARRANTY**

- A. Provide three year manufacturer warranty for all LED luminaires, including drivers.



## **PART 2 - PRODUCTS**

### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

### **2.02 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- H. Recessed Luminaires:
  - 1. Ceiling Compatibility: Comply with NEMA LE 4.
  - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
  - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.
- J. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- K. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
  - 1. LED Tape - General Requirements:
    - a. Listed.
    - b. Designed for field cutting in accordance with listing.
    - c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.

## **2.03 BALLASTS AND DRIVERS**

- A. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
  - 3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- B. Dimmable LED Drivers:
  - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
  - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

## **2.04 POLES**

- A. All Poles:
  - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
  - 2. Material: Steel, unless otherwise indicated.
  - 3. Shape: Square straight, unless otherwise indicated.
  - 4. Finish: Match luminaire finish, unless otherwise indicated.
  - 5. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
  - 6. Unless otherwise indicated, provide with the following features/accessories:
    - a. Handhole, 3" x 5" in size.
    - b. Anchor bolts with leveling nuts or leveling shims.
    - c. Anchor base cover.
- B. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

## **2.05 ACCESSORIES**

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires in accordance with NECA/IESNA 501.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Provide required seismic controls in accordance with Section 26 05 48.
- G. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- H. Recessed Luminaires:
  - 1. Install trims tight to mounting surface with no visible light leakage.
  - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
  - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- I. Suspended Luminaires:
  - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
  - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
  - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
  - 4. Install canopies tight to mounting surface.
  - 5. Unless otherwise indicated, support pendants from swivel hangers.
- J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- K. Pole-Mounted Luminaires:
  - 1. Foundation-Mounted Poles:

- a. Install foundations plumb.
- b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
- c. Tighten anchor bolt nuts to manufacturer's recommended torque.
- d. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
- e. Install anchor base covers as indicated.
- 2. Embedded Poles: Install poles plumb as indicated.
- 3. Grounding:
  - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
- 4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
  
- L. Install accessories furnished with each luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.
- N. Install lamps in each luminaire.

### **3.04 FIELD QUALITY CONTROL**

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### **3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

### **3.06 CLEANING**

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### **3.07 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

### **3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

### **3.09 PROGRAMMING OF CONTROLS**

- A. Test controls prior to construction and notify City and Engineer of any malfunctioning or defective equipment prior to any work being performed.
- B. Provide all programming required for existing Wattstopper LCPs to accommodate new light fixtures.
- C. Coordinate all timeclock scheduled with City representative prior to programming. Set all on/off times as directed by City representative.
- D. Test controls at completion of construction and demonstrate all existing and new fixtures run on and off at the appropriate times.

## **PART 4 - MEASUREMENT & PAYMENT**

### **4.01 EXTERIOR LIGHTING**

#### **A. Measurement:**

- 1. Measurement of "Exterior Lighting" shall be per each (EA).

#### **B. Payment:**

- 2. The contract unit prices paid for the various items in "Exterior Lighting" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Exterior Lighting", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.02 PROGRAMMING FOR EXISTING LCPS**

#### **A. Measurement:**

- 1. Measurement of "Programming for existing LCPs" shall be per Lump Sum (LS).

#### **B. Payment:**

- 1. The contract unit prices paid for the various items in "Programming for existing LCPs" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Programming for existing LCPs", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided

**END OF SECTION 26 56 00**

**SECTION 27 05 00**  
**GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. The work of this Section consists of providing all required labor, supervision, materials and equipment (except equipment furnished by the Owner to be installed by the Contractor) to satisfactorily complete the work shown on the drawings and/or specified in all Sections of Division 27 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete and fully operating facility. The work shall include but not be limited to the following:
1. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated communication systems.

**1.02 RELATED SECTIONS**

- A. This Section provides the basic Communication Requirements which supplement the General Requirements of Division 1 and apply to all Sections of Division 27.

**1.03 STANDARDS AND CODES:**

- A. All work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
2. California Electrical Code (CEC)
  3. American National Standards Institute (ANSI) Publications:
    - a. C2-02 National Electrical Safety Code
  4. Code of Federal Regulations (CFR):
    - a. 29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)
  5. Electronics Industries Association (EIA)
  6. Building Industry Consultants Society International (BICSI)
  7. Institute of Electrical and Electronics Engineers (IEEE)
  8. National Electrical Testing Association (NETA):
    - a. Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, Standard ATS
  9. National Electrical Manufacturers Association (NEMA)
  10. Occupational Safety and Health Act (OSHA) Standards
  11. State of California Public Utilities Commission:
    - a. General Order 128 Rules for Construction of Underground Electric Supply and Communication Systems
- B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.
- C. Underwriter Laboratories (UL) listing is required for all equipment and materials where such

listing is offered by the Underwriters Laboratories. Safety labeling and listing by other organizations, such as ETL Testing Laboratories, may be substituted for UL labeling and listing if acceptable to the Owner. Provide service entrance labels for all equipment required by the NEC to have such labels.

#### **1.04 SUBMITTALS**

- A. As specified in Division 1. Submit to the Engineer shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified.
- B. Obtain approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review.
- C. Submittals are required for all items, regardless of whether they are furnished as specified or are substituted.
- D. Submittals shall be provided prior to the purchasing and installation of the item(s) being submitted. Any work done prior to the final approval of the submittal shall be done at risk and any modifications, changes, or re-work that may be required resulting from the final submittal review shall be provided by the Contractor at no additional cost to the project.
- E. Information to be submitted includes manufacturer's name, trade name, equipment model number, nameplate data, equipment drawings including: size, layout dimensions and capacity, manufacturer's descriptive literature of cataloged products, diagrams, test data, and performance and characteristic curves as applicable. Furnish project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contract compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.
- F. If submittal information includes multiple products, items being submitted for approval shall be clearly identified and Items not to be used on the project shall be clearly marked out. Submittals consisting of manufacturer's catalogs without clearly marking out items not being used will be returned as not reviewed.
- G. Organize submittals for equipment and items related to each specification section together as a package.
- H. Submit submittal packages in digital PDF format.
  - 12. Certificates of Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this contract. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements that imply the item does not meet requirements specified, such as "as good as", "achieve the same end use and results as materials formulated in accordance with the referenced publications;" or "equal or exceed the service and performance of the specified material." Certifications shall state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official, authorized to sign certificates of conformance.

I. Substitutions:

13. The equipment included in the Contract Documents is used to establish standards of quality, utility, size, and appearance. Equipment which in the opinion of the Engineer is equal in quality, utility, size, and appearance will be approved as substitutions to that specified:
  - a. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are approved by the Engineer prior to bidding.
14. Substitutions will be accepted for review where there is a reasonable reason for the substitution. Reasonable reasons include:
  - a. Cost savings to the owner. Include deductive change order with submittal.
  - b. A product with features providing additional benefits to the end user.
  - c. Improved finished environment, lay out of the final installation, or space savings over the specified equipment.
  - d. Delivery considerations.
  - e. Owner's specific requests.
15. Where items are noted as "or equal", a product of equal design, construction, and performance will be considered.
16. Any item proposed as a substitute shall be accompanied by the following:
  - a. Drawings and/or data giving sizes, capacities, all pertinent test data, catalog cut sheets, product information, and all other necessary information required to substantiate that the product is equal or exceeds that specified.
  - b. A summary sheet noting each performance characteristic noted in the specification section or elsewhere in the contract documents of the specified product and the corresponding performance characteristics of the proposed substitution. The summary sheet shall contain the following information:
    - 1) Reason for Substitution Request
    - 2) Pertinent Performance Characteristics
    - 3) Specified Product Values
    - 4) Substituted Product Values
  - c. Any substitution request that does not include the above information shall be rejected.
  - d. Refer to the end of this specification section for an example form to be used for substituted products. A Microsoft Word version of the form can be provided to the Contractor for their use upon request.
17. Substitutions shall be equal, in the opinion of the Engineer, to the specified equipment. The burden of proof of such shall rest with the Contractor. When the Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted equipment to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Plans or Specifications.
18. Contractor shall be responsible for coordination of the substituted products with other trades. Provide all additional connectivity, equipment, increased wire/conduit size, installation hardware, testing, and other miscellaneous appurtenances as required for a complete and fully functional installation.
19. Only one substitution will be considered for each product specified.
20. Alternate manufacturers must be submitted for approval 10 days prior to bid date unless noted otherwise in Division 1.
21. The Contractor shall be responsible for all expenses in connection with the substitution materials, process, and equipment, including the effect of his/her substitution on him/her, his/her subcontractor's or other Contractor's work. No substitution shall be permitted



without written authorization of the Engineer. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the Engineer are at the sole risk of the Contractor.

**B. Change Orders:**

1. Where a change to the contract documents would result in a credit due to the Owner or a value add change to the project, provide a detailed change order request for the Engineer to review.
2. It shall be understood that the Engineer's review of costs associated with the change order shall not constitute approval of the change order or their associated costs. The Engineer's review shall be intended to assist the Owner in evaluating the costs associated with the change only. Final approval or rejection of the change order shall be at the discretion of the Owner.
3. Change order requests shall include the following information:
  - a. Description of the change
  - b. Reference to the document or written direction to make the change:
    - 1) In the case of design-team directed changes, reference the drawing/sketch number or RFI number.
    - 2) In the case of Owner-directed changes, reference the email, memo, or other written direction from the Owner and provide a copy of the direction.
  - c. Detailed cost breakdown for the change:
    - 1) Line item for each material noting:
      - (a) Material used (e.g. ¾" EMT)
      - (b) Total quantity (e.g. 200lf)
      - (c) Unit cost (e.g. \$2/lf)
      - (d) Total materials cost (e.g. \$400)
      - (e) Unit labor hours (e.g. 6hrs/100lf)
      - (f) Total labor hours (e.g. 12hrs)
      - (g) Hourly rate (e.g. \$90/hr)
      - (h) Total labor cost (e.g. \$1,080)
      - (i) Total labor hours for each position (e.g. Journeyman vs. Superintendent)
      - (j) Total materials cost
      - (k) Overhead
      - (l) Profit
      - (m) Total change order value (positive for value added changes, negative for credits)

**C. Closeout Submittals:**

1. As-built drawings: Submit As-Built Record documents as in accordance with section 3.05 below.
2. Cost analysis: Submit final cost information including original bid and any change orders broken down by system, material and labor costs (as applicable):
  - a. Public Address System
  - b. CATV System
  - c. Telecom System
  - d. Data System
  - e. Assistive Listening System
  - f. Audio/Visual System
3. Operation and Maintenance Manuals. Furnish O & M Manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 1. Electrical O & M Manuals shall include as a minimum:

- a. Copies of equipment supplied on the project.
- b. Instruction manuals including operation instructions and maintenance requirements/recommendations.
- c. List of suppliers for all equipment with addresses and telephone numbers.
- d. List of service support for all equipment with addresses and telephone numbers.
- e. Copies of all test reports required in Division 27 specification sections.
- f. Spare Parts: For each piece of equipment, submit a list of recommended spare parts. Include part numbers and the name, address, and telephone number of the supplier.
- g. Other closeout documentation and test results as required under other sections of the specifications.
- h. Provide in a single transmittal.
- i. Warranty for all work, including contractor's general warranty.
- j. All warranties begin as per the Contract, Division 1 or final acceptance of the Work by the Owner, Architect, Engineer, and Authority Having Jurisdiction, which ever is later:
  - 1) Manufacturer's Warrantees and Guarantees that are longer than the base contract/specified amount are to be provided with the manuals.
  - 2) The Contractor is responsible for all Warranty and Guarantee work whether or not the Manufacturer also Warrantees and Guarantees the product.

## **1.05 CONTRACT DOCUMENTS**

- A. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for the installations:
  1. Should there be a need to deviate from the Drawings and Specifications, submit written details and reasons for all changes to the Engineer for favorable review.
  2. All drawings and divisions of these specifications shall be considered as whole. This contractor shall report any apparent discrepancies prior to submitting bids.
  3. Should there be a conflict or discrepancy between the drawings and specifications, or between different drawings sheets, or between different specification sections, the most expensive option shall be required, at the discretion of the Engineer.
- B. Drawings:
  1. The Drawings shall govern the general layout of the completed construction:
    - a. Locations of equipment, inserts, anchors, panels, pullboxes, manholes, conduits, stub-ups, fittings, outlets, racks, devices and ground connections are approximate unless dimensioned; verify locations with the Engineer prior to installation. Field verify scaled dimensions on Drawings.
    - b. The general arrangement and location of existing conduits, piping, apparatus, etc., is shown as existing on drawings or specified. The drawings and specifications are for the assistance and guidance of the contractor, exact locations, distances and elevations are governed by actual field conditions. Extreme accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Engineer.

## 1.06 COORDINATION

- A. Coordinate the communications work with the other trades, code authorities, utilities and the Engineer:
  - 1. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.
  - 2. Coordinate does not mean to only send a Request For Information. Coordinate implies that the contractor is to take the lead in bringing all of the necessary organizations together to coordinate the work and to provide for the associated costs.
- B. Where connections must be made to existing installations, properly schedule all the required work, including the power or communication system shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities:
  - 1. Include costs for work during non-normal working hours and temporary facilities as may be required.
  - 2. Include costs as necessary for sub-contractors to accomplish the specified work.
- C. When two trades join together in an area, make certain that no communications work is omitted. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.
- D. Operations:
  - 1. Perform all work in compliance with Division 1:
    - a. Keep the number and duration of power shutdown periods to a minimum.
    - b. Show all proposed shutdowns and their expected duration on the construction schedule:
      - 1) If the construction schedule is created and maintained by others, make sure that the associated information is incorporated.
      - 2) Failure by the Contractor to properly schedule and plan for such activities is not a basis for additional compensation.
    - c. Carry out shutdown only after the Engineer has favorably reviewed the schedule. Submit power/communications interruption schedule 15 days prior to date of interruption. Failure to provide schedule with adequate review time may result in rescheduling of the work at the Contractor's expense.
- E. Construction telephone:
  - 1. See Division 1 Temporary Utilities.
- F. Storage:
  - 1. Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from sun, weather, condensation, dust, water, or construction operations.
- G. Damaged Products:
  - 1. Notify the Engineer in writing in the event that any equipment or material is damaged. Obtain approval from the Engineer before making repairs to damaged products.
- H. Order material in such a timely manner and after approval of the same so as to insure that the approved material is available to be installed on site in a timely manner. Additional costs or substitutions necessitated because the Contractor failed to order material in a timely manner are not reimbursable. Costs associated with processing of paperwork by the owner and design

consultants resultant of such failures to coordinate the work by the Contractor shall have such costs reimbursed by the Contractor.

## **1.07 LOCATIONS**

### **A. General:**

1. Use equipment, materials and wiring methods suitable for the types of locations in which they are located:
  - a. Dry Locations:
    - 1) All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.
  - b. Wet Locations:
    - 1) All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

## **1.08 SAFETY AND INDEMNITY**

- ### **A. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and properly during performance of the work. This requirement will apply continually and not be limited to normal working hours:**
1. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.
  2. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the engineer, their Consultants or their officers, agents and employees.

## **PART 2 - PRODUCTS**

### **2.01 STANDARD OF QUALITY**

#### **A. Material and Equipment:**

1. Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.

#### **B. Service Support:**

1. Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall

be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.

C. Manufacturer's Recommendations:

1. Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

## **2.02 NAMEPLATES**

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.
- B. Additionally, identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic
- C. 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 1 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel screws or, where favorably reviewed by the Engineer, with epoxy cement. Where no inscriptions are indicated on the Drawings, furnish nameplates with appropriate inscriptions furnished by the Engineer upon prior request by the Contractor. At a minimum, these nameplates shall be provided for:
  1. MDF Racks / Cabinets
  2. IDF Racks / Cabinets
  3. Signal Termination Cabinets (STC)

## **2.03 FASTENERS**

- A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

## **2.04 FINISH REQUIREMENTS**

- A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which as been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.
- B. In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Ensure that all equipment and materials fit properly in their installation.

- B. Perform any required work to correct improperly fit installation at no additional expense to the owner.
- C. Equipment Installation:
  - 1. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
  - 2. Mount all metal panels which are mounted on or abutting concrete walls or any outside walls a minimum of ¼ inch from the wall, and paint the back sides of the panels with Bituminous Coating, Rust-oleum C9578 Coal Tar Epoxy Coating or approved equal. Film thickness shall be 10 mils minimum.
- D. Cutting, Drilling and Welding:
  - 1. Provide the required cutting, drilling welding that is required for the electrical construction work. Comply with Division 1 requirements.
  - 2. Structural members shall not be cut or drilled, except after approval by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.
  - 3. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel. Where welding is required, it shall be accomplished by tradesmen certified to do such work. Provide fire and other protection as appropriate.

### **3.02 FIELD TESTS**

- A. Test shall be in accordance with Acceptance Testing recommendations issued by the NIA/TIA for telecommunications equipment and the manufacturers recommendations for equipment other than telephone or data systems.
- B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all components, and demonstrate as ready for service. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Engineer prior to any test so that the tests may be witnessed.
- C. Provide instruments, other equipment, temporary facilities as may be necessary, and material required for the tests. These shall be of the type designed for the type of tests to be performed and shall be calibrated by a recognized testing laboratory within three months prior to testing.
- D. Operational Tests: Operationally test all drops to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of drops in all modes of operation.
- E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Engineer. Repair and re- test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.
- F. Perform calibration and adjustment on all equipment. Where the values for adjustment are not shown on the Drawings, obtain the proper values from the Engineer.
- G. Maintain records of each test and submit five copies to the Engineer when testing is complete. All tests shall be witnessed by the Engineer. These records shall include:

1. Name of equipment tested.
2. Date of report.
3. Date of test.
4. Description of test setup.
5. Identification and rating of test equipment.
6. Test results and data.
7. Name of person performing test.
8. Owner or Engineer's initials.

H. Items requiring testing as a minimum:

1. Data system.
2. CATV system.

### **3.03 PAINTING OF EQUIPMENT**

- A. Factory Applied: Communication equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.
- B. Field Applied: Paint communication equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

### **3.04 SIGNAGE AND IDENTIFICATION**

- A. Identify system components, wiring, and cabling complying with TIA-606-B.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 1 (C1 - single telecom room) and Class 2 (C2 - multiple telecom rooms) level of administration including optional identification requirements of this standard.
- C. Nameplate Mounting:
  1. Provide number, location and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two stainless steel sheet-metal screws or two rivets.

### **3.05 RECORDS**

- A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the record "as built" condition. After completion of the work, the Contractor shall neatly and carefully mark the work as actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:
  1. Drawings and associated as-built changes shall be completed in AutoCAD or Revit and submitted in CAD/Revit as well as PDF format. Documents with hand-written changes or with RFI responses and field sketches pasted on shall not be acceptable. Engineer shall make digital backgrounds of original contract documents available for Contractor's use upon request.
  2. Cable Size and Type: Provide the size and type of each cable installed on the project.
  3. Substructure: Where the location of duct lines, adjacent utilities, cable boxes, and manholes are found to be different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.

4. Record (As Built) Drawings: At the completion of the Work the Contractor shall provide a set of record “as built” drawings over to the Owner for his use.
  - a. Record drawings are required to be transmitted within 30 days of beneficial occupancy.
  - b. Transmittal and approval process:
    - 1) Contractor is to transmit one printed copy for review and comment.
    - 2) After acceptance of the above, the Contractor is to transmit three printed sets and one reproducible set.
    - 3) Contractor to provide information on their company in the margin of record drawings along with the date of the revisions and the associated revision number.

### **3.06 POSTED OPERATING INSTRUCTIONS**

- A. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
  1. Single line diagrams, wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  2. Start up, proper adjustments, operating and shutdown procedures.
  3. Safety precautions.
  4. The procedure in the event of equipment failure.
  5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

### **3.07 INSTRUCTION TO OWNER'S PERSONNEL**

- A. Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or systems has been accepted and turned over to the Owner for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man- days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.
- B. Contractor shall video record all training sessions and shall provide the Owner with a copy of the recording at the conclusion of the training. Recording shall be in digital video format (MP4, AVI, or similar) and shall be provided on USB stick or DVD labeled with the Contractor’s contact information, the training topic, and date of training.
- C. Contractor shall maintain an attendance sheet from each session which contains the following information:
  1. Attendees with associated arrival and departure time.
  2. Topics covered.
  3. Information provided.



4. Signatures of attendees taken at the completion of the session.

### **3.03 CLEAN UP**

- A. Thoroughly clean all soiled surfaces of installed equipment and materials.
- B. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Engineer.

**END OF SECTION 27 05 00**

**SECTION 27 10 00**  
**WIRE AND CABLES FOR COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. The work of this Section consists of providing all wire and cable rated 600 volts or less, including splices and terminations, as shown on the Drawings and as described herein.

**1.02 RELATED WORK**

- A. See the following Specification Section for work related to the work in this Section:
1. 27 05 00 General Requirements for Communication Systems
  2. 26 05 33.13 Conduit for Electrical Systems
  3. 26 05 33.16 Boxes for Electrical Systems
  4. 26 05 26 Grounding and Bonding for Electrical Systems

**1.03 STANDARDS AND CODES**

- A. Work and materials shall be in compliance with and according to the requirements of the latest revision of the following Standards and Codes:
1. American Society for Testing and Materials (ASTM):
    - a. B3-01, Specification for Soft or Annealed Copper Wire
    - b. B8-99, Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft
    - c. B173-01a, Specification for Rope-Lay-Stranded Copper Conductors Having Concentric-Stranded Members, for Electrical Conductors
  2. Federal Standards (FED. STD.):
    - a. 228, Methods of Testing Insulated Cable and Wire
  3. Federal Specifications (FS):
    - a. A-A-59544, Cable and Wire, Electrical
    - b. A-A-55809, Pressure Sensitive Electrical Plastic Insulation Tape
  4. National Electrical Manufacturers Association (NEMA):
    - a. WC 70-1999/ICEA S-95-658-1999, Cross-Linked Thermosetting Polyethylene, Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
  5. National Fire Protection Association (NFPA), National Electrical Code (NEC) - Latest Revision
  6. California Electrical Code (CEC)
  7. Underwriters Laboratories (UL):
    - a. 44-83 (R1988), Rubber-Insulated Wires and Cable
    - b. 83-1983 (R1989), Thermoplastic-Insulated Wires and Cables
    - c. 510-1986, Insulating Tape

**1.02 SUBMITTALS**

- A. As specified in Division 1 and Section 27 05 00.
  - 1. Catalog Data: Provide manufacturer's descriptive literature.
  - 2. Single Submittal: A single complete submittal is required for all products covered by this Section.

## **PART 2 - PRODUCTS**

### **2.01 CONDUCTORS**

- A. General: Conductors shall be copper, Class B stranded and of the sizes indicated. All conductors 120 volts and above shall be in raceway unless otherwise noted. Minimum power and control wire size shall be No. 12 AWG unless otherwise specified by the Owner's Representative. All cable used on this Project shall be of the same type and conductor material.
- B. Unless otherwise noted, conductors #6 and larger shall be XHHW insulation suitable for operation in wet or dry locations at temperatures not to exceed 75C in wet locations and 90C in dry locations. Conductors #8 and smaller shall be THHN in dry locations and THWN/THHN in wet locations. Control Cable shall be THHN.
- C. Insulation Marking: All insulated conductors shall be identified with printing colored to contrast with the insulation color.
- D. Color Coding: As specified in paragraph 3.03.
- E. Special Wiring: Where special wiring is proposed by an equipment manufacturer, submit the special wiring requirements to the Owner's Representative and, if approved, provide same. Special wire shall be the type required by the equipment manufacturer.
- F. Other Wiring: Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and as approved by the Owner's Representative.
- G. Terminations:
  - 1. Cable Termination for Copper: Crimp style two hole NEMA spade terminals designed and rated for copper cable.
  - 2. Wire Terminations: Crimp on ring-tongue terminals, insulated sleeve, of proper size for the wire used.
  - 3. End Seals: Heat shrink plastic caps of proper size for the wire on which used.
  - 4. Manufacturer: T&B, Burndy or approved equal.
- H. Manufacturer: BICC General Cable Inc., Southwire, or approved equal.

### **2.02 ANALOG CLOCK**

- A. Cable shall be 3 conductor #12. Verify exact quantity of conductors with specific clock system:
  - 1. Conductor for all exterior, underground or wet locations shall be THWN conductors.
  - 2. Cable for all interior plenum locations shall be plenum rated cable. Manufacturer: West Penn 25296B or approved equal.
  - 3. Cable for all interior non-plenum locations shall be riser rated cable. Manufacturer: West Penn 296 or approved equal.

4. Verify additional 120V, 20A circuit wiring for required for power.

## 2.03 DATA STATION DROP CABLE

### A. General:

1. Station Drop Cable refers to MDF-to-jack and IDF-to-jack wiring topology
2. Conductor Identification: Conductors shall be pigmented “White/Blue; White/Orange; White/Green & White/Brown.”
3. Cable for all exterior, underground or wet locations shall be outdoor rated with water-blocked construction, sunlight and moisture resistance jacket.
4. Cable for all interior plenum locations. Cable shall have Fluorinated Ethylene-Propylene insulation with flame retardant PVC Jacket.
5. Cable for all interior non-plenum locations. Cable shall have Polyolefin insulation with flame retardant PVC Jacket.
6. Jacket Color:
  - a. Data cables: Blue
  - b. Telephone cables: White

### B. Category 6A Unshielded Twisted Pair (UTP) cable:

1. Cable shall be 100-Ohm, 23 AWG, Category 6A 4-pair balanced unshielded twisted pair solid annealed copper.
2. Cable shall be guaranteed to exceed all TIA-568 link and channel performance requirements, and capable of supporting 10GBase-T (802.3an) and ISO/IEC 11801 Class EA applications for a total distance of 100 meters with equipment cords. System is guaranteed to meet all CAT6A requirements for short links and channels down to a 10 foot permanent link (5 meter channel) with a guaranteed 5 dB margin of Alien Crosstalk. Field testing is not required for Alien Crosstalk clearance.
3. Cable shall be characterized to 750 MHz and UL/ETL Listed by the Manufacturer printed on the cable jacket and package, as well as Intertek (ETL) Verified to TIA-568 Category 6A and ISO/IEC 11801 Class EA requirements for channel, link and component performance to support IEEE 10GBASE-T (802.3an) networks
4. Manufacturer shall provide documentation from an independent third-party testing agency that verifies through random sampling that cable components perform at or above the levels contained on their product specifications.
5. The unshielded twisted pair conductors shall be surrounded by a non-conductive aluminum/polyester tape and jacketed with flame-retardant polymer alloy.
6. Outer Diameter: 0.275” max.
7. Cable shall be provided on spools or reels-in-box to reduce risk of kinking cable upon deployment, shall be made by an ISO 9001 and 14001 Certified Manufacturer, and shall be guaranteed to meet or exceed Channel margin characteristics as stated above under Performance.
8. Performance:
  - a. Insertion loss: 3%
  - b. NEXT: 4 dB
  - c. PSNEXT: 5 dB
  - d. ACR-F (ELFEXT): 8 dB
  - e. PSACR-F (PSELFEXT): 8 dB
  - f. Return Loss: 4 dB
  - g. ACR-N: 7 dB
  - h. PSACR-N: 7 dB

- i. PSANEXT: 4 dB
- j. PSAACR-F: 10 dB
- 9. Manufacturer:
  - a. Exterior, underground or wet locations: Berk-Tek Leviton LanMark-10G OSP series or approved equal
  - b. Interior plenum locations: Berk-Tek Leviton LanMark-XTP CX6850 CMP series or approved equal
  - c. Interior non-plenum locations: Berk-Tek Leviton LanMark-XTP CX6850 CMR series or approved equal

**2.04 DATA TRUNK CABLE**

- A. General:
  - 1. Trunk Cable refers to MDF to IDF, IDF to IDF, and IDF to STC wiring topology, or from MDF/IDF to camera locations where the distance exceeds 250 feet.
  - 2. Cable for all exterior, underground or wet locations shall be outdoor rated with water-blocked construction, sunlight and moisture resistance jacket.
  - 3. Cable for all interior plenum locations. Cable shall have Fluorinated Ethylene-Propylene insulation with flame retardant PVC Jacket.
  - 4. Cable for all interior non-plenum locations. Cable shall have Polyolefin insulation with flame retardant PVC Jacket.

- B. Data Trunk Cable:
  - 1. Fiber optic cable. Meets and or exceeds Bellcore GR-20-CORE and RUS specifications. Cable shall have 6 strands of Multi-Mode. The following chart is a specification chart with minimal requirements for the cable:

Fiber Optic Cable	Multimode (OM4)
Optical Specs	50/125
Wavelength (nm)	850/1300
Max Attenuation (dB/KM)	3.0/1.0
Min Bandwidth (MHzkm)	3500/500
Jacket Color	Aqua

**2.05 TAPE**

- A. Tape used for cable marking shall be compatible with the insulation and jacket of the cable and shall be of plastic material. Tape shall conform to FS HH-I-595 and UL 510.

**PART 3 - EXECUTION**

**3.01 CABLE INSTALLATION**

- A. Clean Raceways: Clean all raceways prior to installation of cables as specified in Section 27 05
- B. 28.33 – Communication System Raceways and Fittings.
- C. Cable Pulling: Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be

- D. permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.
- E. Bending Radius: Cable bending radius shall be per applicable code or standard, whichever is more stringent.
- F. Splices: Install cables in one continuous length. Splices shall not be permitted.
- G. Equipment Grounding Conductors: Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in any conduit or any raceway.
- H. Wiring at Hinges: For cables crossing hinges, utilize extra flexible stranded wire, make up into groups not exceeding 12, and arrange so that they will be protected from chafing when the hinged member is moved.
- I. Damaged Cables: Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
- J. Cold Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating cable.
- K. Service Loops: In communications rooms where cables are terminated, install a 10-foot long service loop on end of each cable prior to termination.
- L. All wiring and cable shall be supported from the structure above. All wiring over 100 volts shall be installed in conduit except as noted in Section 27 05 28.32. All wiring below 100 volts shall be installed in conduit unless otherwise noted.
- M. Low Voltage Cables:
  - 1. All cables provided inside buildings shall be plenum rated.
  - 2. All cables provide outside buildings shall be outdoor rated, gel filled cables.
  - 3. All low voltage wires and cables concealed in walls shall be run in EMT conduit from flush outlet boxes to above accessible ceilings. Provide conduit where cables penetrate floors and fire walls above ceilings. Where low voltage cables run parallel to line voltage (over 120 volts), they shall be installed a minimum of 12 inches apart.
  - 4. Contractor installing cables shall be manufacturer certified to pull and install cables of the types and ratings noted herein.
  - 5. Maximum horizontal cabling distance for Copper data cables shall not exceed 295 feet per EIA/TIA 568B Standards. Contractor shall notify engineer prior to commencement of work of any cabling exceeding the 295 foot maximum distance.
  - 6. Do not bend cables to a radius of less than eight (8) times the cable diameter.
  - 7. All cables shall be provided with plastic identification tags in each end, identify the source of the cables and the destination of the cables.
- N. Fiber Optic Backbone Cables:
  - 1. Splices in the Fiber Optic backbone cables and UTP station cables are not permitted. There are no exceptions unless during the installation period unless the contractor finds a

problem with the means and method of construction. The contractor shall be responsible to obtain Owner's permission in writing for any splices prior to the splice being installed.

2. Contractor shall place all Fiber Optic backbone cabling in accordance with these specifications, and as indicated on the Drawings. Place Fiber Optic backbone cabling between the Main Distribution Frame (MDF) and the Intermediate Distribution Frames (IDF's) unless otherwise noted.
3. Contractor installing fiber optic cables shall be manufacturer certified to pull and install such cables.
4. Fiber Optic cable used for underground portions of the backbone (if applicable) must be suitable for underground use.
5. Fiber Optic Bending Radius: Indoor rated fiber optic cable shall have minimum bending radius of 3.9 inches and outdoor rated fiber optic cable shall have minimum bending radius of 6 inches.
6. All cables shall be provided with plastic identification tags in each end, identify the source of the cables and the destination of the cables.

### **3.02 CABLE TERMINATIONS AND SPLICES**

- A. Splices:
  1. All power, fire alarm, telephone, and CATV/MATV television cables shall be continuous below grade (i.e. no splices or terminations below grade).
  2. All fiber optic cable and data wiring shall be continuous from end to end. No splices shall be permitted.
  3. Use UL listed wirenuts for line voltage branch circuits in dry locations.
- B. Terminations: Shall comply with the following:
  1. Make up and form cable and orient terminals to minimize cable strain and stress on device being terminated on.
  2. Burnish oxide from conductor prior to inserting in oxide breaking compound filled terminal.

### **3.03 FIELD TESTS**

- A. Refer to individual system specification sections for testing requirements.

## **PART 4 MEASUREMENT & PAYMENT**

### **4.01 WIRE AND CABLES FOR COMMUNICATION SYSTEMS – INCLUDING CAMERAS**

- A. **Measurement:**
  1. Measurement of “Wire and Cables for Communications Systems – Including Cameras” shall be by the Linear Foot (LF).
- B. **Payment:**
  1. The contract unit prices paid for the various items in “Wire and Cables for Communications Systems – Including Cameras” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Wire and Cables for Communications Systems”, as shown on the plans, as specified in

these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 27 10 00**



**SECTION 27 20 00**  
**DATA COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. The work of this Section consists of providing components for the data communication systems. Provide racks, cabinets, pathways, boxes, cabling, terminations, patch cords, patch panels, jacks and testing as required.

**1.02 RELATED SECTIONS**

- A. See the following specification sections for work related to the work in this Section:
1. 27 05 00 General Requirements for Communication Systems
  2. 27 10 00 Wire and Cables for Communication System
  3. 26 05 26 Grounding and Bonding for Electrical Systems

**1.03 STANDARDS AND CODES**

- A. Work and materials shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
1. American National Standards Institute (ANSI) Standards:
    - a. ANSI X3T9.5 Fast Ethernet 100Base-T LAN: Defines standard for 100 Mb/s LAN based on either Fiber Optic cable or Unshielded Twisted Pair (UTP)
  2. Telecommunications Industry Association / Electronic Industries Alliance (TIA/EIA) Standards:
    - a. TIA/EIA 455 Reference Guide for Fiberoptic Testing Procedures
    - b. TIA/EIA 472 General Specifications for Fiberoptic Cables
    - c. TIA/EIA 492 Generic Specification for Optical Waveguide Fibers
    - d. TIA/EIA 568B Commercial Building Telecommunications Cable Standard
    - e. TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces
    - f. TIA/EIA 598 Fiber Optic Cable Color Coding
    - g. TIA/EIA 606 Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings
    - h. TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications
  3. Institute of Electrical and Electronics Engineers, Inc. (IEEE) Standards:
    - a. IEEE 802.3 Ethernet 10Base-T LAN: Defines media and distance requirements for 10Mb/s LAN (issued in October 1990)
    - b. IEEE 802.3z Gigabit Ethernet 1000Base SX and LX LAN: Defines media and distance requirements for 1000Mb/s LAN
  4. Underwriters Laboratories (UL) Standards:
    - a. UL 910 Test method of Fire and Smoke Characteristics of Electrical and Optical Cables Used in Air Handling Spaces

- b. UL 1666 Standard Flame test for Flame Propagation Height of Electrical and Optical Cable Installed Vertically in Shafts

#### **1.04 QUALIFICATIONS**

- A. The telecommunications contractor shall have at least five years experience providing similar work, and shall provide a minimum of five references for similar projects completed with the last five years.
- B. The telecommunications installer(s) shall be certified category 5e and fiber optic cable installer(s) and shall provide proof of certification.

#### **1.05 SUBMITTALS**

- A. Shop Drawings - In accordance with Section 27 05 00.
- B. Submit the following items:
  - 1. Manufacturer's Catalog Data: Manufacturer's original catalog cuts and original description of data of all material and equipment with sufficient information provided so that the exact function of each device is known.
  - 2. Description of conductors to be used with a statement that all wire shall be in conduit.
  - 3. Floor plan of the point to point connections.
  - 4. Diagram of the wiring circuitry.
  - 5. Riser diagram.
- C. Single Submittal: A single complete submittal is required for all products covered by this Section.
- D. Closeout Submittals: Submit operation and maintenance data for all components of the telecommunications equipment specified herein. Submit certified test results. Submit in accordance with Division 1.

#### **1.06 WARRANTY**

- A. Manufacturer shall provide a one year warranty for all system components.

### **PART 2 - PRODUCTS**

#### **2.01 FIBER OPTIC TERMINATION PANEL (PATCH PANEL)**

- A. Minimum performance specifications: Suitable for use with specified Fiber Optic cables. Must meet requirements of TIA/EIA T586B.
- B. Provide Zirconia Ceramic sleeve, SC - type ports.
- C. Panels shall be wall mounted with minimum capacity for 12 fiber connections.
  - 1. Manufacturer: Leviton 5W120-00N, 5F100-9ZT or approved equal.
- D. Provide cable management ring in the back of the panels or other means of securing cables being terminated. Ensure wire management maintains recommended bend radius, and has storage for up

to 2 meters of excess cable per coupling.

- E. Store 2 meters of excess cable in purpose designed cable storage.

## 2.02 FIBER OPTIC TERMINATION PANEL (PATCH PANEL)

- A. Minimum performance specifications: Suitable for use with specified Fiber Optic cables. Must meet requirements of TIA/EIA T586B.
- B. Provide Zirconia Ceramic sleeve, LC - type ports.
- C. Panels for MDF's shall be mountable in a standard 19-inch equipment rack. Provide minimum 20% spare connection capacity.
  - 2. Manufacturer: Leviton 5RXXX series or approved equal.
- D. Panels for IDF's shall be mountable in a standard 19-inch equipment rack with minimum capacity for 36 fiber connections. Provide minimum 20% spare connection capacity or minimum 12 ports whichever is larger.
  - 3. Manufacturer: Leviton 5R430-00N or approved equal.
- E. Provide cable management retaining brackets on the back of the panels or other means of securing cables being terminated. Cable tie down bars, support and strain relief and other wire management devices to be placed between each patch panel. Ensure wire management maintains recommended bend radius, and has storage for up to 2 meters of excess cable per coupling.
- F. Store 2 meters of excess cable in purpose designed cable storage.

## 2.03 FIBER OPTIC PATCH CORDS

- A. Minimum performance specifications: Suitable for use with specified Fiber Optic cables. Must meet requirements of TIA/EIA T586B.3.
- B. Fiber optic cable specifications:
- C. Connector style: LC - LC .
- D. Density: Duplex.
- E. Cable listing: OFNR

- F. Length: 3 meters

Fiber Optic Cable	multimode
	62.5/125
Wavelength (nm)	850/1300
Max Attenuation (dB/KM)	3.5/1.0
Min Bandwidth (MHzkm)	220/600
Gigabit Ethernet Min Distance	300/550
Color	orange

- G. Cable lettering must be legible and shall contain the following information:

1. Manufactures name.
  2. Fiber size.
  3. Fiber Grade.
  4. UL Listing.
  5. Manufacturer's Trade Mark.
  6. Sequential foot markings, in two-foot increments.
- H. Fiber optic connectors:
1. Zirconia Ceramic tipped, LC - type plug, suitable for use with specified Fiber Optic cable.  
Maximum insertion loss across mated-pair: Less than 0.8 dB.
- I. Acceptable manufacturers include Leviton, Berk-Tek, Lucent Technologies, Siecor, CommScope or approved equal.

#### **2.04 DATA SWITCHES:**

- A. All active equipment such as data switches, hubs and/or routers will be furnished by the owner, installed by the contractor.

#### **2.05 UTP DATA WIRE TERMINATION PANELS (PATCH PANELS)**

- A. Minimum performance specifications: Must meet requirements for Category 6A of TIA/EIA.
- B. Provide standard 8-pin, 8-position, RJ-45 style modular patch panels with printed circuit board IDC 110-type connectors, capable of 4-pair, UTP cable termination and wired in an TIA/EIA configuration. Connector spring wire contacts shall be phosphor bronze plated with 50 microinches of gold over 100 microinches of nickel.
- C. Panels shall be mountable in a standard 19-inch equipment rack with capacity for up to 48 modular RJ-45 ports. Ports shall have individual numbers and white labels. Panels shall be UL listed and labeled Cat 6A. Provide minimum of 20% spare port capacity.
- D. Provide cable management retaining brackets on the back of the panels or other means of securing cables being terminated. Horizontal wire management devices to be placed between each patch panel.
- E. Manufacturer: Cat 6A - Leviton 6910G-U48 or approved equal.

#### **2.06 UTP DATA PATCH CORDS**

- A. Provide four pair UTP 24 AWG solid copper. Cable shall be PVC rated. Cross-connect patch cords used on "DATA" cross-connects must meet the impedance, attenuation and NEXT requirements for Category 6A horizontal cable of TIA/EIA.
- B. Provide one patch cord for each patch panel for each data outlet.
- C. Patch cords shall be standard manufacture's length, minimum 5 feet.
- D. Patch cords shall be factory manufactured with protective strain relief boot on each male plug, hand crimping is not acceptable.

- E. Coordinate cross connections with Owner's representative.
- F. Manufacturer: Berk-Tek, Leviton or approved equal.

## **2.07 MODULAR DATA OUTLETS:**

- A. Unless otherwise noted, provide single gang, modular voice/data outlets.
- B. Data Jacks must meet the minimum performance specifications for Category 6A of TIA/EIA. All 8-position, modular jack inserts for data locations shall comply with TIA/EIA T568B specifications.
  - 1. Modular jacks shall be engraved 'CAT 6A' on the face of the jack insert.
- C. Contractor shall coordinate data wiring scheme (T568B or T568A) with owner.
- D. All components shall be UL listed.
- E. Unless otherwise indicated provide insert and faceplate colors:
  - 1. Single gang wall plate, white with two labels and label covers.
  - 2. Provide 4 port unless otherwise noted, coordinate number of ports with drawings.
  - 3. Data jack, blue.
  - 4. Blank jack (where applicable), white.
- F. Manufacturer: Ortronics OR-KSFP series or approved equal.

## **PART 3 - EXECUTION**

### **3.01 CABLE & WIRE INSTALLATION**

- A. General:
  - 1. All data communications cables shall be terminated and tested under this contract.
- B. Station Cables:
  - 1. Install station cabling, outlets and jacks as detailed on the Drawings. The typical configuration for most outlets is two unshielded twisted pair (UTP) cables of 4 pairs each.
  - 2. Each data outlet shall be clearly marked with the MDF/IDF, patch panel and port number to which they are connected.

### **3.02 QUANTITIES AND LOCATIONS OF ITEMS**

- A. Location and placement of splices, patch panels and other distribution hardware shall be as shown on the Drawings or defined herein. Where Drawings are not specific as to placement, refer below.
- B. Quantities of racks, cabinets, splices and patch panels shown on the drawings are illustrative only and are meant to indicate the general configuration of the work. The contractor is responsible for providing the correct quantities of racks, patch panels, connectors and appurtenances necessary to terminate, cross connect and patch the volume of cable described herein and shown on the Drawings. Where less than all of the capacity of a patch panel is used to terminate cables, the Contractor shall provide the Owner with the number of connecting blocks, coupling panels, and

couplings to completely fit out the patch panel:

1. Properly install freestanding equipment mounting rack(s), securely mounted to floor, walls and structure above to meet all sway bracing and seismic requirements:
  - a. Cable tray shall be installed directly above rack. Brace tray to walls and structure above.
2. Provide lockable wall mounted equipment cabinets securely mounted to walls.
3. Rack mount Fiber Optic Patch Panels and UTP Patch Panels installed at locations as noted on the drawings. Complete with all necessary hardware.
4. MDF/IDF patch panels for station outlets shall be clearly marked to indicate the room/location served by each port.

### **3.03 CABLE TERMINATIONS**

- A. Fiber Optic cables:
  1. After dressing the cable to its final destination, sheath shall be removed to a point that allows the conductors to be splayed and terminated in a neat and uniform fashion. At this point all fibers will be terminated in strict compliance with the manufacturers instructions.
  2. Terminate both ends of each fiber optic cable with a SC type port, per manufacturer's recommendations. After termination, mount all connectors in fiber optic termination panels and label appropriately.
- B. UTP cables:
  1. Each cable shall be terminated on an 8-pin modular jack as indicated in this specification section. Terminate each cable on an TIA/EIA T568 compliant outlet jack matching the cable's specification.
  2. Cable pair twists shall be maintained up to within 0.25 inch of the point of termination. Under no circumstances shall cable pairs be untwisted or otherwise altered prior to termination.

### **3.04 INSTALLATION OF WALL PLATES**

- A. General - Plates shall match the style of the device and shall be plumb within 1/16-inch of the vertical or horizontal.
- B. Interior Locations, Finished Walls: Install non-metallic plates so that all four edges are in continuous contact with the finished wall surfaces. Plaster filling will not be permitted. Oversized plates or sectional plates are not acceptable and shall not be used. If wall finish will not accommodate proper mounting of the plate, the situation shall be brought to the attention of the architect and the wall finish replaced appropriately.
- C. Interior Locations, Unfinished Walls: Install stainless steel.
- D. Future Locations: Install blanking cover plates on all unused outlets.
- E. Prior to installation, coordinate labeling conventions with owner. Provide typed label(s) for faceplate, identifying each jack on faceplate, uniquely identifying source and circuit number supplying jack, unless otherwise noted.

### 3.05 GROUNDING

- A. Provide dedicated ground at MDF and each IDF. Bond all equipment to ground with insulated ground conductors.

### 3.06 TESTING:

#### A. Fiber Optic Cable Testing:

1. Pre-installation testing:
  - a. Fiber Optic cables: Perform visible light continuity checks on each fiber. If one end is not accessible: perform OTDR test to assure fiber continuity.
2. Post installation testing:
  - a. After installation of connectors, visually inspect each fiber end-face at 10x magnification. Refinish fibers with visible defects and/or striations in the core area.
  - b. Perform end-to-end, bi-directional attenuation (loss) test for each fiber strand at 850 NM and 1300 NM wavelengths. Conduct tests in accordance with TIA/EIA-526-14, Method B and with test instrument manufacturers' printed instructions.
  - c. Demonstrate that measured link loss does not exceed the "worst case" allowable loss which is defined as the sum of: the connector losses (based on the number of mated connector pairs at the TIA/EIA-568 maximum allowable loss) and the Fiber Optic cable loss (based on length and the TIA/EIA-568 maximum allowable loss.)
  - d. Strands whose measured attenuation fall outside the acceptable range shall be subject to further inspection and testing to determine the nature of the fault. At a minimum, an OTDR shall be used to: determine the-true loss for each connector pair, the exact length of the fiber and to identify the absence of any core damage,
  - e. Faults related to connectorization shall be corrected, and the fiber re-tested as stated in prior paragraphs above, until acceptable attenuation measurements are recorded.
  - f. Where defects are found inherent-in the fiber itself - replace any cable having fewer than the manufacturers guaranteed number of serviceable fibers.
  - g. Submit the following information regarding the Fiber Optic cable testing:
    - 1) Cable number, fiber count, individual fiber numbers, connector types, number of connectors/ patches, calculated maximum link loss, length of run, measured link loss for each fiber.
3. Recommended test equipment (obtain approval of Owner prior to using substitute test equipment):
  - a. Fiber Optic power meter and Light Source: Siecor CPM-850/1300 meter and OS-100D Light Source or approved equal.
  - b. OTDR: Tektronix TFP2 FiberMaster, Easer Precision TD-2000 or equal with 850 NM and 1300 NM emitter modules and hard copy printout or approved equal.
  - c. Fiber Optic inspection scope: Cambridge Instruments 10X fiber-scope or approved equal.

#### B. Paired and Multi-Conductor UTP Cable Testing:

1. After terminating both ends of all UTP cables, but before any cross connects are installed, test all UTP station cables for attenuation and cross-talk (NEXT) to 100 MHz. Test all UTP cables for continuity, ground fault, proper cross-connection, shorts and crossed pairs.
2. After installing cross-connects, perform end-to-end testing of each cross connected cable pair for continuity, ground fault, proper cross-connection, shorts and crossed pairs.
3. For multi-pair cables: For 100 pair or smaller replace entire cable if bad pair is found. For larger pair count cables, replace if more than 1% of pairs are bad.
4. Submit the following information regarding the UTP station cable testing:

- a. Cable number, cable type, pair or conductor count; individual pair or conductor numbers; number of cross connects and/or patches in each pair; results of each test for each pair or conductor; total number of serviceable pairs or conductors in cable.
- b. Information required above shall be provided in printed format only.
- 5. Recommended test equipment (Contractor shall obtain approval of Owner in writing prior to using substitute test equipment):
  - a. Fluke DSP 1100 SR, no known equal. Equipment shall be equipped with latest software. Contractor shall refer to Owner to obtain required set-up parameters.

**3.07 ACCEPTANCE:**

- A. Upon receipt of the Contractor's documentation of proposed cable testing, the Owner will have the right to review and observe the installation and randomly request tests of the cables/wires installed. Once the testing has been completed and the Owner is totally satisfied, that all work is in accordance with the Contract Documents, the Owner will notify the Contractor in writing.

**3.08 RECORD DRAWINGS:**

- A. The Project record as-built drawings shall show the types and locations of installed:
  - 1. Fiber Optic Cables.
  - 2. Station Cables/Outlets.
  - 3. Main Distribution Frames.
  - 4. Intermediate Distribution Frames.
  - 5. Patch panels.
- B. The Project record as-built drawings shall identify numbering on each cable identification label.

**PART 4 MEASUREMENT AND PAYMENT:**

**4.01 DATA COMMUNICATIONS**

- A. Measurement:**
  - 1. Measurement of "Data Communications" shall be by Lump Sum (LS).
- B. Payment:**
  - 1. The contract lump sum price paid for "Data Communications", shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in a complete data communications system as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**4.02 CAMERA POLES**

- A. Measurement:**
  - 1. Measurement of "Camera Poles" shall be Per Each (EA).
- B. Payment:**
  - 1. The contract lump sum price paid for "Camera Poles", shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work



involved in a complete data communications system as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 27 20 00**

**SECTION 31 10 00**  
**SITE CLEARING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Removal of existing vegetation
- B. Clearing vegetation, debris, trash and other materials within limits indicated
- C. Grubbing of vegetation within limits indicated
- D. Stripping of topsoil within limits indicated
- E. Disposing of objectionable material

**1.02 RELATED SECTIONS**

- A. Section 02 40 00 – Demolition.
- B. Section 31 20 00 – Earth Moving.
- C. Section 31 23 00 – Excavation and Fill.
- D. Section 32 12 00 – Asphalt Paving.
- E. Section 32 05 23 – Cement and Concrete for Exterior Improvements.
- F. Section 32 90 00 – Landscape Planting.
- G. Section 33 46 00 – Prefabricated Composite Drainage Panels.

**1.03 DEFINITIONS**

- A. ANSI: American National Standards Institute
- B. CAL-OSHA: California Occupational Safety and Health Administration
- C. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

#### **1.04 SUBMITTALS**

- A. Follow submittal procedure outlined in General and Supplementary Conditions.
- B. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

#### **1.05 QUALITY ASSURANCE**

- A. Do not remove or prune trees without first securing a permit from the appropriate agency.
- B. Prune to the standards of the International Society of Arborists and to ANSI A300.

#### **1.06 PROJECT CONDITIONS**

- A. Except for materials indicated to be stockpiled (including soils) or to remain the Owner's property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store where indicated on plans or where designated by the Owner's Representative. Avoid damaging materials designated for salvage.
- C. Unidentified Materials;
  - 1. If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the Owner's Representative.
  - 2. If necessary, the Owner's Representative will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.

### **PART 2 - PRODUCTS**

#### **2.01 SOIL MATERIALS**

- A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to engineered fill defined in Section 31 23 00 – Excavation and Fill.
- B. Backfill excavations resulting from demolition operations for planting areas shall conform to section 32 90 00 – Planting and Section 31 23 00 – Excavation and Fill.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Protect and maintain benchmarks and survey control points during construction.

- B. Locate and clearly flag trees and vegetation to remain.
- C. Protect existing site improvements to remain during construction.

### **3.02 RESTORATION**

- A. Restore damaged improvements to their original condition, as acceptable to the Owner's Representative.
- B. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, as directed by the Owner's Representative.
  - 1. Employ a qualified arborist, licensed in jurisdiction where the Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
  - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the Owner's Representative.

### **3.03 CLEARING AND GRUBBING**

- A. Areas to be graded shall be cleared of existing vegetation, rubbish, existing structures, and debris.
- B. Remove obstructions, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

### **3.04 SITE STRIPPING**

- A. Remove vegetation before stripping soil.
- B. Surface soils that contain organic matter should be stripped. In general, the depth of required stripping will be relatively shallow (i.e. less than 2 inches); deeper stripping and grubbing may be required to remove isolated concentrations of organic matter or roots.
- C. Remove trash, debris, weeds, roots, and other waste materials.
- D. Stockpile soil materials designated to remain on site at a location approved by the Owner's Representative at a location away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
- E. Do not stockpile soil within drip line of remaining trees.

### **3.05 BACKFILL**

- A. Place and compact material in excavations and depressions remaining after site clearing in accordance with Section 31 23 00 – Excavation and Fill.
- B. Place and compact material remaining in excavations and depressions in areas to receive planting in conformance with Section 32 90 00 – Planting and Section 31 23 00 – Excavation and Fill.

### **3.06 DISPOSAL**

- A. Remove surplus soil material, unsuitable soil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner's property.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Removal of various items includes:
  - 1. Measurement of "Clear and Grub" shall be per square foot (SF).
  - 2. Measurement of "Tree Removal" shall be by Lump Sum (LS).

### **4.02 PAYMENT**

- A. The contract unit price paid for removal includes full compensation for furnishing all labor, materials, tools, equipment, soil preparations and incidentals, including disposal of removed materials, to complete work as indicated on the plans, specified in the Standard Specifications and these technical specifications, and as directed by the Engineer, and no additional compensation will be allowed.
- B. The contract unit prices paid for the various items in "Site Clearing" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 31 10 00**

**SECTION 31 20 00**  
**EARTH MOVING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, for roadways, driveways, parking areas, building pads, walks, paths, or trails and any other site improvements called for on the Plans.

**1.02 SECTION EXCLUDES**

- A. Earthwork related to underground utility installation shall be performed in accordance with Sections 31 21 00, Utility Trenching and Backfill.

**1.03 RELATED SECTIONS**

- A. Section 01 56 39 - Tree Preservation and Pruning
- B. Section 02 04 00 – Demolition
- C. Section 31 10 00 – Site Clearing
- D. Section 31 23 00 – Excavation and Fill.
- E. Section 31 23 33 – Trenching and Backfilling
- F. Section 32 18 23 – Synthetic Sports Turf
- G. Section 33 46 00 – Subdrainage

**1.04 RELATED DOCUMENTS**

- A. Geotechnical Report: “Geotechnical Investigation – New Synthetic Turf Field Pickleweed Park” by Miller Pacific Engineering Group on May 27, 2022.
- B. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
- C. D1586, Method for Penetration Tests and Split-Barrel Sampling of Soils
- D. D2487, Classification of Soils for Engineering Purposes
- E. D3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. D4318. Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

## Inspection of Materials Used in Construction

- H. E548, Guide for General Criteria Used for Evaluating Laboratory Competence
- I. California Building Code, California Code of Regulations, Title 24, Part 2, Chapter 18, Soils and Foundations, and Chapter 33, Safeguards During Construction.
- J. Caltrans Standard Specifications, 2015
  - 1. Section 17, General
  - 2. Section 19, Earthwork
- K. CAL/OSHA, Title 8.

### 1.05 DEFINITIONS

- A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.  
Excavation: Removal of material encountered above subgrade elevations.
  - 1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans or authorized by the Geotechnical Engineer.
  - 2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions without authorization by the Geotechnical Engineer. Unauthorized excavation shall be without additional compensation.
- B. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock definition testing, as documented according to ASTM D3740 and ASTM E548.
- C. Structural Backfill: Soil materials approved by the Geotechnical Engineer and used to fill excavations resulting from removal of existing below grade facilities, including trees.
- D. Structural Fill: Soil materials approved by the Geotechnical Engineer and used to raise existing grades.
- E. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material  $\frac{3}{4}$  cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D1586, exceeds a standard penetration resistance of 100 blows/2 inches.
- F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
- G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.
- H. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.
- I. Import Soil: Bottom rock, top rock, non-expansive fill, lime treatment

- J. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project. The Geotechnical Engineer will determine if a soil material is unsuitable.
- K. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure ASTM D1557.
- L. Utilities: onsite underground pipes, conduits, ducts and cables.

## **1.06 SUBMITTALS**

- A. Follow submittal procedure outlined in General and Supplemental Conditions.
- B. Samples:
  - 1. If required by the Geotechnical Engineer, provide 20 pound samples, sealed in airtight containers, tagged with source locations and suppliers of each proposed soil material from on-site or borrow sources, 72 hours prior to use. Do not import materials to the Project without written approval of the Geotechnical Engineer.
  - 2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Engineer.
- C. Classification according to ASTM D2487 of each onsite or borrow soil material proposed for fill and backfill.
  - 1. Laboratory compaction curve in conformance with ASTM D1557 for each onsite or borrow soil material proposed for fill and backfill.

## **1.07 QUALITY ASSURANCE**

- A. Provide an independent testing agency qualified according to ASTM E329 to conduct soil materials and rock definition testing, as documented according to ASTM D3740 and ASTM E548.
- B. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Engineer.
- C. Conform all work in accordance with Caltrans Standard Specification Section 17, General and Section 19, Earthwork.
- D. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D1557.
- E. Perform excavation, filling, compaction and related earthwork under the observation of the Geotechnical Engineer. Materials placed without approval of the Geotechnical Engineer will be presumed to be defective and, at the discretion of the Geotechnical Engineer, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Engineer at least 24 hours prior to commencement of earthwork and at least 48 hours prior to testing.
- F. The Geotechnical Engineer will perform observations and tests required to enable him to form an opinion of the acceptability of the Project earthwork. Correct earthwork that, in the opinion of the Geotechnical Engineer, does not meet the requirements of these Technical Specifications and the Geotechnical Report.



- G. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications and the Geotechnical Report. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces and shall replace portions that in the opinion of the Geotechnical Engineer have been displaced or are otherwise unsatisfactory due to the Contractor's operations.
- H. Finish subgrade tolerance at completion of grading:
  - 1. Building and paved areas:  $\pm 0.05$  feet
  - 2. Other areas:  $\pm 0.10$  feet

**1.08 PROJECT CONDITIONS**

- A. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- B. Prevent erosion of freshly-graded areas during construction and until such time as permanent drainage and erosion control measures have been installed in accordance with Section 01 50 50, Erosion Control.
- C. Temporarily stock-pile fill material in an orderly and safe manner and in a location approved by the Owner's Representative.
- D. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

**PART 2 - PRODUCTS**

**2.01 SOIL MATERIALS**

- A. General: On-site soils are considered suitable for use as fill provided the materials are placed in accordance with Geotechnical Recommendations. Highly expansive soils shall not be used as select structural fill, or used as backfill for trenches located within hardscape areas.
- B. Imported fill soils, if required, should be predominantly granular in nature, and should be free of organics, debris, or rocks over 3 inches in size, and shall be approved by the Geotechnical Engineer before importing to the site. Imported non-expansive soils shall have a Plasticity Index less than 15 as determined by ASTM D4318, an R-value of at least 20, and fines content between 15 and 65 percent. Import fill shall be considered non-hazardous per Department of Toxic Substances Control guidelines (DTSC, 2017) and non-corrosive per Caltrans Corrosion Guidelines (Caltrans, 2015).
- C. Import planting soils, if required, shall conform to Section 31 23 33 – Trenching and Backfilling.

**PART 3 - EXECUTION**

**3.01 GENERAL**

Pickleweed Park  
San Rafael, California

- A. Perform work in accordance with Caltrans Standard Specification Section 19, Earthwork, as modified by the Contract Documents.
- B. Prior to commencing Earth Moving, Contractor shall schedule a field meeting with the engineer to field walk the site to field document and photo document all demolition and site clearing that has been completed with no deleterious material left on site which could cause contamination to planting soils or backfill. All areas and soils noted by engineer as deleterious shall be cleaned, excavated and/or off-hauled and replaced with fill or import soils as required for the project by the Contractor at no additional cost to the Contract.
- C. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.
- D. The use of explosives will not be permitted.
- E. Grading and earthwork operations shall be observed and tested by a representative of the Geotechnical Engineer for conformance with the project plans/specifications and the geotechnical recommendations. This work includes site preparation, selection of satisfactory materials, and placement and compaction of the subgrades and fills. Sufficient notification (72 hours) prior to commencement of earthwork is essential to make certain that the work will be properly observed.

### **3.02 CONTROL OF WATER AND DEWATERING**

- A. Comply with control of watering and dewater per Section 31 23 33 – Trenching and Backfilling, if dewatering is necessary.

### **3.03 WET WEATHER CONDITIONS**

- A. Do not prepare subgrade, place or compact soil materials if subgrade or materials are above optimum moisture content.

### **3.04 BRACING AND SHORING**

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Geotechnical Engineer, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner's Representative.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

### **3.05 TOPSOIL STRIPPING**

- A. Remove topsoil in accordance with Section 31 10 00 – Site Clearing.

### **3.06 EXCAVATION**

- A. Excavate earth and rock to lines and grades shown on plans and to the neat dimensions indicated on the plans, required herein or as required to satisfactorily compact backfill.
- B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.
- C. Excavation through buried concrete and other unknown obstructions will require specialized techniques for demolition and removal.
- D. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.
- E. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

F.

### **G. GRADING**

- H. Uniformly grade the Project to the elevations shown on plans
- I. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.
- J. Round tops and bottoms of slopes as indicated or to blend with existing contours.

### **3.07 SUBGRADE PREPARATION**

- A. Subgrade Preparation: Prior to backfilling depressions, scarify the bottom of the excavation to an approximate depth of 8 inches and uniformly moisture condition the scarified surfaces to a moisture content within 2 percent of optimum. Compact the scarified surfaces to a minimum of 90 percent relative compaction.
- B. Over-excavate any remaining soft (pumping) areas down to firm soil and backfill the area.
- C. Subgrade shall be maintained in a moist, but not wet, condition by periodically sprinkling water prior to the placement of additional fill or installation of baserock. Subgrade that has been permitted to dry out and loosen or develop desiccation cracking should be scarified, moisture conditioned, and re-compacted as recommended above.
- D. Install underground utilities and service connections prior to final preparation of subgrade and placement of base materials for final surface facilities. Extend services so that final surface facilities are not disturbed when service connections are made.
- E. Prepare subgrades under the structural section of paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill.

- F. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.
- G. Obtain the Geotechnical Engineer's approval of subgrades prior to placing pavement structural section.

### **3.08 FILL PLACEMENT AND COMPACTION**

- A. Place fill in uniformly moisture conditioned and compacted lifts not exceeding 8 inches in loose thickness. Each lift should be thoroughly moisture conditioned and compacted to 90 percent before successive fill layers are placed.
- B. In order to achieve satisfactory compaction in the subgrade and fill soils, it may be necessary to adjust the soil moisture content at the time of soil compaction per geotechnical recommendations. This may require that water be added and thoroughly mixed into any soils which are too dry or that scarification and aeration be performed in any soils which are too wet.
- C. Obtain the Geotechnical Engineer's approval of surface to receive structural fill prior to placement of structural fill material.
- D. Place structural fill on prepared subgrade.
- E. Do not compact by ponding, flooding or jetting.
- F. Perform compaction using rollers, pneumatic or vibratory compactors or other equipment and mechanical methods approved by the Geotechnical Engineer.
- G. Compaction requirements (unless specified otherwise by the Geotechnical Engineer):
  - 1. Compact structural fills less than 5 feet thick to 90 percent compaction.
  - 2. Compact structural fill 5 feet thick or greater to 95 percent compaction.
  - 3. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent compaction. Extend compaction 5 feet beyond pavement edges unless specified otherwise by the Geotechnical Engineer.
  - 4. Compact the upper 6 inches of subgrade soils under walks, structures and areas to receive structural fill to 90 percent compaction.

### **3.10 DISPOSAL**

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 EARTHWORK AND EXCAVATION (ROUGH GRADING)**

#### **A. Measurement**

- 1. Measurement of "Earthwork and Excavation (Rough Grading)" shall be per cubic yard (CY).

**B. Payment**

1. The contract unit prices paid for the various items in “Earth Moving” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Earth Moving”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.
2. “Earthwork and Excavation (Rough Grading)” includes stripping, excavation, grading, fill placement and compaction, and disposal as shown on the Plans and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 31 20 00**

**SECTION 31 23 00**  
**EXCAVATION AND FILL**

**PART 5 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, for roadways, driveways, parking areas, walks, paths, or trails and any other site improvements called for on the Plans.

**1.02 SECTION EXCLUDES**

- A. Earthwork related to underground utility installation, see Section 31 23 33 – Trenching and Backfilling.

**1.03 RELATED SECTIONS**

- A. Section 31 20 00 – Earth Moving.
- B. Section 31 23 33 – Trenching and Backfilling
- C. Section 33 40 00 – Storm Drainage Utilities

**1.04 RELATED DOCUMENTS**

- A. Geotechnical Report.
- B. ASTM:
  - 1. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  - 2. D 1586, Method for Penetration Tests and Split-Barrel Sampling of Soils.
  - 3. D 2487, Classification of Soils for Engineering Purposes.
  - 4. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
  - 5. D 4318. Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
  - 6. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
  - 7. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.
- C. California Administrative Code, Title 24, Part 2 - Basic Building Regulations, Chapter 24, Excavations, Foundations, and Retaining Walls.

- D. Caltrans Standard Specifications:
  - 1. Section 10, General.
  - 2. Section 19, Earthwork.
- E. CAL/OSHA, Title 8.

## **1.05 DEFINITIONS**

- A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.
- B. Excavation: Removal of material encountered above subgrade elevations.
  - 1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans or authorized by the Geotechnical Consultant.
  - 2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.
- C. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- D. Structural Backfill: Soil materials approved by the Geotechnical Consultant and used to fill excavations resulting from removal of existing below grade facilities, including trees. See Section 31 23 33 – Trenching and Backfilling.
- E. Structural Fill: Soil materials approved by the Geotechnical Consultant and used to raise existing grades.
- F. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material  $\frac{3}{4}$ -cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
- H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.
- I. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project. The Geotechnical Consultant will determine if a soil material is unsuitable.
- J. Utilities: onsite underground pipes, conduits, ducts and cables.

## **1.06 SUBMITTALS**

- A. Follow submittal procedures outlined in Division 1.
- B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

## **1.07 QUALITY ASSURANCE**

- A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.
- B. Conform all work to the appropriate portion(s) of Caltrans Standard Specifications, Section 10 and 19.
- C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- D. Perform excavation, filling, compaction and related earthwork under the observation of the Geotechnical Consultant. Materials placed without approval of the Geotechnical Consultant will be presumed to be defective and, at the discretion of the Geotechnical Consultant, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Consultant at least 24-hours prior to commencement of earthwork and at least 48 hours prior to testing.
- E. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the Project earthwork. Correct earthwork that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.
- F. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications and the Geotechnical Report. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces and shall replace portions that in the opinion of the Geotechnical Consultant have been displaced or are otherwise unsatisfactory due to the Contractor's operations.

## **1.08 PROJECT CONDITIONS**

- A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless the Contractor has notified the Owner in writing of differing conditions prior to the Contractor starting work on affected items.
- B. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.



- C. Prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.
- D. Temporarily stockpile fill material in an orderly and safe manner and in a location approved by the Owner.
- E. Provide dust and noise control in conformance with Division 1 General Requirements.
- F. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

## **PART 6 - PRODUCTS**

### **2.01 SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.
- B. Obtain approval of on-site soil materials and borrow materials to be used for structural fill or structural backfill from the Geotechnical Consultant.
- C. On-Site Structural Fill and Structural Backfill: Soil or soil-rock mixture from on site excavations, free from organic matter or other deleterious substances. On-site structural fill and backfill shall not contain rocks or rock fragments over 3 inches in greatest dimension, shall have a liquid limit of less than 45, a plasticity index of less than 25, and shall be free of organic content.
- D. Imported Structural Fill and Structural Backfill: Conform to the requirements of on-site structural fill. Material shall also be a non-expansive and predominantly granular soil or soil-rock mixture with plasticity index of 15 or less in accordance with ASTM D 4318 and an R-Value of 25 or greater.

## **PART 7 - EXECUTION**

### **3.01 GENERAL**

- A. Conform to Section 19, Earthwork, Caltrans Standard Specifications as modified by the Contract Documents.
- B. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.
- C. The use of explosives will not be permitted.

### **3.02 CONTROL OF WATER AND DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Obtain the Geotechnical Consultant's approval for proposed control of water and dewatering methods.
- D. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.
- E. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.
- F. Maintain dewatering system in place until dewatering is no longer required.

### **3.03 WET WEATHER CONDITIONS**

- A. Do not prepare subgrade, place or compact soil materials if above optimum moisture content.
- B. If the Geotechnical Consultant allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Consultant.

### **3.04 BRACING AND SHORING**

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner, submit details and calculations to the Owner. The Owner may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

### **3.05 EXCAVATION**

- A. Excavate earth and rock to lines and grades shown on drawings and to the neat dimensions indicated on the Plans, required herein or as required to satisfactorily compact backfill.
- B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.
- C. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.
- D. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

### **3.06 REMOVAL OF EXISTING FILLS AND UNSUITABLE MATERIAL**

- A. Over-excavate areas of existing fills and other unsuitable material encountered during mass grading as directed by the Geotechnical Consultant.
- B. Compensation for increased removal widths and depths that are not required by the Geotechnical Consultant will not be considered, except when such increase is necessary for protection of life and property as determined by and approved by the Owner.
- C. The Geotechnical Consultant will provide written approval for each excavation prior to placement of fill. Allow adequate time after excavation and before filling for the Geotechnical Consultant's review and written approval and, if necessary, time for the Owner to conduct as built survey prior to placing fill. Basis for calculating the quantity of material excavated or placed may be the difference between the grading shown on the Plans and an as built survey of the grading.

### **3.07 GRADING**

- A. Uniformly grade the Project to the elevations shown on the Plans.
- B. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.
- C. Round tops and bottoms of slopes as indicated or to blend with existing contours.

### **3.08 SUBGRADE PREPARATION**

- A. Install underground utilities and service connections prior to final preparation of subgrade and placement of base materials for final surface facilities. Extend services so that final surface facilities are not disturbed when service connections are made.
- B. Prepare subgrades under paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill.

- C. Prepare subgrades for paved areas, curbs and gutters by plowing or scarifying surface at least 6 inches below final subgrade elevations and 5-feet beyond edge of pavement unless specified otherwise by the Geotechnical Consultant. Uniformly moisture condition to obtain optimum moisture contents. Break clods and condition surface by harrowing or dry rolling. Remove boulders, hard ribs and solid rock. Prepare earth uniform for full depth and width of subgrade.
- D. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.
- E. Obtain the Geotechnical Consultant's approval of subgrades prior to placing pavement.

### **3.09 PLACEMENT OF STRUCTURAL FILL**

- A. Obtain the Geotechnical Consultant's approval of surface to receive structural fill prior to placement of structural fill material.
- B. Place structural fill on prepared subgrade.
- C. Spread structural fill material in uniform lifts not more than 8-inches in un-compacted thickness and compact.
- D. Place structural fill material to suitable elevations above grade to provide for anticipated settlement and shrinkage.
- E. Overbuild fill slopes, as required by the Geotechnical Consultant, to obtain required compaction. Remove excess material to lines and grades indicated.
- F. Do not drop fill on structures. Do not backfill around, against or upon concrete or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.

### **3.10 COMPACTION AND TESTING**

- A. Do not compact by ponding, flooding or jetting.
- B. Compact soils at optimum water content. Aerate material if it is too wet. Add water to material if it is too dry. Thoroughly mix lifts before compaction to ensure uniform moisture distribution.
- C. Perform compaction using rollers, pneumatic or vibratory compactors or other equipment and mechanical methods approved by the Geotechnical Consultant.
- D. Compaction requirements:
  1. Compact structural fills less than 5-feet thick to 90 percent compaction.
  2. Compact structural fill 5-feet thick or greater to 95 percent compaction.
  3. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 88 to 93 percent compaction. Extend compaction 5-feet beyond pavement edges unless specified otherwise by the Geotechnical Consultant.

4. Compact the upper 6-inches of subgrade soils under walks, structures and areas to receive structural fill to 88 to 93 percent compaction.

### **3.11 DISPOSAL**

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

### **3.12 CLEANUP**

- A. Upon completion surroundings shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner.

## **PART 8 - MEASUREMENT AND PAYMENT**

### **8.1 MEASUREMENT**

- A. Measurement of "Earthwork and Excavation (Rough Grading)" shall be per cubic yard (CY).

### **8.2 PAYMENT**

- A. The contract unit prices paid for the various items in "Earthwork and Excavation (Rough Grading)" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Earthwork and Excavation (Rough Grading)", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 31 23 00**

**SECTION 31 23 33**  
**TRENCHING AND BACKFILLING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Excavation, bedding, and backfill for underground storm drain, sanitary sewer, and water piping and associated structures.

**1.02 SECTION EXCLUDES**

- A. Drainage fill material and placement around subdrains.
- B. Trenching and backfill for other utilities such as underground HVAC piping, electrical conduit, telephone conduit, gas piping, cable TV conduit, etc.

**1.03 RELATED SECTIONS**

- A. Section 31 20 00 – Earth Moving.
- B. Section 31 23 00 – Excavation and Fill.
- C. Section 33 11 00 – Water Utility Distribution Piping
- D. Section 33 30 00 – Sanitary Sewer
- E. Section 33 40 00 – Storm Drainage

**1.04 RELATED DOCUMENTS**

- A. Geotechnical Report.
- B. ASTM:
  - 1. C 33, Specification for Concrete Aggregates.
  - 2. C 150, Specification for Portland Cement.
  - 3. C 260, Specification for Air-Entraining Admixtures for Concrete.
  - 4. C 618, Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
  - 5. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  - 6. D 2321, Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
  - 7. D 2487, Classification of Soils for Engineering Purposes.
  - 8. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
  - 9. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing

and/or Inspection of Materials Used in Construction.

10. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence
11. California Administrative Code, Title 24, Part 2 - Basic Building Regulations, Chapter 24, Excavations, Foundations, and Retaining Walls.

C. Caltrans Standard Specifications:

1. Section 19, Earthwork.
2. Section 26, Aggregate Bases.
3. Section 68, Subsurface Drains.
4. Section 88, Engineering Fabrics.

D. CAL/OSHA, Title 8.

### 1.05 DEFINITIONS

A. AC: Asphalt Concrete.

B. ASTM: American Society for Testing and Materials.

C. Bedding: Material from bottom of trench to bottom of pipe.

D. CDF: Controlled Density Fill.

E. DIP: Ductile Iron Pipe.

F. Initial Backfill: Material from bottom of pipe to 12-inches above top of pipe.

G. PCC: Portland Cement Concrete.

H. RCP: Reinforced Concrete Pipe.

I. Springline of Pipe: Imaginary line on surface of pipe at a vertical distance of  $\frac{1}{2}$  the outside diameter measured from the top or bottom of the pipe.

J. Subsequent Backfill: Material from 12-inches above top of pipe to subgrade of surface material or subgrade of surface facility or to finish grade.

K. Trench Excavation: Removal of material encountered above subgrade elevations and within horizontal trench dimensions.

1. Authorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions as shown on plans or authorized by the Geotechnical Consultant.
2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.

L. Utility Structures:

1. Storm drainage manholes, catch basins, drop inlets, curb inlets, vaults, etc.
2. Sanitary sewer manholes, vaults, etc.
3. Water vaults, etc.

## **1.06 SUBMITTALS**

- A. Follow submittal procedures outlined in Division 1.
- B. Product Data:
  - 1. Grading and quality characteristics showing compliance with requirements for the Work.
  - 2. Certify that material meets requirements of the Project.
- C. Samples:
  - 1. If required by the Geotechnical Consultant, provide 40-pound samples of all imported trench bedding and backfill material sealed in airtight containers, tagged with source locations and suppliers of each proposed material. Do not import materials to Project without written approval of the Geotechnical Consultant.
  - 2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Consultant and the Owner.

## **1.07 QUALITY ASSURANCE**

- A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.
- B. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19.
- C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- D. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the trench backfill. Correct the trench backfill that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.

## **1.08 PROJECT CONDITIONS**

- A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless Contractor has notified the Owner in writing of differing conditions prior to contractor starting work on affected items.
- B. Protect open, trenches, and utility structure excavations with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- C. Stockpile on-site and imported backfill material temporarily in an orderly and safe manner.
- D. Provide dust and noise pollution control in conformance with Section 01 00 00 – General Requirements.



## **PART 2 - PRODUCTS**

### **2.01 PIPE BEDDING AND INITIAL BACKFILL**

- A. ASTM D 2321, Class IA, IB or II.
  - 1. Clean and free of clay, silt or organic matter.
- B. Class 2 Aggregate Base: Conform to Section 26 of Caltrans Standard Specifications, ¾-inch maximum.

### **2.02 SUBSEQUENT BACKFILL**

- A. Conform to on-site or imported structural backfill in Section 31 23 00 – Excavation and Fill.
- B. Class 2 Aggregate Base: Conform to Section 26 of Caltrans Standard Specifications, ¾-inch maximum.

### **2.03 CONCRETE STRUCTURE BEDDING AND BACKFILL**

- A. Precast Structures: Same materials to the same heights as specified for pipe bedding and backfill, or other material approved by the Geotechnical Consultant.
- B. Poured-in-Place Structures:
  - 1. Bedding: Bedding shall meet the approval of the Geotechnical Consultant. In general, bedding is not required, pour bases against undisturbed native earth in cut areas and against engineered fill compacted to 90% relative compaction in embankment areas.
  - 2. Side Backfill: On-site or imported structural fill meeting the requirements given in Section 31 23 00 – Excavation and Fill.

## **PART 3 - EXECUTION**

### **3.01 TRENCHING AND EXCAVATION**

- A. Existing PCC or AC Areas: Cut PCC or AC to full depth at a minimum distance of 12-inches beyond the edge of the trench.
- B. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.
- C. Excavation Depth for Bedding: Minimum of 4-inches below bottom of pipe or as otherwise allowed or required by the Geotechnical Consultant, except that bedding is not required for nominal pipe diameters of 2-inches or less.

- D. Excavation Width at Springline of Pipe:
  - 1. Up to a nominal pipe diameter of 24-inches: Minimum of twice the outside pipe diameter, or as otherwise allowed or required by the Geotechnical Consultant.
  - 2. Nominal pipe diameter of 30-inches through 36-inches: Minimum of the outside pipe diameter plus 2-feet, or as otherwise allowed or required by the Geotechnical Consultant.
  - 3. Nominal pipe diameter of 42-inches through 60-inches: Minimum of the outside pipe diameter plus 3-feet, or as otherwise allowed or required by the Geotechnical Consultant.
- E. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.
- F. Comply with the Owner's limitations on the amount of trench that is opened or partially opened at any one time. Do not leave trenches open overnight without the approval of the Owner.
- G. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.
- H. Bottoms of trenches will be subject to testing by Geotechnical Consultant. Correct deficiencies as directed by the Geotechnical Consultant.
- I. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing.

### **3.02 CONTROL OF WATER AND DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.
- B. Be solely responsible for dewatering trenches and excavations and subsequent control of ground and surface water. Provide and maintain such pumps or other equipment as may be necessary to control ground water and seepage to the satisfaction of the Geotechnical Consultant and the Owner until backfilling is completed.
- C. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- D. Obtain the Geotechnical Consultant's approval for proposed control of water and dewatering methods.
- E. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.
- F. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.
- G. Maintain dewatering system in place until dewatering is no longer required.

### **3.03 BRACING AND SHORING**

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the pipes and appurtenances being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner, submit details and calculations to the Owner. The Owner may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations in trench section or around structures shall precede a response to the submittal by the Owner.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the line, grade, or backfill compaction or operation of the utility being installed or adjacent utilities and facilities.

### **3.04 PIPE BEDDING**

- A. Obtain approval of bedding material from the Geotechnical Consultant.
- B. Accurately shape bedding material to the line and grade called for on the Plans. Carefully place and compact bedding material to the elevation of the bottom of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of bedding material will not be permitted.
- C. Upon completion of bedding operations, and prior to the installation of pipe, notify the Geotechnical Consultant, who will inspect the bedding layer. Do not commence pipe laying until the Geotechnical Consultant has approved the bedding.

### **3.05 BACKFILLING**

- A. Obtain approval of backfill material from Geotechnical Consultant.
- B. Bring initial backfill up simultaneously on both sides of the pipe, so as to prevent any displacement of the pipe from its true alignment. Carefully place and compact initial backfill material to an elevation of 12-inches above the top of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of initial backfill material will not be permitted.

- C. Bring subsequent backfill to subgrade or finish grade as indicated. Carefully place and compact subsequent backfill material to the proper elevation in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction, except that the upper 36-inches in areas subject to vehicular traffic shall be compacted to at least 95% relative compaction, unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of subsequent backfill material will not be permitted.
- D. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive pipe displacement or damage the pipe.
- E. Utility backfill shall be inspected and tested by the Geotechnical Consultant during placement. Cooperate with the Geotechnical Consultant and provide working space for such tests in operations. Backfill not compacted in accordance with these specifications shall be re-compacted or removed as necessary and replaced to meet the specified requirements, to the satisfaction of the Geotechnical Consultant and the Owner prior to proceeding with the Project.

### **3.06 CLEANUP**

- A. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT AND PAYMENT**

- A. Full compensation for “Trenching and Backfilling” shall be considered as included in the contract unit prices paid for the various items of work performed and no additional compensation will be allowed.

**END OF SECTION 31 23 33**

**SECTION 32 05 23**  
**CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Pedestrian Concrete Paving
- B. Vehicular Concrete Paving
- C. Raised Planter Wall
- D. Concrete Curb
- E. Concrete Mowband
- F. Curb Ramps

**1.02 RELATED REQUIREMENTS**

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.
- B. These Contract Specifications are part of the Contract Drawings and shall include all labor, materials, equipment, reasonable incidentals, and services necessary for the execution of the Work installed complete in place.
- C. Refer to all other sections, determine the extent and character of related work, and coordinate all work to produce a complete, properly constructed product.

**1.03 RELATED SECTIONS**

- A. Section 01 50 50 – Erosion Control
- B. Section 31 10 00 – Site Clearing
- C. Section 32 17 23 – Pavement Markings
- D. Section 31 20 00 – Earth Moving
- E. Section 31 23 00 – Excavation and Fill
- F. Section 31 23 33 – Trenching and Backfilling
- G. Section 32 11 00 – Base Course

## **1.04 RELATED DOCUMENTS**

### **A. ASTM Standards**

1. A 82, Cold Drawn Steel Wire for Concrete Reinforcement.
2. A 185, Steel Welded Wire Fabric, Plain for Concrete Reinforcement.
3. A 615, Deformed and Plain Billet Steel Bars, for Concrete Reinforcement.
4. C 94, Specification for Ready-mixed Concrete.
5. C 114, Method for Chemical Analysis of Hydraulic Cement.
6. C 150. Portland Cement.
7. C 618, Fly Ash and Raw or Calcined Natural Pozzolan for use as Natural Admixture in Portland Cement.
8. C 1751, Preformed Expansion Joint Fillers for Concrete. Paving and Structural Construction (Non-extruded and Resilient Bituminous Types).

### **B. Caltrans Standard Specifications:**

1. Section 51: Concrete Structures.
2. Section 73: Concrete Curbs and Sidewalks.
3. Section 90: Concrete

## **1.05 DEFINITIONS**

- A. ASTM: American Society for Testing and Materials.

## **1.06 QUALITY CONTROL AND ASSURANCE**

### **A. Materials and methods of construction shall comply with the following standards:**

1. ASTM International, (ASTM):
  - a. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.
  - b. ASTM C979 – Pigments for Integrally Colored Concrete.
2. American Concrete Institute, (ACI):
  - a. Specification for Measuring, Mixing and Placing Concrete, (ACI 304)
  - b. Specification for Hot Weather Concreting (ACI 305)
  - c. Specification for Cold Weather Concreting (ACI 306)
  - d. Building Code Requirements for Structural Concrete (ACI 318)
  - e. Specification for Formwork for Concrete (ACI 347)
3. State Standard Specifications, California Department of Transportation.
4. American National Standards Institute, (ANSI).

### **B. Conform to the applicable provisions of Section 51, 73 and 90 of the Caltrans Standard Specification and these Technical Specifications.**

1. Conform construction of portland cement concrete surface improvements (including curbs, gutters, medians, valley gutters, walks) to the requirements of Section 73 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.

2. Construct "V" ditches in accordance with Section 72-4 of the Standard Specifications; except that finishing shall be in accordance with Standard Specification Section 73 instead of 53, or as otherwise required in these Technical Specifications or shown on the Plans.
  3. Conform other construction of portland cement concrete items to the requirements of Section 51 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.
- C. Inspection by the City of San Rafael and Other Governing and Regulatory Authorities: Allow the Engineer and other governing and regulatory authorities to perform testing and inspection of materials and practices associated with construction within their jurisdiction on the Worksite during business hours for the purpose of ensuring that the Work is in compliance with the requirements of the Contract Drawings, Contract Specifications, and other local, state and federal laws and regulations.
- D. Concrete shall be subject to quality assurance in accordance with Section 90 of the Standard Specifications.
1. Slump tests: Have available, at job site, equipment required to perform slump tests. Make one slump test for each cylinder sample, from same concrete batch. Allowable maximum slump shall be 4 inches for walls and 3 inches for slabs on grade and other work.
- E. Certifications:
1. Provide Owner's Representative at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:
    - a. Materials contained comply with the requirements of the Contract Documents in all respects.
    - b. Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.
    - c. Statement of type and amount of any admixtures.
  2. Provide Owner's Representative at the time of delivery with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.
- F. Contractor Quality Control:
1. Sampling, Testing and Inspection:
    - a. Hire an independent Quality Control Testing Firm to perform sampling, testing, and inspections in accordance with the provisions herein and Section 01 45 00 - Quality Control.
    - b. Wherever it is specified herein that sampling, testing, or inspection shall be performed by the Contractor, it shall be understood to mean that said sampling, testing, or inspection shall be performed by the Quality Control Testing Firm.
    - c. Cooperate with and notify the Engineer at least 48 hours in advance of sampling, tests and inspections, being performed by the Quality Control Testing Firm. The Engineer may elect to observe these procedures. Provide samples and facilities for inspection to the Engineer without extra charge if requested.
    - d. The Quality Control Testing Firm shall collect samples of materials for testing in accordance with the provisions outlined herein and as directed by the Engineer.

- e. The Quality Control Testing Firm shall perform quality control through observation, inspection, sampling and testing.
- 2. Qualifications of the Quality Control Testing Firm: Refer to Section 01 45 00 - Quality Control.
  
- G. Engineer Quality Assurance:
  - 1. The Engineer will monitor the implementation of the Contractor's quality control programs through observation, inspection, sampling and testing.
  
- H. All manufacturer's specifications and details shall be included as part of the Contract Documents. Contractor shall review all manufacturer requirements, standards, specifications and details prior to bid and include all mix designs, additives, and incidentals required.
  
- I. The supervising foreman shall be onsite during all decorative concrete placement and finishing work for the complete duration of the project.
  
- J. Maintain field records of time, date of placing, curing and removal of forms of concrete in each portion of work.
  
- K. Samples:
  - 1. Sample panel: Before ordering material for concrete paving, provide sample panel, minimum 4' x 4' of each color and finish, using specified materials. Show color, texture, pattern, edging, and joint treatments. Contractor to provide additional samples at no additional cost to contract until all colors and finishes have been approved by the Engineer.
    - a. Where applicable, the approved sample panel may be a portion of the work and remain in place. Location as directed by the Engineer. Contractor will be required to provide additional panels as necessary, until approved.
  - 2. Sample wall: Before ordering material for concrete paving, provide sample panel, minimum 3-foot section of wall, using specified materials. Show color, texture, pattern, edging, graffiti coating, and joint treatments. Contractor to provide additional samples at no additional cost to contract until all colors and finishes have been approved.

## **1.07 SUBMITTALS**

- A. General: Refer to section 00 72 11 General Contract Requirements and 01 78 23 Operations and Maintenance Data for instructions relating to Shop Drawings, Product Data, and Samples for submittal requirements and procedures.
  
- B. Submit concrete mix designs for each concrete type. Obtain approval before placing concrete.
  - 1. Pedestrian and Vehicular flatwork Concrete
  
- C. Product data:
  - 1. Submit complete materials list of items proposed for the work. Identify materials source.
  - 2. Submit admixture, curing compound, retarder, and accessory item product data, if used.
  - 3. Submit material certificates for aggregates, fly ash, slag, reinforcing, dowels, sealants, diamond dowels, and joint fillers.
  - 4. Submit manufacturer's product data and specifications for all accessories and incidentals.



- D. Provide Owner's Representative at the time of delivery with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers. Delivery ticket must also include:
  - 1. Batch number.
  - 2. Mix by class or sack content with maximum size aggregate.
  - 3. Admixtures.
  - 4. Slump.
- E. Submit concrete test reports.
- F. Trial batch shrinkage tests, when required as specified herein, shall show conformance with the "Drying Shrinkage" requirements specified in Article 2.01I.
- G. Design Mixes: Have all concrete mixes designed by a testing laboratory and approved by the Consulting Engineer. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.

#### **1.08 DESIGNATION**

- A. General: Whenever the 28-day compressive strength is designated herein or on the plans is greater than 3,600 psi, the concrete shall be considered to be designated by compressive strength. The 28-day compressive strength shown herein or on the plans which are 3,600 psi or less are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the plans, the concrete shall contain the cement per cubic meter shown in section 90-1.01 of the Caltrans Standard Specifications.
- B. Unless specified otherwise herein or on the Plans, Portland Cement Concrete for this Project shall be Class "2" as specified in Section 90-1.01 of the Caltrans Standard Specifications.

#### **1.09 DELIVERY, STORAGE AND HANDLING**

- A. Work notification: Notify Engineer at least 24 hours prior to installation of concrete.
- B. Establish and maintain required lines and grade elevations. All concrete shall slope to drain with no ponding of water.
- C. Do not install concrete work over wet, saturated, muddy, or frozen subgrade.
- D. Do not install concrete when air temperature is below 40 degrees F. Use of calcium chloride, salt, or any other admixture to prevent concrete from freezing is prohibited.
- E. Protect adjacent work.
- F. Provide temporary barricades and warning lights as required for protection of project work and public safety.

## **PART 2 - PRODUCTS**

### **2.01 PORTLAND CEMENT**

- A. General: Type V or type II (modified) cement conforming to the requirements of ASTM C 150, with the following modifications:
1. Cement shall not contain more than 0.60% by weight of alkalis, calculated as the percentage of Na<sub>2</sub>O plus 0.658 times the percentage of K<sub>2</sub>O when determined by either 4 intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in accordance with the requirements of ASTM C 114.
  2. The autoclave expansion shall not exceed 0.50%.
  3. Mortar containing the portland cement to be used and the sand, when tested in accordance with Test Method No. Calif. 527, shall not expand in water more than 0.010% and shall have an air content less than .048%.
  4. Allowable tri-calcium Aluminate (C<sub>3</sub>A) by weight shall not exceed 5%. Allowable tetracalcium aluminoferrite plus twice the tricalcium aluminate (C<sub>4</sub>AF+2C<sub>3</sub>A) by weight shall not exceed 25%. The sulfate expansion test (ASTM C 452) may be used in lieu of the above chemical requirements, provided the sulfate expansion does not exceed 0.040% at 14 days (maximum).
  5. Contractor may substitute pozzolan for Portland Cement in amounts up to 15% of the required mix unless high early strength concrete is specified. Pozzolan shall consist of Class F Fly Ash meeting the requirements of ASTM C 618.
- B. Cement for Surface Improvements: Provide a coloring equivalent to ¼ pound of lampblack per cubic yard. Add to the concrete at the central mixing plant.
- C. Liquiblack, as supplied by Concrete Corporation of Redwood City, California, may be used in lieu of lampblack. One pint of liquiblack shall be considered equal to one pound of lampblack.

### **2.02 AGGREGATE AND AGGREGATE GRADING**

- A. General: Conform to the requirements of Section 90-2.02, 2.02A and 2.02B of the Caltrans Standard Specifications.
- B. Aggregate Size and Gradation: Conform to the requirements of section 90-3 of the Caltrans Standard Specifications for 25-mm (1-inch) maximum combined aggregate.

### **2.03 WATER**

- A. General: Conform to the requirements of section 90-2.03 of the Caltrans Standard Specifications, for mixing and curing portland cement concrete and for washing aggregates.

## **2.04 CLASSIFICATION OF PORTLAND CEMENT CONCRETE**

- A. Concrete for the following items shall be designated by the following classes per Section 90-1.01 of the Caltrans Standard Specifications:
  - 1. Vehicular Pavement: Class 2.
  - 2. Curbs, Gutters, and Sidewalks: Minor Concrete.
  - 3. Cast in place Concrete Pipe: The concrete shall consist of a minimum of 564 pounds of Portland cement per cubic yard of concrete.
  - 4. Thrust Blocks: The concrete shall have a minimum compressive strength of 3,000 psi.
  - 5. Sign and Fence Footings: The concrete shall consist of a minimum of 376 pounds of Portland cement per cubic yard of concrete.
  - 6. Water, Storm, and Sanitary Structures: The concrete shall consist of a minimum of 564 pounds of portland cement per cubic yard of concrete.

## **2.05 MIXES**

- A. Provide Class A ready-mixed concrete. Batch mixing at site not acceptable.
  - 1. For all decorative site concrete: Use Portland Cement Concrete containing not less than 658 pounds of cementitious materials cubic yard, with a 28 day compressive strength of not less than 4000 p.s.i.
- B. Indicate water added to mix at Worksite on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements.

## **2.06 REINFORCEMENT AND DOWELS**

- A. Bar reinforcement for concrete improvements shall be deformed steel bars of the size or sizes called for on the plans conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Size and shape for bar reinforcement shall conform to the details shown or called for on the Plans. Substitution of wire mesh reinforcement for reinforcing bars will not be allowed.
- B. Slip dowels, where noted or called for on the plans or detail drawings shall be smooth billet-steel bars as designated and conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Ends of bars inserted in new work shall be covered with a cardboard tube sealed with cork; no grease or oil shall be used.
- C. Mesh for reinforcement for concrete improvements shall be cold drawn steel wire mesh of the size and spacing called for on the plans conforming to the requirements of ASTM Designation A 82 for the material and ASTM Designation A 185 for the mesh. Size and extent of mesh reinforcement shall conform to the details shown or called for on the plans.
- D. Tie wire for reinforcement shall be eighteen (18) gauge or heavier, black, annealed conforming to the requirements of ASTM Designation A 82.
- E. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.

## **2.07 EXPANSION JOINT MATERIAL**

- A. Material for expansion joints in portland cement concrete improvements shall be premolded expansion joint fillers conforming to the requirements of ASTM Designation D 1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site. Unless noted otherwise herein or on the Plans expansion joint thickness shall be as follows:
  - 1. Curbs, Curb Ramps, Island Paving, Sidewalks, Driveways and Gutter Depressions: ¼-inch.
  - 2. Concrete Slope Protection, Gutter Lining, Ditch Lining and Channel Lining: ½-inch.
  - 3. Structures: As indicated.
- B. Joint Sealants: Two-component polysulfide or polyurethane elastomeric type complying with FS TT-S-00227, self-leveling, designed for foot traffic. Provide vehicular rated sealant in all vehicular areas. Colors shall match paving.

## **2.08 ACCESSORY MATERIALS**

- A. Conform water stops and other items required to be embedded inside of Portland Cement Concrete structures to the applicable requirements of Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans or detail drawings.
- B. Curing compound: ASTM C309, non-yellowing, non-staining liquid membrane-forming type containing a fugitive dye. Chlorinated rubber compounds not acceptable for exterior use.
  - 1. BASF Corporation; MasterKure 1315 WB – (800) 243-6739
  - 2. Admixtures Inc.; Colorful Clear Curing Compound – (626) 357-3263 or <http://admixtures.home.att.net/>
  - 3. Cure & Sealer Lithocrete® Sealer or HLQ 125
- C. Accessories: Provide reinforcement accessories, consisting of bar supports, spacers, hangers, chairs, ties, and similar items as required for spacing, assembling, and supporting reinforcement in place. Conform with CRSI referenced standards and the following requirements:
  - 1. For footings, grade beams, and slabs on grade, provide supports with precast concrete or mortar bases or plates or horizontal runners where wetted base materials will not support chair legs.
- D. Glare Reducing Agents
  - 1. Lampblack in dry form, in accordance with the requirements of ASTM “ Standard Specification for Lampblack”, Designation D 209, in the proportion of from ½ to ¾ pound over cubic yard of concrete.
  - 2. An approved liquid or semi-paste black colorant intended for use integrally in concrete mixes. The proportion required, generally from 10 to 40 ounces liquid measure per cubic yard of concrete, may be affected by the colorant used. Curing in this case shall be by the pigmented curing compound method.
  - 3. All visible Standard Gray concrete work shall include Lampblack as indicated above.

## **2.09 FORMS**

- A. Conform to the requirements of Section 51-1.05 of the Caltrans Standard Specifications.
- B. Wood or metal of sufficient strength to resist concrete placement pressure and to maintain horizontal and vertical alignment during concrete placement. Provide forms straight, free of defects and distortion, and height equal to full depth of concrete work.
  - 1. Provide 2" nominal thickness, surfaced plank wood forms for straight sections. Use flexible metal, 1" lumber or plywood forms to form radius bends.
  - 2. Lumber to be new #2 grade or better. Do not use used form lumbe.
  - 3. Perform form layout with a digital electronic transit for line layout accuracy.
  - 4. Allow forms to remain in place long enough to allow concrete to set properly. Remove forms when appropriate.

## **2.10 PRECAST CONCRETE STRUCTURES**

- A. Conform to the following Sections of Caltrans Standard Specifications:
  - 1. 51-1.02, Minor Structures.
  - 2. 70-1.02C, Flared End Sections.
  - 3. 70-1.02H, Precast Concrete Structures.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine subgrades and installation conditions. Do not start concrete work until unsatisfactory conditions are corrected.
- B. Review all Architectural, Civil and Structural Contract Drawings for items which require coordination.
- C. Contractor and Engineer to field review location, orientation, and elevations of all utility boxes, structures, drainage elements, and footings with the proposed grades, walls, score pattern and joint layouts prior to the placement of work. Correct any deficient items prior to proceeding with Decorative Concrete work.

### **3.02 PREPARATION**

- A. Prepare subgrade in accordance with Earth Moving, Section 31 20 00.
- B. Provide compacted base material as shown on Contract Documents. Compact base to 95% of the maximum dry density in accordance with ASTM D1557.
- C. Remove loose material and debris from base surface before placing concrete.

- D. Install, align, and level forms. Stake and brace forms in place. Maintain following grade and alignment tolerances:
  - 1. Top of form: Maximum 1/8" in 10'-0".
  - 2. Vertical face: Maximum 1/2" in 10'-0".
- E. Coat form surfaces in contact with concrete with form release agent. Clean forms after each use and coat with form release agent as necessary to assure separation from concrete without damage.
- F. Install, set, and build-in work furnished under other specification sections. Provide adequate notification for installation of necessary items.
- G. Install pipe sleeves for irrigation system furnished under Section 32 84 00. Stake location of irrigation sleeves.
- H. All waterproof membranes and drainage courses shall be reviewed and approved in writing by the associated manufacturer's representative and Engineer.

### **3.03 STRUCTURAL EXCAVATION**

- A. Structural excavation may be either by hand, or by machine and shall be neat to the line and dimension shown or called for on the plans. Excavation shall be sufficient width to provide adequate space for working therein, and comply with CAL-OSHA requirements.
- B. Where an excavation has been constructed below the design grade, refill the excavation to the bottom of the excavation grade with approved material and compact in place to 95% of the maximum dry density.
- C. Remove surplus excavation material remaining upon completion of the work from the job site, or condition it to optimum moisture content and compact it as fill or backfill on the site, if the material is approved by the Geotechnical Consultant.

### **3.04 BRACING AND SHORING**

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a Civil Engineer or Structural Engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner's Representative.

- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

### **3.05 PLACING CONCRETE FORMS**

- A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.
- B. Thoroughly clean all forms prior to placement and coat forms with an approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.
- C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.
- D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

### **3.06 PLACING REINFORCEMENT**

- A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond. All bending shall be done cold, to the shapes shown on the plans. The length of lapped splices shall be as follows:
  - 1. Reinforcing bars No. 8, or smaller, shall be lapped at least 45 bar diameters of the smaller bar joined, and reinforced bars Nos. 9, 10, and 11 shall be lapped at least 60 bar diameters of the smaller bars joined, except when otherwise shown on the plans.
  - 2. Splice locations shall be made as indicated on the plans.
- B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads. Provide supports and ties of such strength and density to permit walking on reinforcing without undue displacement.
- C. Place reinforcing to provide the following minimum concrete cover:
  - 1. Surfaces exposed to water: 4-inches.
  - 2. Surfaces poured against earth: 3-inches.
  - 3. Formed surfaces exposed to earth or weather: 2-inches.
  - 4. Slabs, walls, not exposed to weather or earth: 1-inch.
- D. Minimum spacing, center of parallel bars shall be two and one half (2-1/2) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.
- E. Clean, bend and place reinforcement in accordance with current requirements of the ACI Manual of Concrete Practice.

- F. Dowels: Provide dowels where indicated or required for connecting construction and for maintaining structural and reinforcement continuity. Dowels shall be tied securely in place before concrete is deposited. Provide additional bars for proper support and anchorage where required. Do not bend dowels after embedment.
- G. Reinforcement Splices:
  - 1. Reinforcing bars - 24 bar diameter minimum, except as otherwise noted.

### **3.07 MIXING AND TRANSPORTING PORTLAND CEMENT CONCRETE**

- A. Transit mix concrete in accordance with the requirements of ASTM Designation C 94. Transit mix for not less than ten (10) minutes total, not less than three (3) minutes of which shall be on the site just prior to pouring. Mix continuous with no interruptions from the time the truck is filled until the time it is emptied. Place concrete within one hour of the time water is first added unless authorized otherwise by the Owner's Representative. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.
- B. Do not hand mix concrete for use in concrete structures.

### **3.08 PLACING PORTLAND CEMENT CONCRETE**

- A. Concrete placement:
  - 1. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing. In cold weather comply with ACI 306, "Standard Specification for Cold Weather Concreting". In hot weather comply with ACI 305, "Standard Specification for Hot Weather Concreting".
  - 2. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete. Verify structures are at required finish elevation and alignment before placing concrete.
  - 3. Do not place concrete until the subgrade and the forms have been approved.
  - 4. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.
  - 5. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the Owner's Representative. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.
  - 6. Place and spread concrete to the full depth of the forms. Use only square-end shovels or concrete rakes for hand-spreading and consolidating operations to prevent segregation of aggregate and dislocation of reinforcement.
  - 7. Place concrete in a continuous operation between expansion joints. Provide construction joints where sections cannot be placed continuously.
  - 8. Place concrete as indicated on the Contract Drawings in one course, monolith construction, for the full width and depth of concrete work.



9. Concrete in certain locations may be pumped into place upon prior approval by the Owner's Representative. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.
10. Strike-off and bull-float concrete after consolidating. Level ridges and fill voids. Check surface with a 10'-0" straightedge. Fill depressions and refloat repaired areas. Darby the concrete surface to provide a smooth level surface ready for finishing.

### **3.09 EXPANSION JOINTS**

- A. Construct expansion joints incorporating premolded joint fillers at all concrete curbs, gutters, sidewalks, median/island paving, valley gutters, driveway approaches, at the ends of all returns and at all concrete work abutting curbs, walls, structures, walks, utility boxes and other fixed objects. At each expansion joint install one-half inch by twelve inch (1/2" x 12") smooth slip dowels in the positions shown or noted on the detail drawings.
  1. Locate expansion joints as indicated or at a distance at 20' maximum, where paving patterns collide, between existing and new work, between pedestrian and vehicular paving, around all light post foundations, walls, and around all structural foundations.
  2. Coordinate all expansion joints with fixed objects.
  3. Install joint fillers full-width and depth of joint. Recess top edge of snap cap at finish grade for joint sealants.
  4. Provide joint fillers in single lengths for the full slab width, whenever possible. Fasten joint filler sections together when multiple lengths are required.
  5. Protect the top edge of the joint filler during concrete placement.
  6. Brooming. After the curing period, expansion joints shall be carefully cleaned and filled with approved joint sealant to just below adjacent paved surface in such a manner as to avoid spilling on paved surfaces or overflow from joint.
  7. Joints to be 1/4 depth of slab as indicated on the Contract Drawings. Contractor to allow concrete to cure as required before beginning operations.
  8. Joints cuts shall be of a consistent depth, and visually straight.
- B. Orient slip dowels at right angles to the expansion joint and hold firmly in place during the construction process by means of appropriate chairs.

### **3.10 WEAKENED PLANE JOINTS**

- A. Construct weakened plane joints in concrete curbs, gutters, sidewalks, median/island paving and valley gutters between expansion joints at ten (10) foot intervals throughout, or as otherwise indicated. Depth of joint score depth to be one-fourth (25%) the thickness of the concrete.
  1. Grooved Joints: Form weakened plane joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of weakened plane joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

### **3.11 PLACING ACCESSORY MATERIALS**

- A. Place water stops and other items required to be embedded in of portland cement concrete structures at locations shown or required in accordance with Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans.

- B. Curing:
  - 1. Cure concrete with a clear, non-staining liquid membrane-forming compound. Spray apply in accordance with manufacturer's recommended coverage rate. Apply curing compound immediately after completing surface finish.
  - 2. After Concrete is placed, cure concrete for a minimum of seven (7) days without foot traffic and a minimum thirty (30) days without vehicular traffic. If a curing compound is required, refer to Section 2.03 of this specification for acceptable curing compounds or install a moisture retaining, non-staining, non-woven, curing cover and maintain sufficient moisture under cover to provide for 100% humidity conditions at concrete surface for a minimum of 7 days. Cover shall be reflective in nature to prevent excessive heat build up under cover and allow for optimal curing conditions..
  
- C. Sealants
  - 1. Remove top of snap cap to receive sealant
  - 2. Protect all adjacent concrete work as required.
  - 3. Place sealants in a continuous manner along expansion joints.

### **3.12 FINISHING CONCRETE**

- A. Finish curb and gutter in conformance with the applicable requirements of Section 73-1.04 and 73-1.05A of the Caltrans Standard Specifications as modified herein.
- B. Where monolithic curb, gutter and sidewalk is specified, separate concrete pours will not be allowed.
- C. Provide a medium broom finish to all horizontal surfaces unless otherwise shown. Broom Finish: Shall be obtained by drawing a stiff bristled broom across a floated finish. Direction of brooming to be perpendicular to direction of work or otherwise shown on Contract Drawings.
- D. Concrete paving and concrete finishes along accessible routes of travel shall be at least as slip-resistant as that described as a medium salted finish for slopes of less than 6%, and slip-resistant at slopes of 6% or greater.

### **3.13 FORM REMOVAL**

- A. Remove forms without damage to the concrete. Remove all shores and braces below the ground surface, before backfilling.
- B. Do not backfill against concrete until the concrete has developed sufficient strength to prevent damage.
- C. Leave forms for cast-in-place walls in place at least 72 hours after pouring.
- D. Leave edge forms in place at least 24 hours after pouring.

### **3.14 CONSTRUCTION**

- A. Form, place and finish concrete walkways, island paving, valley gutters and driveway approaches in conformance with the applicable requirements of Section 73-1.04 and 73-1.06 of the Caltrans Standard Specifications as modified herein.
- B. Construct new concrete curb, curb and gutter and valley gutters against existing asphalt concrete by removing a minimum of 12-inches of the asphalt concrete to allow placement of curb or gutter forms. Patch pavement with a 6-inch deep lift of asphalt concrete after gutter form is removed.

### **3.15 FIELD QUALITY CONTROL AND ASSURANCE**

- A. Engineer Quality Assurance:
  - 1. The Engineer will monitor the implementation of the Contractor's quality control programs through observation, inspection, sampling and testing.
  - 2. Failure of the Engineer to detect defective work or material shall not prevent later rejection when such defect is discovered, nor shall it obligate the Engineer for final acceptance.
- B. Finish subgrade for concrete improvements shall be subject to approval prior to placement of forms.
- C. No concrete shall be placed prior to approval of forms.
- D. Concrete improvements constructed shall not contain "bird baths" or pond water and shall be smooth and ridge free.
- E. Conform the finish grade at top of curb, flow line of gutter, and the finish cross section of concrete improvements to the design grades and cross sections.
- F. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances established in Sections 73-1.05 and/or 73-1.06 of the Caltrans Standard Specifications.

### **3.16 TOLERANCES**

- A. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"

### **3.17 CONNECTING TO EXISTING CONCRETE IMPROVEMENTS**

- A. New curb, gutter, or sidewalk is to connect to existing improvements to remain by saw cutting to existing sound concrete at the nearest score line, expansion joint or control joint. Drill and insert ½-inch diameter by 12-inch long dowels at 24-inches on center into existing improvements. Install pre-molded expansion joint filler at the matching joint.
- B. A cold joint to the existing curb is not acceptable.

### **3.18 RESTORATION OF EXISTING IMPROVEMENTS**

- A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.

- B. Remove and replace in kind landscaping or plantings damaged or disturbed due to the installation of concrete improvements.

### **3.19 PROTECTION**

- A. Protect concrete work from damage due to construction and vehicular traffic until Final acceptance. Exclude construction and vehicular traffic from concrete pavements for at least 14 days.
- B. Protection: Protect precast concrete items from chipping, spalling, cracking, or other damage until the Work is accepted by the Engineer.
- C. Concrete work subject to traffic shall be heavily protected by the contractor as required to ensure damage does not occur. Damaged concrete shall be considered Defective Concrete as specified in Article 3.08 herein.

### **3.20 DEFECTIVE CONCRETE**

- A. Concrete work which does not meet the Contract Specifications or Contract Drawings shall be considered defective concrete.
- B. Color and finish of all concrete work shall match. Inconsistent color, and finishing shall be considered defective concrete.
- C. All walls shall be plumb, straight with top of wall held level. Walls which are not plumb, straight, or level shall be considered defective concrete.
- D. All joints shall be straight and true. Joints which are not straight shall be considered defective concrete.
- E. All sealants shall be installed in accordance with the manufacturer's specifications and detail in a clean and consistent manner. Sealant joints which are installed over the top of plastic snap caps, are crooked, wavy, too high, too low, or not in conformance with the mockup submittal shall be considered defective concrete.
- F. Concrete work which ponds, does not conform to ADA requirements, does not match grading, is of poor finish, has poor scoring depth, map cracking, chipped, cracked, or otherwise deemed non acceptable shall be considered defective concrete.
- G. Defective concrete shall be repaired or replaced as directed by the Engineer, at no added expense to the Contract. Repair materials may include specialty cements, reinforcement grouts, dry pack, admixtures, epoxy and aggregates as necessary.
  - 1. Engineer's authorization for the Contractor to repair defective concrete work does not provide an acceptance of defective concrete work. All final repair work that does not meet the approval of the Engineer shall be rejected, removed and replaced at no additional cost to the contract.
  - 2. In general, minor defective work may be repaired by use of dry pack. If defective work is serious or affects the strength of the structure or the appearance, the Engineer may require the removal and replacement of the portion of the structure.
  - 3. Immediately after removing forms, all concrete surfaces shall be inspected any poor joints voids, rock pockets, tie holes, except as specified, etc., shall be patched at once, but not until

the surfaces have first been reviewed by the Engineer. Submit patching mixture and method proposed for use, for review prior to commencing work.

4. Repaired or Replaced work shall match existing work. Work which does not match may require full removal and replacement.
5. All labor, materials, equipment, incidentals, and work related to the repairs or replacement of Concrete work including but not limited to demolition, planting, irrigation, and protective surfacing shall be done at no additional cost to the Contract.

### **3.21 CLEANUP**

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from concrete operations.
- B. Sweep concrete sidewalks and pavement; wash free of stains, discoloration, dirt, and other foreign material immediately prior to final acceptance.
- C. After a complete installation the contractor shall remove all debris including but not limited to all form work, concrete "overpour"; remove all Cementous materials, base courses, deleterious materials, grouts, cuttings & or hardware. Planting areas adjacent to all concrete work shall be clean with soils matching existing conditions.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.05 MEASUREMENT & PAYMENT**

- A. Concrete forming, Concrete Form liners, Portland cement, dowels, aggregates, curing, admixtures, finishing, sealants, waterproofing, reinforcement, saw cutting, joints, mockups, testing and analysis of materials, mix designs, batching, mixing, transportation, inspection, testing, repairs, and replacements will not be measured separately for payment. All costs in connection therewith will be incidental to and included with the applicable items of work.
- B. Footings will not be measured separately for payment but will be considered as included in the Contract unit price for the work performed, as indicated in the Bid Schedule of the Bid Form for all applicable work.

### **4.06 PEDESTRIAN CONCRETE**

- A. **Measurement:** "4" Concrete Paving (Pedestrian)" will be measured for payment by the square foot (SF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.
- B. **Payment:** Full compensation for "4" Concrete Paving (Pedestrian)" will be paid for at the indicated contract unit prices and no additional compensation will be allowed therefor.

#### **4.07 RETAINING CURB**

- A. **Measurement:** “Retaining Curb” will be measured for payment by the linear foot (LF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.
- B. **Payment:** Full compensation for “Retaining Curb” will be paid for at the indicated contract unit prices and no additional compensation will be allowed therefore.

#### **4.08 CONCRETE CURBS**

- A. **Measurement:** “Vertical Curbs, Curb and Gutter, Flush Curb, Rolled Curb, and Valley Gutter” will be measured for payment by the linear foot (LF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.
- B. **Payment:** Full compensation for “Concrete Curb” will be paid for at the indicated contract unit prices and no additional compensation will be allowed therefore.

#### **4.09 CONCRETE MOWBANDS**

- A. **Measurement:** “Vertical Curbs, Curb and Gutter, Flush Curb, Mowband, Rolled Curb, and Valley Gutter” will be measured for payment by the linear foot (LF), including but not limited to, furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as shown on the plans, as specified in the Standard Specifications, and as shown in these Special Provisions.
- B. **Payment:** Full compensation for “Concrete Curb” will be paid for at the indicated contract unit prices and no additional compensation will be allowed, therefore.

**END OF SECTION 32 05 23**

**SECTION 32 11 00**  
**PAVEMENT BASE COURSE**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Aggregate subbase
- B. Aggregate base
- C. Cement treated base
- D. Lime stabilization

**1.02 RELATED SECTIONS**

- A. Section 01 50 50 – Erosion Control
- B. Section 31 20 00 – Earth Moving
- C. Section 31 23 33 – Trenching and Backfilling
- D. Section 31 23 00 – Excavation and Fill
- E. Section 32 05 23 – Cement and Concrete for Exterior Improvements
- F. Section 32 11 23 – Permeable Base (Single Stone) For Synthetic Turf System
- G. Section 32 12 00 – Flexible Paving

**1.03 RELATED DOCUMENTS**

**ASTM:**

- 1. D75, Standard Practice of Sampling Aggregates
- 2. C125: Standard Terminology Relating to Concrete and Concrete Aggregates
- 3. C131: Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- 4. C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- 5. C702: Standard Practice for Reducing Samples of Aggregate to Testing Size
- 6. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
- 7. D2167, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- 8. D2434, Standard Test Method for Permeability of Granular Soils (Constant Head).

9. D3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
10. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
11. D5821, Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
12. D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
13. E329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
14. E548, Guide for General Criteria Used for Evaluating Laboratory Competence

Caltrans Standard Specifications, 2015

15. Section 24, Stabilized Soils
16. Section 25, Aggregate Subbases
17. Section 26, Aggregate Bases
18. Section 27, Cement Treated Bases

#### **1.04 DEFINITIONS**

**Geotechnical Testing Agency:** An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock definition testing, as documented according to ASTM D3740 and ASTM E548.

**Rock:** Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material  $\frac{3}{4}$  cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D1586, exceeds a standard penetration resistance of 100 blows/2 inches.

**Structures:** Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.

**Subgrade:** Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials. Perform work in accordance with Section 31 20 00, Earth Moving.

#### **1.05 SUBMITTALS**

Follow submittal procedure outlined in the General and Supplemental Conditions.

Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

Submit an electronic copy of product data on filter fabric and separation fabric.

Submit an electronic copy of certification signed by Contractor's Materials Testing Agency stating they meet the qualifications presented in 1.06 - Quality Assurance.



Submit an electronic copy of certification signed by Contractor's Rock Manufacturer stating material supplied to the project meets the requirements as specified in the Construction Documents.

## **1.06 QUALITY ASSURANCE**

Conform all work and materials to the recommendations or requirements of the Plans and Geotechnical Report and meet the approval of the Geotechnical Engineer.

Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D1557.

Perform installation of base materials under the observation of the Geotechnical Engineer. Materials placed without approval of the Geotechnical Engineer will be presumed to be defective and, at the discretion of the Geotechnical Engineer, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Engineer at least 24 hours prior to commencement of base material installation and at least 48 hours prior to testing.

Finish surface of material to be stabilized prior to lime treatment shall be in accordance with Caltrans Standard Specification Section 24, Stabilized Soils.

Finish surface of the stabilized material after lime treatment shall be in accordance with Caltrans Standard Specifications Section 24, Stabilized Soils.

Finish surface of cement treated base shall be in accordance with Caltrans Standard Specification Section 27, Cement Treated Bases.

Do not project the finish surface of aggregate subbase above the design subgrade.

Finish grade tolerance at completion of base installation: +0.05 feet

During construction, the Contractor shall perform their own inspection and testing by Geotechnical Testing Agency or Rock Manufacturer on rock materials to the degree they deem necessary to assure compliance of the rock materials with the specifications. This inspection and testing shall be in addition to that which is specifically required by this specification.

If ASTM C136 test results conducted by the Contractor's Rock Manufacturer on a quality control sample indicates a difference of 10% or greater from the test results of the approved permeable submittal sample. ASTM D2434 testing shall be conducted on the material to confirm that the material meets the minimum permeability requirement.

## **1.07 PROJECT CONDITIONS**

Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

Temporarily stockpile material in an orderly and safe manner and in a location approved by the District.

Provide dust and noise control in accordance with the General and Supplemental Conditions.

## **PART 2 - PRODUCTS**

### **2.01 AGGREGATE SUBBASE**

Material: Class 2 in accordance with Caltrans Standard Specification Section 25, Aggregate Subbases.

Substitution: The use of recycled aggregate may be reused as Class 2 Aggregate Subbase.

### **2.02 AGGREGATE BASE**

Material: Class 2 ¾ inch maximum in accordance with Caltrans Standard Specification Section 26, Aggregate Bases.

Substitution: The use of recycled aggregate may be reused as Class 2 Aggregate Base if removed without contamination from the underlying soil.

### **2.03 GRAVEL PARKING LOT**

Material: Class 2 ¾ inch maximum in accordance with Caltrans Standard Specification Section 26, Aggregate Bases.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

### **3.02 WET WEATHER CONDITIONS**

Do not place or compact subgrade if above optimum moisture content.

If the Geotechnical Engineer allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Engineer.

### **3.03 AGGREGATE SUBBASE**

Spreading and Compacting: In accordance with Caltrans Standard Specification Section 25-1.03D, Spreading and 25-1.03E, Compacting.

### **3.04 AGGREGATE BASE**

Watering, Spreading and Compacting: In accordance with Caltrans Standard Specification Section 26-1.03D, Spreading and 26-1.03E, Compacting.

Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

### **3.05 DISPOSAL**

Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Measurement of "Compacted Aggregate Base" shall be per cubic yard (CY).

### **4.02 PAYMENT**

- A. "The weight of material to be paid for will be determined by deducting from the weight of material delivered to the work, the weight of water in the material at the time of weighing in excess of one percentage (1%) point more than the optimum moisture content as determined by California Test Method No. 216. The weight of water in the material at the time of weighing will be as determined by California Test Method no. 226. The weight of water deducted as provided herein will not be paid for. The contract unit price paid per ton for "Aggregate Base" includes full compensation for furnishing all labor, materials, tools, equipment, soil preparations and incidentals, and for doing all work involved in furnishing and placing aggregate base as specified in the Standard Specifications, these technical specifications, and as directed by the Engineer.
  
- B. If the total quantity of aggregate base exceeds the bid quantity by more than 25%, the Contractor will be paid for all the aggregate base using the bid unit price, and no adjustment will be made to the unit price as bid.

**END OF SECTION 32 11 00**

**SECTION 32 11 23**  
**PERMEABLE BASE (SINGLE STONE) FOR SYNTHETIC TURF SYSTEM**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. The Contractor's scope of work includes site preparation, excavation, disposal of excess or unsuitable material, subgrade grading, installation of subsurface drain pipe and perimeter header, and the selection, purchase, grading and compaction of permeable material in accordance with the lines, grades, and cross-sections shown on the drawings.

**1.02 RELATED SECTIONS**

- A. Section 01 50 50 – Erosion Control
- B. Section 31 20 00 – Earth Moving
- C. Section 31 23 33 – Trenching and Backfilling
- D. Section 31 23 00 – Excavation and Fill
- E. Section 32 11 00 – Base Course

**1.03 QUALITY ASSURANCE**

- A. Reference Standards - ASTM: American Society for Testing and Materials.
- B. Contractor's Materials Testing Agency Qualifications: An independent testing agency qualified to conduct soil materials and rock-definition testing that complies with ASTM E329 or D3740 and has personnel with at least 5 years of experience performing the following ASTM standard test methods and practices;
  - 1. D75: Standard Practice of Sampling Aggregates.
  - 2. C125: Standard Terminology Relating to Concrete and Concrete Aggregates
  - 3. C131: Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - 4. C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 5. C702: Standard Practice for Reducing Samples of Aggregate to Testing Size.
  - 6. D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  - 7. D2167: Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
  - 8. D2434: Standard Test Method for Permeability of Granular Soils (Constant Head).

9. D4253: Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
  10. D5821: Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
  11. D6938: Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- C. Owner's Testing Agency shall review Contractor's submittals under this specification and recommend action as defined under Section 00 72 00 – 1.31 Submittal Procedures.
- D. The Owner shall reject material delivered to the site not meeting specifications. All material rejected by the Owner shall be removed from the site and replaced with suitable material at the Contractor's expense.

#### **1.04 SUBMITTALS**

- A. Submittals prior to installation:
1. Submit an electronic copy of product data on pipe, pipe accessories, filter fabric and separation fabric.
  2. Submit an electronic copy of certification signed by Contractor's Materials Testing Agency stating they meet the qualifications presented in Article 1.2.B - Quality Assurance.
  3. CalTrans Class 1B permeable material: submit one (1) electronic copy of certification signed by Contractor's Rock Manufacturer stating material supplied to the project meets the requirements as specified in the Standard Specifications.
  4. Crushed Permeable Stone: The following items shall be submitted as a complete package. Failure to submit all items listed below will result in the submittal being returned to the Contractor as incomplete.
    - a. Submit an electronic copy of certification signed by Contractor's Rock Manufacturer stating that the submittal samples were prepared and tested within the last 60 days by the rock manufacturer and meet the gradation requirements specified in Part 2, PRODUCTS. Certification shall list specified gradation requirements and show results of gradation test conducted in accordance with ASTM C136.
    - b. Submit an electronic copy of report signed by Contractor's Materials Testing Agency certifying that submittal samples meet all specified requirements as listed in Part 2, PRODUCTS. The report must present test results performed in accordance with the following ASTM standard test methods and practices:
      - 1) C131: Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
      - 2) C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
      - 3) D2434: Standard Test Method for Permeability of Granular Soils (Constant Head).
      - 4) D4253: Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
  5. Additional reporting requirements for this submittal:

- a. Description of ASTM D2434 testing apparatus and procedure used to prepare samples for testing.
- B. Submittals during construction:
  1. For every 500 tons of permeable material produced, with a minimum of one sample per field, submit one (1) electronic copy of a certificate of compliance signed by Contractor stating that a quality control sample was collected, prepared, and tested by the Contractor's Rock Manufacturer and/or Contractor's Materials Testing Agency and meets the specified gradation requirements. Certification shall report specified gradation requirements and results of gradation test conducted in accordance with ASTM C136. This submittal shall be received and approved by the Owner prior to delivery of the material to the site.
  2. Submit certification signed by the Contractor's Synthetic Turf Installer stating that they have visited the site and observed the initial placement and compaction of a test area of permeable stone and find the surface suitable to install the synthetic turf. This submittal shall be received and approved by the Owner prior to placement of the permeable material.

#### **1.05 MATERIAL TESTING AND INSPECTION DURING CONSTRUCTION**

- A. The Owner's Testing Agent will be present intermittently to observe the Contractor's operation, to perform tests and measurements. Such observations, tests, measurements shall not alter the requirements of the drawings or specifications nor imply any superintendence or control of the Contractor's operation, nor warranty the Contractor's work.
- B. During construction, the Contractor shall perform their own inspection and testing by Contractor's Materials Testing Agency or Rock Manufacturer on rock materials to the degree they deem necessary to assure compliance of the rock materials with the specifications. This inspection and testing shall be in addition to that which is specifically required by this specification.
- C. Contractor's Materials Testing Agency shall be required to conduct the following tests during construction:
- D. If ASTM C136 test results conducted by the Contractor's Rock Manufacturer on a quality control sample as defined in Article 1.04 indicates a difference of 10% or greater from the test results of the approved permeable submittal sample. ASTM D2434 testing shall be conducted on the material to confirm that the material meets the minimum permeability requirement.
- E. Related sections can include, but may not be limited to the following:
  1. Section 01 45 00 – Quality Control
  2. Section 32 11 00 – Base Course

### **PART 2 - PRODUCTS**

#### **2.01 NONWOVEN GEOTEXTILE**

- A. Nonwoven geotextile (Filter Fabric) placed in the subsurface drainage trenches shall conform to the following specifications.

<u>Mechanical Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Minimum Ave. Roll Value</u>
Grab tensile strength	ASTM D4632	lbs	120(MD), 120(CD)
Grab tensile elongation	ASTM D4632	%	50(MD), 50(CD)
Trapezoid tear strength	ASTM D4533	lbs	45(MD), 45(CD)
CBR Puncture strength	ASTM D6241	lbs	300
Apparent opening size	ASTM D4751	mm	0.20
Flow rate	ASTM D4491	gal/min/ft <sup>2</sup>	130

## 2.02 WOVEN GEOTEXTILE

- A. Woven geotextile (Separation Fabric) placed on the subgrade shall conform to the following specifications.

<u>Mechanical Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Minimum Ave. Roll Value</u>
Tensile Strength (ultimate)	ASTM D4595	lbs/ft	2000(MD), 1500(CD)
Grab tensile strength	ASTM D4632	lbs	250(MD), 250(CD)
Grab tensile elongation	ASTM D4632	%	20(MD), 20(CD)
Trapezoid tear strength	ASTM D4533	lbs	100(MD), 50(CD)
CBR Puncture strength	ASTM D6241	lbs	500
Apparent opening size	ASTM D4751	mm	0.30
Flow rate	ASTM D4491	gal/min/ft <sup>2</sup>	30

## 2.03 CRUSHED PERMEABLE STONE

- A. Perimeter Drainage Trench Rock for the Synthetic Turf Section shall be crushed stone conforming to the requirements for ¾-inch drainrock or Caltrans Class 1B permeable material.
- B. Permeable Material for the Synthetic Turf Section shall be crushed angular stone conforming to the following requirements:
1. Gradation Requirements (ASTM C136):
    - a. Maximum particle size: ¾"
    - b. Maximum percent passing #200 sieve: 2%
    - c. Gradation Criteria:
      - 1)  $D_{60}/D_{10} > 3$  ;  $0.6 < \frac{D_{20}^2}{D_{10} D_{60}} < 3$

["D60" is the particle size diameter of which 60 percent of the test sample's particle diameters are smaller. This and other specified diameters shall be interpolation from a semi-log plot of the gradation test results.]
  2. Drainage Requirements (ASTM D2434):
    - a. Laboratory Permeability > 350 in/hr (2.5 X 10<sup>-1</sup> cm/sec) [Test with rock saturated and compacted between 92% and 100% of maximum per ASTM D4253]
  3. Durability Requirements (ASTM C131):
    - a. LA Abrasion (500 revs) < 20% loss

- C. Recommended Gradation: Permeable stone within the following ranges will generally meet the requirements listed above. This information is not a warranty, it is only intended to help guide the Contractor's Rock Manufacturer in the production of the materials.

<u>Gradation Sieve Size</u>	<u>Permeable Stone Percent Passing</u>
3/4"	100
1/2"	80 – 100
3/8"	50 – 80
No. 4	30 – 60
No. 8	20 – 40
No. 16	5 – 30
No. 30	0 – 10
No. 50/60	0 – 7
No. 100	0 – 4
No. 200	0 – 2

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Excavating and grading shall be performed in conformance with the alignment, grade and cross-sections indicated on the drawings.

#### **3.02 SUBGRADE SLOPES AND GRADE TOLERANCES**

- A. Final subgrade grades shall conform to the lines and grades shown on the drawings.
- B. The subgrade shall be excavated to create a positive slope towards the subsurface drain pipes. Unless otherwise specified on the drawings, the minimum slope of the subgrade shall be 1.0%.
- C. The final subgrade grade shall be rolled with a smooth drum roller to remove all localized depressions deeper than 1/2 inch caused by construction and compaction equipment tires or rollers.
- D. The measured grades shall not deviate more than 0.08 feet from the planned grades and not vary more than 0.04 feet in 10 feet in any direction. Laser grading is recommended.
- E. All subgrade grades shown on the drawings shall be completed by the Contractor and inspected by the Owner and Engineer prior to commencing with the subsequent work items.
- F. A conformance survey shall be performed by a licensed surveyor

#### **3.03 SUBSURFACE DRAINAGE SYSTEM**

- A. A system of shallow trenches shall be excavated to the lines, grades and dimensions shown on the drawings.



- B. The excavated trenches shall be free of loose soil and debris.
- C. A layer of filter fabric shall be placed in the shallow trench and backfilled with at least 2 inches of ¾-inch drainrock or CalTrans Class 1B permeable material. A perforated drain pipe shall then be placed in the trench in accordance with the drawings. The pipe shall be laid with the perforations down and at a minimum slope of 0.5% unless otherwise specified on the drawings. Lengths of pipe shall be joined by fittings fabricated by the pipe manufacturer. The perforated drain pipe shall be covered with at least 2 inches of ¾-inch drainrock or CalTrans Class 1B permeable material.
- D. All trench rock backfill shall be placed in layers eight inches or less in loose thickness and compacted to achieve at least 90% of the maximum density (ASTM D4253).
- E. Solid pipe clean out risers with end caps shall be installed at locations designated on the drawings. The long bend “sweeping” 90-degree bends, or two consecutive 45-degree bends, should be utilized for the subdrain cleanouts.
- F. The perforated sub-drain pipes shall connect to a non-perforated discharge pipe. The discharge pipe shall connect into the storm water drainage system as shown on the drawings.

### **3.04 GEOTEXTILE**

- A. Geotextile shall not be installed until a perimeter header has been installed.
- B. Geotextile shall not be installed until subdrainage trenches have been excavated.
- C. Geotextile rolls shall be handled in such a way that they are not damaged.
- D. Geotextile shall be placed on exposed subgrade surfaces in accordance with the drawings. The geotextile shall be rolled out parallel to the long direction of the playfield.
- E. Geotextile shall be securely anchored and then rolled in such a manner as to continually keep the geotextile sheet in tension.
- F. Geotextile seams shall be anchored using 60d nails through 1-1/2” round washers placed at 36 to 48 inches on center during placement. Additional anchoring shall be installed as required to prevent bunching of the geotextile.
- G. Adjacent widths of geotextile shall be “shingled” and have a 6-inch overlap at all edges.
- H. Holes or tears in the geotextile shall be repaired with a fabric patch spot-seamed with a minimum 24-inch overlap in all directions.

### **3.05 CRUSHED PERMEABLE STONE**

- A. The specified permeable stone shall be carefully placed and compacted over the subgrade to the grades and elevations shown on the drawings. If the thickness of the planned permeable stone exceeds 8-inches, the rock shall be placed in horizontal layers not exceeding 8 inches and each layer compacted to 90% of the maximum density to firm and unyielding surface with a vibratory smooth drum roller.
- B. The Contractor's Synthetic Turf Installer shall observe the initial placement and compaction of permeable stone in a 20-foot by 20-foot trial area and determine whether the surface is suitable to install the synthetic turf. The Contractor shall modify installation procedures and/or material used until the Contractor's Synthetic Turf Installer is satisfied.
- C. Should any segregation of the material occur, during any stage of the stockpiling, spreading or grading, the Contractor shall immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation.
- D. Finished surface shall be proof to verify a non-yielding, smooth, flat surface.
- E. Final permeable stone grades shall conform to the lines and grades shown on the drawings. The measured grades shall not deviate more than 0.04 feet from the planned grades and not vary more than 0.02 feet in 10 feet in any direction. Laser grading is recommended.
- F. The surface of the permeable shall be sloped as shown on the drawings.
- G. Permeable stone grades shall be completed by the Contractor and inspected by the Owner and Engineer prior to commencing with the subsequent work items.
- H. A conformance survey shall be performed by a licensed surveyor.
- I. Field percolation testing shall be conducted by the Owner's Testing Agent in accordance with Section 1.04.F.2. The Contractor shall correct the drain rock layer, at no cost to the Owner, if the minimum percolation requirement is not achieved.

### **3.06 FINISHING OF SURFACE PLANARITY**

- A. Finish surface planarity shall be adjusted by the Contractor using the string line method. A mason's line held taught between two workman separated by a distance of approximately 40 feet, shall be placed directly on the finished rock surface, parallel to the long axis of the field. A third workman shall check for separations between the mason's line and the finished surface that are equal to or greater than the tolerances specified in 3.09 E. The entire finished surface shall be checked with the mason's line in increments no greater than 3 linear feet. Areas of separation shall be identified with marking paint and the depth of separation indicated.
- B. Areas identified with marking paint shall be filled with drain rock to the depth indicated and raked by hand. Filled areas shall be compacted to 90% of the maximum density to provide a non-yielding, smooth, flat surface.
- C. The entire finished surface shall be rechecked using the method described in 3.10 A.

- D. Roller marks, tire tracks, footprints or other impressions on the finished surface shall be raked out where they are equal to or greater than the tolerances specified in 3.09 E.
- E. A conformance survey shall be performed by a licensed surveyor.
- F. Following long and short axis string line check and any subsequent corrections, the Contractor shall notify the Owner that the finished surface is ready for inspection.
- G. The Contractor shall perform a final string line check along the long axis of the field in the presence of the Owner and Contractor's Synthetic Turf Installer. Finished surface planarity shall be approved by the Owner prior to installation of synthetic turf system.
- H. Damage to the finished surface planarity occurring after approval shall be corrected by the Contractor using the method described in 3.10 A and 3.10 B.

#### **PART 4 - MEASUREMENT AND PAYMENT**

##### **4.01 MEASUREMENT**

- A. Measurement of "Crushed Permeable Stone" shall be per ton.

##### **4.02 PAYMENT**

- A. The weight of material to be paid for will be determined by deducting from the weight of material delivered to the work, the weight of water in the material at the time of weighing in excess of one percentage (1%) point more than the optimum moisture content as determined by California Test Method No. 216. The weight of water in the material at the time of weighing will be as determined by California Test Method no. 226. The weight of water deducted as provided herein will not be paid for. The contract unit prices paid for the various items in "Permeable Base One Stone for Synthetic Turf" shall include full compensation for furnishing all labor, materials, geotextile fabric, tools, equipment, and incidentals, and for doing all work involved, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.
- B. If the total quantity of aggregate base exceeds the bid quantity by more than 25%, the Contractor will be paid for all the aggregate base using the bid unit price, and no adjustment will be made to the unit price as bid.

**END OF SECTION 32 11 23**

**SECTION 32 12 00**  
**FLEXIBLE PAVING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Prime coat.
- B. Tack coat.
- C. Asphaltic concrete paving.
- D. Asphaltic concrete overlay.
- E. Slurry seals.
- F. Speed bumps.
- G. Asphalt curbs.
- H. Pavement grinding.

**1.02 RELATED SECTIONS**

- A. Section 01 50 50 – Erosion Control
- B. Section 31 20 00 – Earth Moving
- C. Section 31 23 00 – Excavation and Fill
- D. Section 31 23 33 – Trenching and Backfilling
- E. Section 32 11 00 – Base Course

**1.03 RELATED DOCUMENTS**

- A. Geotechnical Report.
- B. ASTM:
  - 1. D 979: Practice for Sampling Bituminous Paving Mixtures.
  - 2. D 1073: Specification for Fine Aggregate for Bituminous Paving Mixtures.
  - 3. D 1188: Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.
  - 4. D 2041: Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

5. D 2726: Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
  6. D 2950: Test Method for Density of Bituminous Concrete in Place by Nuclear Method.
  7. D 3549: Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
  8. D 3666: Specifications for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Mixtures.
- C. Caltrans Standard Specifications.
1. Section 37: Bituminous Seals.
  2. Section 39: Asphalt Concrete.
  3. Section 88: Engineering Fabrics.
  4. Section 92: Asphalt Binders.
  5. Section 93: Liquid Asphalts.
  6. Section 94: Asphaltic Emulsions.

#### **1.04 DEFINITIONS**

- A. ASTM: American Society for Testing Materials.

#### **1.05 QUALITY ASSURANCE**

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness of Asphaltic Concrete: In-place compacted thickness of asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
1. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to Caltrans 309, and compacted according to job-mix specifications.

2. In-place density of compacted pavement may be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
  - a. One core sample may be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
  - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with Caltrans 309 or ASTM D 2726.

## **1.06 SUBMITTALS**

- A. Follow submittal procedures outlined in Division 1.
- B. Job-Mix Designs: Certificates signed by manufacturers certifying that each asphaltic concrete mix complies with requirements.
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

## **1.07 PROJECT CONDITIONS**

- A. Environmental Limitations:
  1. Prime Coat: Minimum surface temperature of 60 deg F at application.
  2. Tack Coat: Minimum surface temperature of 60 deg F at application.
  3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at application.
  4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at application.
  5. Reinforcing Fabric: Air temperature is 50 deg F and rising and pavement temperature is 40 deg F and rising.

## **PART 2 - PRODUCTS**

### **2.01 ASPHALTIC CONCRETE**

- A. Caltrans Standard Specifications Section 39, Type B.
- B. Asphalt Materials:
  1. Asphalt: Caltrans Standard Specification Section 92, steam refined paving asphalt.
    - a. Asphalt Curbs: use grade PG 70-10
    - b. All other asphalt products: use grade PG 64-10.
  2. Prime Coat: Caltrans Standard Specification Section 92, SC-70.
  3. Tack Coat: Caltrans Standard Specification Section 93, SS1.
  4. Asphaltic Emulsion: Caltrans Standard Specification Section 94, quick-setting type, Grade QS1h anionic or CQS1h cationic.
- C. Aggregates: Conform to Caltrans Standard Specification Sections 37-2.02C and 39-2.02 as applicable.

- D. Storing, Proportioning and Mixing Materials: Caltrans Standard Specification Section 39-3.
- E. Paving Fabric: Caltrans Standard Specification Section 96.
- F. Sand: ASTM D 1073, Grade No. 2 or 3.

## **2.02 AGGREGATE BASE**

- A. Aggregate base shall comply with the provisions in Section 32 11 00 – Base Course.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Owner in writing of any unsatisfactory conditions. Do not begin paving until these conditions have been satisfactorily corrected.

### **3.02 PAVEMENT GRINDING**

- A. Clean existing paving surface of loose or deleterious material immediately before pavement grinding.
- B. Grind conforms as indicated.

### **3.03 SURFACE PREPARATION FOR AGGREGATE BASE MATERIALS**

- A. General: Immediately before placing asphalt materials remove loose and deleterious material from substrate surfaces and ensure that prepared subgrade is ready to receive paving according to the Caltrans Standard Specification Section 39-4.01.
- B. Prime Coat: Apply uniformly over surface of compacted-aggregate base according to the Caltrans Standard Specification Section 39-4.02. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 24 hours minimum.
  - 1. If prime coat is not entirely absorbed within 8 hours after application, spread excess prime coat with hand tools and broadcast sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.

- C. Tack Coat: Apply uniformly to all vertical surfaces against which asphaltic concrete is to be placed, including existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new asphalt pavement, according to the Caltrans Standard Specification Section 39-4.02.
  - 1. Allow tack coat to cure undisturbed before paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### **3.04 SURFACE PREPARATION FOR PAVEMENT AT ASPHALTIC CONCRETE OVERLAYS AND SLURRY SEALS**

- A. Pavement Irregularities: Level with asphaltic concrete, Type B, No. 4 maximum.
- B. Pavement Cracks:
  - 1. Less than ¼-inch wide: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion.
  - 2. Wider than ¼-inch: provide crack repair as shown on the project plans.
- C. Clean surface of all material, such as leaves, dirt, sand, gravel, water and vegetation prior to applying binder of paving asphalt to existing surface.

### **3.05 ASPHALTIC CONCRETE SPREADING AND COMPACTING EQUIPMENT**

- A. Spreading Equipment: Caltrans Standard Specification Section 39-5.01.
- B. Compaction Equipment: Caltrans Standard Specification Section 39-5.02.

### **3.06 ASPHALTIC CONCRETE PLACEMENT**

- A. Place, spread and compact asphaltic concrete to required grade, cross section, and thickness according to the Caltrans Standard Specification Sections 39-6.01, 39-6.02 and 39-6.03.
- B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### **3.07 JOINTS**

- A. Construct joints to ensure continuous bond between adjoining paving sections according to the Caltrans Standard Specification Sections 39-6.01 and 39-6.02.
  - 1. Construct joints free of depressions with same texture and smoothness as other sections of asphalt course.
  - 2. Clean contact surfaces and apply tack coat.
  - 3. Offset longitudinal joints in successive courses a minimum of 6 inches.
  - 4. Offset transverse joints in successive courses a minimum of 24 inches.
  - 5. Compact joints as soon as asphaltic concrete will bear roller weight without excessive displacement.



### **3.08 COMPACTION**

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact according to the Caltrans Standard Specification Sections 39-6.01 and 39-6.03.
- B. Compaction Requirements: Average Density to be 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- C. Finish Rolling: Finish roll paved surfaces to remove roller marks while asphalt is still warm.
- D. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- E. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh asphalt. Compact by rolling to specified density and surface smoothness.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### **3.09 INSTALLATION TOLERANCES**

- A. Asphalt Pavement:
  - 1. Course thickness and surface smoothness within the tolerances in the Caltrans Standard Specification Sections 39-6.01, 39-6.02 and 39-6.03.
  - 2. Total Thickness: Not less than indicated.
- B. Trench Patch:
  - 1. Compacted surface: Within 0.01 foot of adjacent pavement.
  - 2. Do not create ponding.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Measurement of "Hot Mix Asphalt" shall be per ton.

### **4.02 PAYMENT**

- A. The contract unit prices paid for the various items in "Hot Mix Asphalt" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Flexible Paving", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

- B. Full compensation for furnishing and replacing aggregate base under new concrete shall be considered as included in the price paid for the various contract items of concrete work involved and no additional compensation will be allowed therefor.
- C. Excess Asphalt Concrete will not be measured nor paid for.

**END OF SECTION 32 12 00**

**SECTION 32 15 40**  
**DECOMPOSED GRANITE PAVING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. The scope of work outlined in this Section includes the following items of work, as detailed in these Contract Specifications, as shown on the Contract Drawings or reasonably implied therefrom and is not limited to the following items:
  - 1. Decomposed Granite
  - 2. Redwood Header

**1.02 RELATED SECTIONS**

- A. Section 12 93 00                      Site Furnishings & Accessories
- B. Section 31 23 00                      Excavation and Fill
- C. Section 32 11 00                      Base Courses
- D. Section 32 13 16                      Cement and Concrete for Exterior Improvements
- E. Section 32 90 00                      Landscape Planting

**1.03 RELATED REQUIREMENTS**

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.
- B. These Contract Specifications are part of the Contract Drawings and shall include all labor, materials, equipment, reasonable incidentals, and services necessary for the execution of the Work installed complete in place.
- C. Refer to all other sections, determine the extent and character of related work, and coordinate all work to produce a complete, properly constructed product.
- D. Percent Compaction: As referred to in these Specifications, percent compaction or relative compaction is required in-place dry density of material expressed as a percentage of the maximum dry density of the same material determined in accordance with ASTM D1557. Optimum moisture content is the moisture content corresponding to the maximum dry density determined by ASTM D2216.
- E. American Society for Testing and Materials, (ASTM).
- F. Standard Specifications: Where referred to in these Specifications, "State Specifications" shall mean the California Caltrans Specifications, latest edition.

#### **1.04 QUALITY CONTROL AND ASSURANCE**

- A. Decomposed granite paving shall comply with these specifications and all applicable sections of the above named references and standards.
- B. Installation: Performed only by skilled workmen with satisfactory record of performance on completed projects of comparable size and quality.
- C. Sample Panel: Before starting decomposed granite paving, provide a sample panel including redwood headers. Build panel at the site of full thickness and approximately 4 feet x 4 feet. Correct and rebuild sample panel until City of San Rafael's acceptance of the work. Retain panel during construction as a standard for completed paving work.
  - 1. The approved sample panel may be a portion of the work and remain in place. Location as directed by the City of San Rafael's representative.
- D. Do not change source of decomposed granite during the course of the work.

#### **1.05 VISIT TO THE SITE**

- A. The contractor shall visit the construction site and shall take all measurements and obtain any other information as may be necessary for a complete and conclusive bid.

#### **1.06 SUBMITTALS**

- A. Submit manufacturer's product data and specifications.
- B. Submit the following material samples for the City of San Rafael's written approval prior to delivery of materials to site, or preparation of sample panel. Provide suppliers sieve analysis with each sample.
  - 1. Base Course: one-half cubic foot.
  - 2. Surface Course: one-half cubic foot.
- C. Submit material certificates for base materials.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store loose granular materials in a well drained area on a solid surface to prevent mixing with foreign materials.

#### **1.08 PROJECT CONDITIONS**

- A. Review installation procedures and coordinate paving work with other work affected by decomposed granite paving work. Do not begin the work until installation of trees and boulders is complete.
- B. Protect partially completed paving against weather damage when work is not in progress.
- C. Provide temporary barricades and warning lights as required for protection of project work and public safety.

- D. Protect adjacent work from damage, soiling, or staining during paving operations.

**PART 2 - PRODUCTS**

**2.01 DECOMPOSED GRANITE**

- A. Aggregate Base: Class 2, Standard Specification Section 26-1.02A, free from vegetable matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base.
- B. Surface Course: #4 minus Path Fines by Felton Quarry, Granite Construction Co., (408) 335-3445, or equal. decomposed granite; color: Tan or buff.

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8"	89-99
#4	95-100
#8	75-90
#30	35-50
#200	10-19

**2.02 BINDER**

- A. Technisoil G3 Binder or approved equal.

**2.03 ACCESSORIES**

- A. Headers and Stakes per plan.
- B. Soil Sterilizer: Granular weed growth inhibiting type herbicide, labeled for use under pavement surfaces. Material shall not damage trees and plant adjacent to pavement surfaces.

**PART 3 - EXECUTION**

**3.01 INSPECTION**

- A. Examine the substrate under which paving is to be installed. Notify the City of San Rafael, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

**3.02 LINES AND LEVELS**

- A. Finished grade of decomposed granite shall be 1/4" to 1/2" below top of adjacent header. Any settlement below this level shall be corrected.
- B. Surfaces shall be true to within 1/8" inch when tested in any direction with a 10 foot straightedge. There shall be no pools of water standing on the pavement after a rain.

- C. Transition between changes in vertical gradient of walks and paving shall be smooth and gradual with no abrupt or sharp changes.

### **3.03 PREPARATION OF SUBGRADE**

- A. Preparation of subgrade: specified in Section 31 23 00 – Excavation and Fill.

### **3.04 WEED CONTROL**

- A. Apply soil sterilizer over subgrade prior to installing paving in accordance with the manufacturer's printed instructions.

### **3.05 DECOMPOSED GRANITE**

- A. General: Uniformly spread approved material and compact to grades and lines shown. Compaction shall be made by power rollers to 90%. Each lift shall be compacted separately immediately after placement. Apply water as required.
- B. Base Course: Place over prepared subgrade, and compact to depth shown. Finish to a tolerance of +1/4".
- C. Surface Course: Place surface material over base course and compact to depth shown.
- D. When surface areas have been rolled and it becomes necessary to add thin layer of material to bring surface to grade, previously rolled or compacted area shall be scarified to provide bond with added material.
- E. Finish surface of walks shall be uniform in appearance as to texture and color, and shall have a firm stable consistency, resistant to erosion.
- F. Finish surfaces shall be flush to all adjacent conforms, sloped to drain without bird baths.

### **3.06 HEADERS**

- A. Install headers true to line and grade as indicated in the Drawings.
- B. Sharp radii may be constructed of laminated material to the thickness of header board indicated on the Drawings.
- C. Stakes shall be a minimum 18 inches long (increase length as necessary per soil conditions for solid anchorage) at 4 feet on center.
- D. Double stake corners and splices.
- E. Securely attach stakes to headers with corrosion resistant decking screws.

### **3.07 PROTECTION**

- A. Restrict traffic from paving surfaces during construction and until final project acceptance by City of San Rafael.

### **3.08 DEFECTIVE DECOMPOSED GRANITE PAVING**

- A. Decomposed Granite work which does not meet the Contract Specifications or Contract Drawings shall be considered defective.
- B. Color and finish of all Decomposed Granite work shall match. Inconsistent color, and finishing shall be considered defective.
- C. Decomposed Granite work which ponds, does not conform to ADA requirements, does not match grading, or is otherwise deemed non acceptable shall be considered defective.
- D. Defective Decomposed Granite shall be repaired or replaced as directed by the Landscape Architect, at no added expense to the Contract. Repair materials may include new Decomposed Granite fines, stabilizer, and header.

### **3.09 CLEANING**

- A. Perform cleaning during installation of work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from crushed stone paving operations.

## **PART 4 - MEASUREMENT & PAYMENT**

### **4.01 DECOMPOSED GRANITE**

- A. **Measurement:** Measurement of “Decomposed Granite” shall be per square foot (SF).
- B. **Payment:** The contract unit prices paid for the various items in “Decomposed Granite” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Decomposed Granite”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.02 REDWOOD HEADER**

- A. **Measurement:** Measurement of “Redwood Header” shall be per lineal foot (LF).
- B. **Payment:** The contract unit prices paid for the various items in “Redwood Header” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Redwood Header”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 32 15 40**

**SECTION 32 17 23**  
**LANDSCAPE PAVEMENT MARKINGS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Traffic Striping
- B. Pavement Makings

**1.02 RELATED DOCUMENTS**

- A. ASTM:
  - 1. ASTM D6359-99 “Minimum Retroreflectance of Newly Applied Pavement Marking Using Portable Hand-Operated Instruments”.
- B. Caltrans Standard Specifications.
  - 1. Section 37: Bituminous Seals.
  - 2. Section 39: Asphalt Concrete.
  - 3. Section 92: Asphalt Binders.
  - 4. Section 93: Liquid Asphalts.
  - 5. Section 94: Asphaltic Emulsions.

**1.03 DEFINITIONS**

- A. ASTM: American Society for Testing Materials.

**1.04 SUBMITTALS**

- A. Follow submittal procedures outlined in Division 1.
- B. Product: Striping products
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

**PART 2 - PRODUCTS**

**2.01 THERMOPLASTIC STRIPING**

- A. Thermoplastic material shall be free of lead and chromium and shall conform to the requirements in State Specification PTH 02ALKYD.



- B. Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359 99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 250 mcd/m<sup>2</sup>lx 1. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 mcd/m<sup>2</sup>lx 1.
- C. Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern. The minimum application rate is based on a solid stripe of 100 mm in width. Thermoplastic traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

A. Minimum Stripe Thickness (mm)	B. Minimum Application Rate (kg/m)
C. 2.0	D. 0.4
E. 2.5	F. 0.5

- G.
- D. Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

## 2.02 PAVEMENT MARKERS

- A. Pavement markers shall be placed in conformance with the provisions in Section 81-35, "Pavement Markers," of the State Standard Specifications and these Technical Specifications.
- B. Thermoplastic roadway markings such as parking stalls, etc., shall be in accordance with Section 84-2.03C, "Application of Stripes and Markings," of the State Standard Specifications.
- C. Existing pavement markers to be removed shall be removed in accordance with Section 81-8.03B, "Remove Pavement Markers," of the State Standard Specifications

## 2.03 PAINTED CURBS

- A. Painted red curb shall conform to Section 84-2.02C, "Paint" & Section 84-2.03C(3) "Painted Traffic Stripes and Pavement Markings" of the State Standard Specifications. The Contractor shall paint the tops and faces of curbs red as shown on the plans, and as directed by the Engineer in the field. Contractor to submit color sample for red curb a minimum 24 hours before placement for review.

## **PART 3 - EXECUTION**

### **3.01 REMOVAL OF TRAFFIC STRIPES, PAVEMENT MARKINGS AND PAVEMENT MARKERS**

- A. Where blast cleaning is used for the removal of painted traffic stripes and pavement markings, or for removal of objectionable material, remove the residue, including dust and water, immediately after contact with the surface being treated. Remove by a vacuum attachment operating concurrently with the blast cleaning operation.
- B. Where grinding is used for the removal of thermoplastic traffic stripes and pavement markings; remove the residue by means of a vacuum attachment to the grinding machine. Do not allow the residue to flow across or be left on, the pavement.
- C. Where markings are to be removed by blast cleaning or by grinding, the removed area shall be approximately rectangular so that no imprint of the removed marking remains on the pavement.
- D. Waste from removal of yellow painted traffic stripe may contain lead chromate. Residue produced when yellow paint is removed may contain heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and may produce toxic fumes when heated. As such, when grinding or other methods approved by the Owner's Representative are used to remove yellow painted traffic stripes, the removed residue, including dust, shall be collected and contained immediately. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow painted traffic stripe to the Owner's Representative for approval not less than fifteen (15) days prior to the start of the removal operations. Removal operations shall not be started until the Owner's Representative has approved the work plan.
- E. Contractor will be responsible for repairing any damage to the pavement during removal of pavement markers. Damage to the pavement, resulting from removal of pavement markers, shall be considered as any depression more than 1/4-inch deep.

### **3.02 TEMPORARY PAVEMENT MARKERS**

- A. If permanent pavement markers cannot be installed immediately, and the street or road is to be placed in service, install short term, temporary pavement markers on the new pavement prior to opening the street or road to traffic.
- B. Place markers, at a minimum, of 24 feet on centers, or as required by the governmental agency having jurisdiction, in the appropriate colors to delineate centerlines and travel lanes on multi-lane roadways.

### **3.03 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS**

- A. Apply in conformance with the manufacturer's instructions and the applicable requirements Caltrans Standard Specification Section 84-2.03, Construction, and Caltrans Standard Plans A20A through A20D, and A24A through A24E.

**3.04 PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS**

- A. Apply in conformance with the manufacturer's instructions and the applicable requirements of Caltrans Standard Specification Section 84-3.03, 3.04 and 3.05 and Caltrans Standard Plans A20A through A20D, and A24A through A24F.

**3.05 PAVEMENT MARKERS**

- A. Place in accordance with Caltrans Standard Specification Section 81-3.03, Construction.
- B. Pavement recesses are not required. Markers shall be installed accurately to the line established by the Owner's Representative. No markers shall be installed until the surface has been approved by the Owner's Representative.

**3.06 TRAFFIC CONTROL SIGNS**

- A. Install in accordance with Caltrans Standard Specification Sections 82-2.03 and 82-3.03, Caltrans Standard Plan RS1, the applicable requirements of the State of California Department of Transportation Maintenance Manual and the details shown on the Plans. The horizontal locations shown on Caltrans Standard Plan RS1 shall not be applicable, the horizontal location shall be as shown on the Plans.
- B. Portland cement concrete for post foundations shall be of the configuration shown on the Plans.
- C. After erection, damage to traffic sign faces shall be touched up or the sign replaced.

**3.07 STREET NAME SIGNS**

- A. Install in accordance with the manufacturer's instructions and as shown on the Plans.
- B. Horizontal location shall be as shown on the Plans.
- C. Portland cement concrete for post foundations shall be of the configuration shown on the Plans.

**3.08 REFLECTORIZED OBJECT MARKERS.**

- A. Install in accordance with Caltrans Standard Specification Section 82-5.03, Construction, except that the metal marker posts shall not be driven in place without prior approval of the Owner's Representative.
- B. Install at locations shown on the Plans.

**3.09 STREET SURVEY MONUMENTS**

- A. Install Survey Monuments in accordance with Caltrans Standard Specification Section 78-2.03, Construction and Caltrans Standard Plan A74, except that the marker disk will not be furnished. Exact point in marker to be determined by an accurate survey and placed by a California Licensed Land Surveyors in accordance with the Professional Land Surveyors' Act.

**3.10 PROTECTION**

- A. Protect the newly installed traffic stripes and pavement markings from damage until the material has cured.
- B. Replace any traffic stripes or pavement markings or markers broken, misaligned or otherwise disturbed prior to opening roadway to traffic.

**3.11 RESTORATION OF EXISTING IMPROVEMENTS**

- A. Existing signs striping or other markings removed or damaged due to the installation of new facilities shall be replaced in kind.
- B. Existing landscaping or planting removed, damaged or disturbed due to the installation of traffic control signs or street name signs shall be replaced in kind.

**PART 4 - MEASUREMENT AND PAYMENT**

**4.01 MEASUREMENT**

- A. Measurement of “Striping” shall be per linear foot.

**4.02 PAYMENT**

- A. The contract unit prices paid for the various items in “Pavement Markings” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Pavement Markings”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.
- B. “Striping” includes parking lot thermoplastic pavement striping as shown on the Horizontal Control Plan and Plans and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION**

**SECTION 32 18 16**  
**PLAYGROUND PROTECTIVE SURFACING**

**PART 1 - GENERAL**

**1.1. RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Divisions 1 Specifications Sections, apply to this section.

**1.2. SUMMARY**

- A. This Section includes the following:
  - 1. Engineered Wood Fiber
- B. Related Sections:
  - 1. Section 12 93 00: Site Furnishing and Accessories

**1.3. DEFINITIONS**

- A. CPSC: U.S. Consumer Products Safety Commission
- B. Critical Height: Standard measure of shock attenuation. According to Consumer Products Safety Commission (CPSC) No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur."
- C. SBR: Styrene-butadiene rubber.
- D. EPDM: Ethylene propylene diene terpolymer rubber.

**1.4. REFERENCE STANDARDS**

- A. ASTM – American Society for Testing and Materials.
  - 1. F1292-09 - Standard Test Method for Impact Attenuation or Critical Fall Height of Surfacing Materials Under and Around Playground Equipment.
  - 2. F1951-09: Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
  - 3. F2075 - Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment.
  - 4. D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
- B. IPEMA – International Play Equipment Manufacturers Association

2. Public Play Surfacing Certified to ASTM F1292-09 - Standard Test Method for Impact Attenuation or Critical Fall Height of Surfacing Materials Under and Around Playground Equipment.

### **1.5. PERFORMANCE REQUIREMENTS**

- A. Surfacing systems shall be capable of meeting the following performance requirements as applicable:
  1. IPEMA Public Play Surfacing Certified.
  2. ASTM F1292-09: Impact attenuation. Playground protective surface shall meet performance requirements for the impact attenuation of playground surfacing materials installed within the use zone of playground equipment, as specified by Architect.
  3. F1951-09: Standard Specification for Determination of Accessibility of Surface Systems under and Around Playground Equipment.

### **1.6. SUBMITALS**

- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Include materials, plans, cross sections, drainage, installation, and edge termination.
- D. Samples for Initial Selection:
  1. Include similar samples of playground surface system and accessories involving color selection.
- E. Samples for Verification:
  1. Minimum 1-quart loose-fill surface sealed in a container.
  2. Twelve-inch (12”) long by full-size cross section of border edging.
  3. Minimum twelve-inch (12”) by- twelve-inch (12”) Sample of geosynthetic fabric.
- F. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
  1. Extent of surface systems and use zones for equipment.
  2. Critical heights for playground surfaces and fall heights for equipment.
- G. Qualification Data: For qualified Installer and testing agency.
- H. Material Certificates: For each type of playground surface system, from manufacturer.
- I. Material Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each playground surface system.
- J. Product Certificates: For each type of unitary synthetic playground surface system, from manufacturer, including IPEMA

- K. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each unitary synthetic playground surface system.
- L. Warranty: Sample of special warranty.
- M. Maintenance Data: Maintenance manuals to include manufacturer's data on maintenance of playground surface system.

#### **1.7. MAINTENANCE MATERIAL SUBMITALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

#### **1.8. QUALITY CONTROL**

- E. Installer Qualifications: An employer of workers trained and approved by manufacturer. Installer's Site Superintendent is to have a minimum of five (5) years of experience installing similar materials on similarly scaled projects.
- F. Source Limitations: Obtain playground surface system materials, including primers and binders, from single source from single manufacturer.
  - 1. Provide secondary materials including adhesives, primers, and geosynthetics, and repair materials of type and from source recommended by manufacturer of playground surface system materials.
- G. Standards and Guidelines: Comply with CPSC No. 325, "Handbook for Public Playground Safety"; IPEMA-certified product, ASTM F 1292; and ASTM F 1487.
- H. Color: All colors of surfacing shall be as specified in the Contract Documents. Colors shall be uniform in appearance. In the case of color percentages of material, the mixtures of color shall be uniform and consistent.

#### **1.9. PRESERVATION OF PROPERTY**

- I. Protect existing on- and off-site improvements, utilities, irrigation, pavement, and plants from damage. No vehicle shall be allowed to pass over curbs, sidewalk, and planting areas unless proper protection is provided. Damage resulting from Contractor's operations shall be repaired or replaced at the Contractor's expense and to the Engineer's satisfaction.
- J. Contractor to submit a work plan depicting all areas to be protected, protection methods, proposed equipment details including size and weight, haul routes, and schedule of work for review and approval by the District.

#### **1.10. PROJECT CONDITIONS**

- K. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements.

**1.11. WARRANTY**

- L. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground surface system that fail in materials or workmanship within the specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - Reduction in impact attenuation.
    - Deterioration of surface and other materials beyond normal weathering.
    - Minimum 5 Warranty Period: Five (5) years from date of Substantial Completion.

**1.12. DELIVERY, STORAGE, AND HANDLING**

- M. Materials and equipment shall be delivered in manufacturer’s original, unopened, undamaged containers with identification labels intact and stored, if necessary, in accordance with the manufacturer's recommendations, in an area as directed by the Owner’s Representative.

**PART 2 – PRODUCTS**

**2.1 ENGINEERED WOOD FIBER**

- A. Product used shall be FibarSystemn 300 or approved equal.
- B. Surfacing shall be a mix of random-sized wood fibers. Standard wood chips or bark mulch will not be acceptable.
- C. Contractor shall guarantee sieve analysis of wood fiber as follows: Greater than 85% passing 3/8" sieve. Less than 50% passing #60 sieve.
- D. Wood fiber shall have no twigs, bark, leaf debris or other organic material incorporated within.
- E. Recycled wood from used pallets are not acceptable.
- F. The amount of Fibar Engineered Wood Fiber necessary to provide the approximate depth after compaction is as follows:

<u>Depth</u>	<u>Quantity</u>
8"	38 cubic yards per 1,000 sq. ft. of playground area
9"	42 cubic yards per 1,000 sq. ft. of playground area
10"	46 cubic yards per 1,000 sq. ft. of playground area
11"	48 cubic yards per 1,000 sq. ft. of playground area
12"	50 cubic yards per 1,000 sq. ft. of playground area

- G. Drainage System:



1. Drainage system used shall be FibarDrain that channels water away from play surfacing area. Manufacturer Fibar Playground Surfaces or approved equal.
2. Drainage system's matrix shall have a minimum flow rate of 10 gpm/ft.
3. Matrix shall consist of needle-punched 100% non-woven geotextile sleeve encasing a monofilament nylon mesh. Laid out on 6'-0 centers in the direction of the grade.

H. Geotextile Barrier

1. Product shall be FibarFelt, Manufacturer Fibar Playground Surfaces or approved equal.
2. Needle-punched 100% non-woven geotextile fabric that separates the Engineered Wood Fiber from soil below. Seams shall be overlapped 3".

I. Wood Fiber Mat:

Product shall be recycled rubber, FibarMat, Manufactured by Fibar Playground Systems, or approved equal.

1. Dimensions are minimum 36" by 36" by 1.5" thick with beveled edges on all sides to meet ADA Compliance.
2. 3. Wear mat must meet Consumer Product Safety Commission Guidelines for a drop-height of 3' in accordance with ASTM F1292. When installed on top of a Fibar Systems surface of 8" depth or greater.
3. 4. FibarMat must meet ASTM F1292 at a drop height of 12' (impact attenuation performance tests are available on request.)
4. 5. Place under each swing seat, tire swing, slide exit, and sliding poles.
5. 6. Can be placed on top, in middle or under Engineered Wood Fiber (but over FibarFelt).

J. CRITICAL FALL HEIGHTS AND ENGINEERED WOOD FIBER

1. Safety Surfacing depth is based upon Critical Fall heights established for each Play structure/apparatus. See Spec Section 11 68 16 Play Structures/12 93 00 Site Furnishings. It is the Contractor's responsibility to verify critical fall heights of play structures prior to determining depth requirements for safety surfacing. Contact manufacturer of play structures for more information.
2. Chart below list depths per Critical Fall Height. It is included as a guideline. It is the responsibility of the Contractor to verify thickness required with engineered wood fiber manufacturer to determine depth requirements for safety surfacing.

SPECIFICATIONS			
SYSTEM	DESCRIPTION	CRITICAL HT.	USE
312	12" Fibar®, <b>FibarFelt</b> , <b>FibarDrain</b> , <b>FibarMat</b>	14'	Playground
310	10" Fibar®, <b>FibarFelt</b> , <b>FibarDrain</b> , <b>FibarMat</b>	12'	Playground
308	8" Fibar®, <b>FibarFelt</b> , <b>FibarDrain</b> , <b>FibarMat</b>	10'	Playground
<i>Depth measurements are approximate after compaction.</i>			

## **2.2 DRAINAGE**

- A. See Division 33 Section 33 46 00 Subdrainage.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, subgrade and substrate conditions, drainage, and other conditions affecting performance of the Work.
- B. Surface Substrates: Verify that substrates are satisfactory for unitary playground surface system installation and that substrate surfaces are dry, cured, and uniformly level or sloped to drain within recommended tolerances according to playground surface system manufacturer's written requirements for cross-section profile.
  - 1. Concrete Substrates: Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system or that may interfere with adhesive bond. Determine adhesion, dryness, and acidity characteristics by performing procedures recommended in writing by playground surface system manufacturer.
  - 2. Gravel Substrate: Three quarter-inch (3/4") angular gravel drainage stone, clean and washed; depth as indicated on Contract Drawings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. General: Prepare substrates to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- B. Concrete Substrates: Provide sound supportive surface for playground surface system.
  - 1. Repair unsatisfactory surfaces and fill holes and depressions.
  - 2. Mechanically scarify or otherwise prepare concrete substrates to achieve recommended degree of roughness.
  - 3. Saw cut concrete for terminal edges of playground surface systems as indicated.
  - 4. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through playground surface system.
- C. Gravel Substrates: Provide sound supportive surface for playground surface system.
  - 1. Gravel substrate is to be an approved substrate as stated by the manufacturer of the final play surface. Provide documentation from manufacturer prior to construction of play surface.
  - 2. Edge boundary structures and drainage systems are to be installed prior to placement of gravel substrate.

3. Place and consolidate gravel substrate within edge boundary structures shown on Contract Drawings. Depth as shown on Contract Drawings.
4. Smooth gravel surface by raking. Obtain Project Manager's approval prior to placing surface.
5. Repair any damage to gravel surface from foot traffic prior to placing final surface.

### **3.3 INSTALLATION, GENERAL**

- A. General: Comply with playground surface system manufacturer's written installation instructions. Install playground surface system over area and in thickness indicated.
- B. Verify that all sub-base leveling is complete prior to installation.
- C. Installer/Contractor shall examine the surface to receive the shock absorbing playground pad and accept the sub-base planarity in writing prior to the beginning of installation.
  1. Acceptance is dependent upon the Owner's test results indicating compaction and planarity are in compliance with manufacturer's specifications.
  2. The surface shall be accepted by Installer as "clean" as installation commences and shall be maintained in that condition throughout the process.
- D. Compaction of the aggregate base shall be a minimum of 90%, in accordance with ASTM D1557 (Modified Proctor procedure); and the surface tolerance shall not exceed 0-1/4 inch over 10 feet and 0-1/2 inch from design grade.
- E. Correct conditions detrimental to timely and proper completion of Work.
- F. Do not proceed until unsatisfactory conditions are corrected.
- G. Beginning of installation means acceptance of existing conditions.

### **3.4 DRAINAGE SYSTEMS**

- A. Install drainage systems as indicated on Contract Drawings, Details, and per Division 33 Section 33 46 00 Subdrainage.

### **3.5 WOOD FIBER SURFACING**

- A. The wood fiber surface shall be spread to uniform depth, installed to allow for settling and natural compaction. To allow for compaction, the following formulas must be used to determine the correct number of cubic yards: 12" deep: Sq. ft. of playground x 0.05.
- B. Wood Fiber Surfacing - In-Ground Installation (Exiting at Grade Level)
  1. Excavate area to proper depth, based on Critical Fall Height.
  2. Minimum 1% downward grade to ensure proper drainage to FibarDrain Strip.

3. On grades of greater than 10% - use of FibarSystems is not recommended.
4. Remove all roots, stones, and vegetation.
5. Accurately grade and firmly compact entire area, especially where fill materials have been utilized.
6. Excavate trench 2" wide x 6" deep, perpendicular to grade at lowest point of playground area.
7. Install FibarDrain and connect low end of strip to storm drain or similar device to remove collected water.
8. Install playground equipment.
9. Install retaining border or curb.
10. Install FibarDrain strips at 6' centers in direction of grade.
11. Cover sub-grade and drainage trench with FibarFelt.
  - a. Allowing 3" overlap at all seams.
  - b. Slit to fit around footings of equipment.
  - c. Overlap all slits with either next piece of FibarFelt or scrap piece, to ensure complete coverage.
12. Install FibarMat wear mats either on FibarFelt, in middle of Fibar Engineered Wood Fiber® or on top of system.
13. Permanently mark, with paint or other type of permanent marker, all the legs of the playground equipment with the compacted system design depth.
14. Spread Fibar EngineeredWood Fiber using a Bobcat, small front-end loader or Express Blower Trucks.
15. Care should be taken when driving over FibarDrain.
16. Do not make sharp turns on FibarFelt or FibarDrain.
17. Install all materials delivered.
18. Additional materials are supplied to account for natural compaction.
19. Material may be several inches high, until it compacts.
20. Feather edges to make smooth transition to grade or border.
21. Hand spread and rake for smooth, finished surface.

C. Fibar Mat

1. Fibar Mat must be installed under all swings and at slide exits to preserve Fibar System Warranty. It should also be used under other heavy-use equipment, including sliding poles.
2. When a FibarMat is installed at the base of a sliding pole, you must cut the mat so that the pole goes through the center. A sharp utility knife can be used for this purpose.
3. Install the FibarMat flush with the surface of the Fibar wood fiber. An area 39" x 39" x 2" should be raked out. Make sure the area is as level as possible. Drop in the FibarMat and rake back the Fibar to the edge of the FibarMat.

### 3.6 CLEANING

- A. Perform cleaning during installation of the Work and upon completion of the Work. Remove all excess materials, debris, and equipment from site. Repair any damage resulting from installation of surfacing.

### 3.7 PROTECTION

- A. Prevent vehicular traffic in total and pedestrian traffic over play surfacing for not less than forty-eight (48) hours after installation or per manufacturer's recommendations, whichever is longer.

- B. Protect play areas from construction debris, including dust, dirt, runoff, trash and equipment following installation for the duration of construction.

#### **PART 4 - MEASUREMENT & PAYMENT**

##### **4.01 PLAYGROUND SAFETY SURFACING**

- A. **Measurement:** Measurement of “Playground Safety Surfacing” shall be per square foot (SF).
- B. **Payment:** The contract unit prices paid for the various items in “Playground Safety Surfacing” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Poured in Place Rubber Surfacing”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION**

**SECTION 32 18 23**  
**SYNTHETIC SPORTS FIELD TURF**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Furnish all labor, materials, tools and equipment necessary to install slit-film/monofilament synthetic turf as indicated on the plans and as specified herein; including components and accessories required for a complete installation. including but not limited to
  - 1. Acceptance of prepared sub-base.
  - 2. Coordination with related trades to ensure a complete, integrated, and timely installation: Aggregate base course, sub-base material (tested for permeability), grading and compacting, piping and drain components (when required); as provided under its respective trade section.

**1.02 RELATED SECTIONS**

- A. Section 12 93 00 – Site Furnishings & Accessories
- B. Section 31 10 00 – Site Clearing
- C. Section 31 23 00 – Excavation and Fill
- D. Section 31 20 00 – Earth Moving
- E. Section 32 11 23 - Permeable Base (Single Stone) for Synthetic Turf
- F. Section 33 46 00 - Subdrainage

**1.03 REFERENCE STANDARDS**

- A. FM Factory Mutual
  - 1. P7825 - Approval Guide; Factory Mutual Research Corporation; current edition

**1.04 RELATED DOCUMENTS**

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.

**1.05 SUBMITTALS**

- A. Substitutions: Other products are acceptable if in compliance with all requirements of these specifications. Submit alternate products to Architect for approval prior to bidding.
  - 1. All substitution requests must be submitted 2 weeks prior to the bid date.

2. Provide substantiation that proposed system does not violate any other manufacturer's patents, patents allowed or patents pending.
  3. Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- B. Comply with Section 01 33 00, Submittals Procedures. Submit for approval prior to fabrication.
- C. Shop Drawings:
1. Indicate field layout; field marking plan and details for the specified sports; i.e., NCAA Football; roll/seaming layout; methods of attachment, field openings and perimeter conditions.
  2. Show installation methods and construction indicating field verified conditions, clearances, measurements, terminations, drainage.
  3. Provide joint submission with related trades when requested by Architect.
- D. Product Data:
1. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations; storage, handling requirements and recommendations.
  2. Submit fiber manufacturer's name, type of fiber and composition of fiber.
  3. Submit data in sufficient detail to indicate compliance with the contract documents.
  4. Submit manufacturer's instructions for installation.
  5. Submit manufacturer's instructions for maintenance for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.
- E. Samples: Submit samples, 6 x 6 inches, illustrating details of finished product in amounts as required by General Requirements, or as requested by Architect.
- F. Product Certification:
1. Submit manufacturer's certification that products and materials comply with requirements of the specifications.
  2. Submit test results indicating compliance with Reference Standards.
- G. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Division 1 Specifications Series, General Requirements.
- H. List of existing installations: Submit list including respective City of San Rafael's representative and telephone number.
- I. Warranties: Submit warranty and ensure that forms have been completed in City of San Rafael's name and registered with approved manufacturer.
- J. Testing data to the City of San Rafael's Representative to substantiate that the finished field meets the required shock attenuation, as per ASTM F1936.
- K. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:
1. Pile Height, Face Weight & Total Fabric Weight, ASTM D5848.

2. Primary & Secondary Backing Weights, ASTM D5848.
3. Tuft Bind, ASTM D1335.
4. Grab Tear Strength, ASTM D1682 or D5034.
5. Shock Attenuation, ASTM F1936.
6. Water Permeability, ASTM D4491

## **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section. The turf contractor and/or the turf manufacturer:
1. Shall be experienced in the manufacture and installation of specified type of hybrid synthetic turf system for a minimum of three years. This includes a hybrid fiber, backing, the backing coating, and the installation method.
  2. Shall have 500 fields in play for at least two years. Fields shall be 65,000 ft<sup>2</sup> or more
  3. Shall have a minimum of 500 fields that are at least 8 years old, which is equal to the respective warranty period.
  4. The manufacturer must have ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.
  5. Turf manufacturer must have installed a minimum of 40 organic/natural infilled fields in the last 5 years.
  6. Shall have a minimum of 1 FIFA Quality Pro recommended field in North America.
  7. Shall have a minimum of 5 NFL game and/or practice fields in play for the previous year
  8. Shall have minimum 25 NCAA Division 1 game and/or practice fields installed for football or soccer.
  9. Shall have a minimum of 1000 installations in North America, each of 65,000 ft<sup>2</sup> or more.
- B. Installer: Company shall specialize in performing the work of this section. The Contractor shall provide competent workmen skilled in this specific type of synthetic turf installation.
1. The designated Supervisory Personnel on the project shall be certified, in writing by the turf manufacturer, as competent in the installation of hybrid material, including sewing seams and proper installation of the infill mixture.
  2. Installer shall be certified by the manufacturer and licensed.
  3. The installer supervisor shall have a minimum of 5 years experience as either a construction manager or a supervisor of synthetic turf installations
- C. Pre-Installation Conference: Conduct conference at project site at time to be determined by Architect. Review methods and procedures related to installation including, but not limited to, the following:
1. Inspect and discuss existing conditions and preparatory work performed under other contracts.
  2. In addition to the Contractor and the installer, arrange for the attendance of installers affected by the Work, The City of San Rafael's representative, and the Landscape Architect.
  3. The Contractor shall verify special conditions required for the installation of the system.



4. The Contractor shall notify the Architect of any discrepancies.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Prevent contact with materials that may cause dysfunction.
- B. Deliver and store components with labels intact and legible.
- C. Store materials/components in a safe place, under cover, and elevated above grade.
- D. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.
- E. Inspect all delivered materials and products to ensure they are undamaged and in good condition.
- F. Comply with manufacturer's recommendations.

**1.08 SEQUENCING AND SCHEDULING**

- A. Coordinate the Work with installation of work of related trades as the Work proceeds.
- B. Sequence the Work in order to prevent deterioration of installed system.

**1.09 WARRANTY AND GUARANTEE**

- A. The Contractor shall provide a warranty to the Owner that covers defects in materials and workmanship of the turf for a period of eight (8) years from the date of substantial completion. The turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of God beyond the control of the Owner or the manufacturer. The warranty shall be fully third party insured; prepaid for the entire 8 year term and be non-prorated. The Contractor shall provide a warranty to the Owner that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's representative. Prior to final payment for the synthetic turf, the Contractor shall submit to City of San Rafael's Representative notification in writing that the field is officially added to the annual policy coverage, guaranteeing the warranty to the City of San Rafael. The insurance policy must be underwritten by an "AM Best" A rated carrier and must reflect the following values:
  - Pre-Paid 8-year insured warranty.
  - Insured Warranty Coverage must be provided in the form of 1 single policy
  - Maximum per claim coverage amount of \$3,000,000.
  - Maximum of five million dollar (\$5,000,000) annual aggregate

- Must cover full 100% replacement value of total square footage installed, minimum of \$7.00 per sq ft. (in case of complete product failure, which will include removal and disposal of the existing surface)
- Policies that include self-insurance or self-retention clauses shall not be considered.
- Policy cannot include any form of deductible amount.
- Sample policy must be provided at time of bid to prove that policy is in force. A letter from an agent or a sample Certificate of Insurance will not be acceptable.

B. The synthetic turf system must maintain a G-max of less than 200 for the life of the Warranty as per ASTM F1936.

**1.10 MAINTENANCE SERVICE**

- A. Contractor shall train the City of San Rafael’s facility maintenance staff in the use of the turf manufacturer's recommended maintenance equipment.
- B. Manufacturer must provide maintenance guidelines to the facility maintenance staff specific to organic infilled fields.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURER**

- A. FieldTurf USA Inc.  
175 N. Industrial Blvd  
Calhoun, GA 30701  
P: 800-724-2969  
Model: FieldTurf Vertex Prime PureFill with VersaTile

**2.02 MATERIALS AND PRODUCTS**

- A. Synthetic turf system materials shall consist of the following:
  1. Carpet made of slit-film and monofilament polyethylene fibers tufted together into each individual stitch, into a non-perforated backing. Alternating row monofilament and slit-film carpet constructions are not permitted.
  2. Infill: Controlled mixture of graded sand and granulated cork that partially covers the carpet.
  3. Glue, thread, paint, seaming fabric and other materials used to install and mark the synthetic turf.
- B. The installed synthetic turf hybrid turf shall have the following properties:

<u>Standard</u>	<u>Property</u>	<u>Specification</u>
	Yarn Structure - A	Slit-Film

ASTM D1577	Fiber Denier	5,000
ASTM D1577	Yarn Structure - B	Monofilament
ASTM D1577	Fiber Denier	14,500
ASTM D5823	Pile Height	2"
ASTM D5793	Stitch Gauge	3/4"
ASTM D5848	Pile Weight	39oz/square yard
ASTM D5848	Primary Backing	7+oz/square yard
ASTM D5848	Secondary Backing	14+oz/square yard
ASTM D5848	Total Weight	60+oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+ lbs
ASTM D5034	Grab Tear (Width)	200 lbs/force
ASTM D5034	Grab Tear (Length)	200 lbs/force
ASTM D4491	Carpet Permeability	>40 inches/hour
ASTM F1936	Impact Attenuation (Gmax)	<200
	Infill Material Depth	1.25 inches
	Sand Infill Component	4.5 lbs/square foot
	PureFill Cork Component	1.1 lbs/square foot
	Shock & Drain Tile	VersaTile 13mm or app equal

*\*Variation of +/- 5% on above listed properties is within normal manufacturing tolerances*

*\*\*The system above needs a separate shock and drain tile.*

C. Carpet shall consist of hybrid fibers tufted into a primary backing with a secondary backing.

D. Carpet Rolls shall be 15' wide rolls.

1. Rolls shall be long enough to go from field sideline to sideline.

E. Backing:

1. Primary backing shall be a double-layered polypropylene fabric

2. Secondary backing shall consist of an application of porous, heat-activated urethane to permanently lock the fiber tufts in place.

3. Perforated (with punched holes), backed carpet are unacceptable.

F. Shock and Drain Tile:

1. Shock and drainage tile system shall have a thickness height of 0.5"

2. Shock and drainage tile system shall be made in part with recycled turf and elastomeric material.

3. Shock and drainage tile system shall be made and delivered in foldable square sections with hinges.

4. Tile System shall feature a minimum 80% free draining void area.

G. Infill materials shall be approved by the manufacturer.

1. Infill shall consist of a resilient layered granular system, comprising selected and graded sand and granulated cork. Organic infill must be comprised of materials that do not require irrigation to be installed around the field.

2. Synthetic Turf products without silica sand and granulated cork as its sole infill components will not be acceptable.

3. Granulated cork must have a bulk density of 0.25 g/cm<sup>3</sup> +/- 15%

- H. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.
- I. Thread for sewing seams of turf shall be as required by the synthetic turf manufacturer.
- J. Glue and seaming fabric for inlaying lines and markings shall be as required by the synthetic turf manufacturer.

### **2.03 QUALITY CONTROL IN MANUFACTURING**

- A. The manufacturer shall own and operate its own manufacturing plant in North America. Both tufting of the field fibers into the backing materials and coating of the turf system must be done in-house by the turf manufacturer. Outsourcing of either is unacceptable.
- B. The manufacturer shall have full-time certified in-house inspectors at their manufacturing plant that are experts with industry standards.
- C. The manufacturer's full-time in-house certified inspectors shall perform pre-tufting fiber testing on tensile strength, elongation, tenacity, denier, shrinkage, and twist i.e., turns per inch, upon receipt of fiber spools from fiber manufacturer.
- D. Primary backing shall be inspected by the manufacturer's full-time certified in-house inspectors before tufting begins.
- E. The manufacturer's full-time in-house certified inspectors shall verify "pick count", yarn density in relation to the backing, to ensure the accurate amount of face yarn per square inch.
- F. The manufacturer's full-time, in-house, certified inspectors shall perform turf inspections at all levels of production including during the tufting process and at the final stages before the turf is loaded onto the truck for delivery.
- G. The manufacturer shall have its own, in-house laboratory where samples of turf are retained and analyzed, based on standard industry tests, performed by full-time, in-house, certified inspectors.
- H. The manufacturer must have ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.

### **2.04 QUALITY CONTROL IN FIBER MANUFACTURING**

- A. Synthetic turf fiber must perform in a uniform manner or manufacturer quality control issues in the extrusion processes will be suspected. Linear Low Density Polyethylene Polymer ("LLDPE") and batch additives obtained from a reputable manufacturer are required to manufacture superior quality hybrid yarn. The master batch formula must include a UV stabilizer package added to its polymer base.
- B. The LLDPE used to make the synthetic turf fiber needs to be a "C6" LLDPE which contains 6 carbon atoms and 12 hydrogen atoms; A C6-based LLDPE produces strong and resilient synthetic

turf fibers over prolonged periods and thus should provide the basis for long term performance of the system.

- C. Adequate UV protection is essential to the long-term durability of any synthetic turf fiber. Typically, stabilizer packages for polyethylene fibers have three components that protect the fibers from degradation: (1) primary antioxidants; (2) secondary antioxidants; and (3) UV stabilizers (i.e., hindered amine light stabilizers ("HALS")). HALS are a particularly important aspect of the stabilizer package. A typical HALS concentration is 10,000 ppm. More developed HALS molecules are methyl stabilized to prevent from degradation.
- D. The fiber must contain both a short-term and a long-term active ingredient for protection during the extrusion process and when installed in the field. The pigments used in the fiber must be UV stable and heavy metal free.
- E. Synthetic turf fiber proposed for the field(s) must have successfully undergone a Lisport wear test as part of Penn State University's fiber wear testing program. This fiber must be exactly the same fiber that is being proposed for the field(s). Official Penn State test reports must be provided.

## **2.05 UTILITY VEHICLE, FIELD GROOMER & SWEEPER**

- A. Supply utility vehicle, field groomer and sweeper as part of the work.
  - 1. Field Groomer shall include a towing attachment compatible with a field utility vehicle.
  - 2. Field Sweeper shall include a towing attachment compatible with a field utility vehicle.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that all sub-base leveling is complete prior to installation.
- B. Installer shall examine the surface to receive the synthetic turf and accept the sub-base planarity in writing prior to the beginning of installation.
  - 1. Acceptance is dependent upon the City of San Rafael's test results indicating compaction and planarity are in compliance with manufacturer's specifications.
  - 2. The surface shall be accepted by Installer as "clean" as installation commences and shall be maintained in that condition throughout the process.
- C. Compaction of the aggregate base shall be 95%, in accordance with ASTM D1557 (Modified Proctor procedure); and the surface tolerance shall not exceed 0-1/4 inch over 10 feet and 0-1/2" from design grade.
- D. Compaction of the subgrade shall be to 92% in accordance with Geotechnical Report.
- E. Correct conditions detrimental to timely and proper completion of Work.

- F. Do not proceed until unsatisfactory conditions are corrected.
- G. Beginning of installation means acceptance of existing conditions.

### **3.02 PREPARATION**

- A. Prior to the beginning of installation, inspect the sub-base for tolerance to grade.
- B. Sub-base acceptance shall be subject to receipt of test results (by others) for compaction and planarity that sub-base is in compliance with manufacturer's specifications and recommendations.
- C. Dimensions of the field and locations for markings shall be measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements shall be made.
- D. When requested by Architect, installed sub-base shall be tested for porosity prior to the installation of the hybrid turf. A sub base that drains poorly is an unacceptable substrate.

### **3.03 INSTALLATION - GENERAL**

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. Only trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing, shearing, top-dressing or brushing operations.
- C. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the Infill mixture.
- D. Designs, markings, layouts, and materials shall conform to all currently applicable National Collegiate Athletic Association rules, NFHS rules, and/or other rules or standards that may apply to this type of synthetic turf installation. Designs, markings and layouts shall first be approved by the City of San Rafael's Representative in the form of final shop drawings. All markings will be in full compliance with final shop drawings.

### **3.04 INSTALLATION**

- A. Install at location(s) indicated, to comply with final shop drawings, manufacturers'/installer's instructions.
- B. The Contractor shall strictly adhere to specified procedures. Any variance from these requirements shall be provided in writing, by the manufacturer's on-site representative, and submitted to the City of San Rafael's Representative, verifying that the changes do not in any way affect the Warranty. Infill materials shall be approved by the manufacturer and installed in accordance with the manufacturer's standard procedures.
- C. Carpet rolls shall be installed directly over the properly prepared aggregate base. Extreme care shall be taken to avoid disturbing the aggregate base, both in regard to compaction and planarity.

1. Repair and properly compact any disturbed areas of the aggregate base as recommended by manufacturer
- D. Full width rolls shall be laid out across the field.
1. Turf shall be of sufficient length to permit full cross-field installation from sideline to sideline.
  2. No cross seams will be allowed in the main playing area between the sidelines.
  3. Each roll shall be attached to the next roll utilizing standard state-of-the-art sewing procedures.
  4. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing surface.
- E. Synthetic turf panel seams shall be sewn along the selvedge edging flap of the turf roll. Seams secured by other means including gluing are unacceptable. Installation shall be 99% sewn.
1. Minimum gluing will only be permitted to repair problem areas, corner completions, and to cut in any logos or inlaid lines as required by the specifications.
  2. Seams shall be flat, tight, and permanent with no separation or fraying.
  3. In the case of all lines and logos, turf carpet must be field fibers must be sheared to the backing (do not cut the backing) and adhered using hot melt adhesives.
- F. Infill Materials:
1. Infill materials shall be applied in numerous thin lifts. The turf shall be brushed as the mixture is applied. The infill material shall be installed to a depth determined by the manufacturer.
  2. Two-layered infill shall be installed in a systematic order.
  3. Infill materials shall be installed to fill the voids between the fibers and allow the fibers to remain vertical and non-directional. The Infill installation consists of a base layer of sand followed by a layer of granulated cork. Infill density shall consist of no more than 4.5 pounds of sand, 1.1 pounds of the specified granulated cork.
- G. Non-tufted or inlaid lines and markings shall be painted in accordance with turf and paint manufacturers' recommendations. Number of applications will be dependent upon installation and field conditions.
- H. Synthetic turf shall be attached to the perimeter edge detail in accordance with the manufacturer's standard procedures.
- I. Upon completion of installation, the finished field shall be inspected by the installation crew and an installation supervisor.

### **3.05 FIELD MARKINGS**

- A. Field markings shall be installed in accordance with approved shop drawings.
- B. Balance of sports markings will be tufted in accordance with the shop drawings.

- C. Center field logo shall be either tufted, according to artwork indicated on Drawings and in accordance with manufacturer's standard palette of turf colors.

### **3.06 FIELD MAINTENANCE**

- A. Perform regularly scheduled periodic maintenance every year. The maintenance will include but not be limited to a complete inspection and repair including all materials and cleaners of all areas of the field including: Fiber fibrillation analysis, Seam analysis, Perimeter anchoring, Excessive wear analysis, UV fade inspection, Infill – consistency in depth, Infill – migration analysis, Glued inlay analysis, Base stability analysis, Painted marking inspection, Debris removal, Brushing, Aerating, Grooming, Removal of weeds and moss, Removal of stains, Keeping the infill level.
- B. The inspection and maintenance will be performed by an Authorized Maintainer, if the person is not the same as the previous visit, then credentials will be submitted for approval before the visit.
- C. Approximate number of times is 1 visit per year for 8 years through the warranty period.

### **3.07 ADJUSTMENT AND CLEANING**

- A. Do not permit traffic over unprotected surface.
- B. Contractor shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.
- C. All usable remnants of new material shall become the property of the City of San Rafael.
- D. The Contractor shall keep the area clean throughout the project and clear of debris.
- E. Surfaces, recesses, enclosures, and related spaces shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the City of San Rafael.

### **3.08 PROTECTION**

- A. Protect installation throughout construction process until date of final completion.

## **PART 4 - MEASUREMENT & PAYMENT**

### **4.01 SYNTHETIC TURF**

- A. **Measurement:** Measurement of "Synthetic Turf" shall be per square foot (SF).
- B. **Payment:** The contract unit prices paid for the various items in "Synthetic Turf" shall include full compensation for furnishing all labor, materials, tools, equipment, testing costs, and incidentals, and for doing all work involved in the installation of "Synthetic Turf", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.



**4.02 TREX HEADER @ SYNTHETIC TURF**

- A. **Measurement:** Measurement of “Trex Header @ Synthetic Turf” shall be per lineal foot (LF).
- B. **Payment:** The contract unit prices paid for the various items in “Trex Header @ Synthetic Turf” shall include full compensation for furnishing all labor, materials, tools, equipment, testing costs, and incidentals, and for doing all work involved in the installation of “Trex Header @ Synthetic Turf”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 32 18 23**

**SECTION 32 31 13**  
**CHAIN LINK FENCES AND GATES**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. The scope of work outlined in this Section includes the following items of work, as detailed in these Contract Specifications, as shown on the Contract Drawings or reasonably implied therefrom and is not limited to the following items:
  - 1. Chain Link Fencing, inc. posts, rails, and fittings
  - 2. Chain Link Windscreen Fabric, reinforcements, and attachments
  - 3. Chain Link Acoustical Barrier Fabric, reinforcements, and attachments.
  - 4. Gates and Hardware
  
- B. References:
  - 1. CLFMI – Chain Link Fence Manufacturer’s Institute, “Product Manual”, 10015 Old Columbia Road, Suite B-215, Columbia, MD.

**1.02 RELATED SECTIONS:**

- A. Section 01 56 39                      Tree Preservation and Pruning
- B. Section 31 20 00                      Earth Moving
- C. Section 31 10 00                      Site Clearing
- D. Section 32 05 23                      Cement and Concrete for Exterior Improvements

**1.03 RELATED REQUIREMENTS**

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.
- B. These Contract Specifications are part of the Contract Drawings and shall include all labor, materials, equipment, reasonable incidentals, and services necessary for the execution of the Work installed complete in place.
- C. Refer to all other sections, determine the extent and character of related work, and coordinate all work to produce a complete, properly constructed product.

**1.04 QUALITY CONTROL AND ASSURANCE**

- A. Use adequate numbers of skilled workmen 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 in this section.

- B. Make all field measurements as required prior to fabrication and installation.
- C. Coordination: Coordinate with other trades to ensure proper sequencing and fitting of construction.
- D. Shop Assembly: Preassemble items in shop to greatest possible extent to minimize field slicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordination of installation.

#### **1.05 SUBMITTALS**

- A. All submittal data shall be forwarded in a single package to the City of San Rafael's Representative within 15 days of award of contract.
- B. Product data: Material descriptions, construction details, Component profiles and finishes for the following:
  - 1. Fence and gate posts, rails, and fittings.
  - 2. Chain link fabric, reinforcements, and attachments.
  - 3. Gates and Hardware.
  - 4. Windscreen
  - 5. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
- C. Shop drawings: Show locations of fence, each gate, posts, rails, and tension wires and details of extended posts, extensions arms, gate swing, or other operation, hardware, and accessories.
- D. Material/Color samples required shall be complete set of Metal sections and parts demonstrating all items proposed for the work.
- E. Samples for Verification: For the following products, in sizes indicated, showing the full range of color, texture, and pattern variations expected. Prepare samples from the same material to be used for the work.
  - 1. PVC-coated steel wire (for fabric) in 6-inch lengths.

#### **1.06 PROJECT CONDITIONS**

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by City of San Rafael or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify City of San Rafael's representative not less than [two] 2 days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without City of San Rafael's written permission
- B. Field Measurements: Verify layout information for chain link fences and gates shown in Drawings in relation to property survey and existing structures. If discrepancies occur, notify City of San Rafael's Representative.

## **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Product Delivery Requirements, Storage and Handling Requirements – Comply with requirements outlined in the general conditions.

## **1.08 GUARANTEE**

- A. Provide one (1) year written guarantee against rust materials and workmanship.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

#### A. General

- 1. Materials shall conform to ASTM F1083 and ASTM A392 ferrous metals, zinc coated, and detailed specifications forming the various parts thereto; and other requirements specified herein. Zinc-coat metal members (including fabric, gates, posts, rails, hardware and other ferrous metal items) after fabrication shall be reasonably free of excessive roughness, blisters and sal-ammoniac spots.

#### B. Chain Link Fence

- 1. Height: Shown on drawings.
- 2. All posts, rails, and appurtenances shall be hot dipped zinc coated steel, 1.2 oz per square foot, per ASTM specifications A53, A123, or A153, whichever is applicable.
- 3. Top Rail: Required, fitted with suitable expansion sleeves and means for securing rail to each gate, corner, and/or end post. Top rail shall be 1 5/8" O.D. standard pipe 2.27 lbs. per foot of section or 1'5/8" x 1'1/4" roll form section with minimum bending strength of 192 pounds. Rails to have a two (2) ounce zinc coating PSF of surface.
- 4. Mid/Brace Rail: Required for all fences greater than 7' - 0" tall. Mid Rail shall be 1 5/8" O.D. standard pipe 2.27 lbs. per foot of section or 1'5/8" x 1'1/4" roll form section with minimum bending strength of 192 pounds. Rails to have a two (2) ounce zinc coating PSF of surface.
- 5. Bottom Rail: Required, fitted with suitable expansion sleeves and means for securing rail to each gate, corner, and/or end post.
- 6. Chain Link Fabric: 9 gauge, 1 3/4" mesh.
  - a. Fabric shall be zinc coated steel wire, coated with 1.8 ounces of zinc per square foot conforming to requirements in ASTM A 392. The material shall receive a PVC or Polyolefin Elastomer coating, thermally fused to 8 gauge zinc coated steel core wire per ASTM-F668 Class 2B. Core wire tensile strength 80,000 psi minimum. Fabric shall be knuckled at top and bottom.
  - b. PVC Color: Black.

- c. Top and bottom selvage shall have twisted and/or knuckled finish. See table below for guidelines.

Fence Height	Selvage Treatment
Up to 6' height	Knuckle both selvages
Above 6' height	Twisted on top edge, knuckled on bottom edge

7. Line Post: O.D. shall be per chart below, standard pipe @ 3.65 #/L.F. or roll form section with minimum 201 pound bending strength perpendicular to fence lines. For fabric heights over 8 foot, "C" section roll form or H-post with minimum bending strength of 314 pounds shall be used. Zinc coating to be 1.8 ounces PSF surface.

Fence Height	6' or less	7' to 8'	8' to 10'	16'
Line Post	2" O.D.	2- 1/2" O.D.	2- 7/8" O.D.	4" O.D.

8. End, Corner, and Pull Posts: Shall be per chart below. Zinc coating to be 1.8 ounces PSF surface.

Fence Height	6' or less	7' to 8'	8' to 10'	10 to 12'	12 to 16'
End, Corner and Pull Post	2- 1/2 O.D.	2- 7/8" O.D.	3- 1/2" O.D.	4" O.D.	4- 1/2" O.D.

9. Gate Post: Shall be per chart below: Zinc coating to be 1.8 ounces PSF surface.

Fence Height	6' or less	7' to 8'	8' to 10'
Gate Post <4' Span	2- 3/8" O.D.	3- 1/2" O.D.	3- 1/2" O.D.
Gate Post > (X)	2- 7/8" O.D. (4')	4" O.D. (6')	4" O.D. (6') 6-5/8" O.D. (12')

10. Gate frames shall be 1.90" O.D. pipe. Gates shall have positive type latching devices with provisions for padlocking; and drive gates shall have a center plunger rod, catch, and semi-automatic outer catches. No pin type hinges.
11. Pipe posts shall have tops which exclude moisture.
12. End, corner, pull, and gate posts shall have braces with same material as top rail and trussed to line posts with 3/8" rods and tighteners.
13. Hinges: Adjustable Self Closing: Manufacturer: Locinox, Model: Mammoth Ultra Heavy Duty. Provide 1 pair of hinges for each leaf of each gate.
14. Fall over prevention device: provide in the event of a hinge failure. See details on plans for more information.

- 15. Latch Assembly for Double Gates: Provide center drop-rod type latch assembly to permit operation from either side of gate. Provide padlock eye as integral part of the latch assembly requiring one padlock for locking both gate leaves.
- 16. Latch Assembly for Single Gates: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch. All gate hinges and parts are to be heavy duty such that they cannot be twisted to gain entry.
- 17. Locking Gate Latch for accessible gates and accessibility signage, refer to plan and details. All gate hinges and parts are to be heavy duty such that they cannot be twisted to gain entry.
- 18. Gate Stops: Provide gate stops consisting of mushroom type or flush plate type with anchors, set in concrete to engage the center drop-rod.
- 19. Keeper: Provide keeper, which automatically engages the gate leaf and holds it in the open position until it is manually released, for all gate leaves.
- 20. Padlock: Provide one padlock for each gate. Padlocks shall conform to FSFF-P- 101 E (1) and as follows: Type EPC, Size 2-inches (solid brass body), 6 pin tumbler mechanism, stainless steel spring extension type shackles with 2-inch clearance, and 2 nickel-chrome plated keys per padlock.
- 21. Vinyl Coated Windscreen Fabric: Color: Green. Shall conform to the following minimum requirements:

Properties	Test Method	Requirements
Weight	ASTM D-5041	8 oz/y <sup>2</sup>
Grab Tensile		230/200lbs
Cold Crack		Pass 40 Degrees F
Strip Tensile		200/140lbs
Flame Resistance	MFR	Minimum 2 mins
Shade Percentage		80%

- 22. Acoustic Barrier Fabric: Color: Paint Green, to match windscreen fabric. Shall conform to the following minimum requirements: must achieve Acoustical performance of STC 28, equivalent to 28db reduction through the material.
- 23. Post Footings: Shall be concrete foundation of 1-2-4 mix. Footing diameter and depth per chart below.

Fence Height	4' or less	4' to 8'	8' to 10'	16'
Conc. Post Footing	3' x 12" DIA.	3' x 12' DIA.	5' x 18" DIA.	6' x 24" DIA.

**2.02 TOLERANCE**

- A. Standard mill tolerances will apply. Installation shall be by experienced fence erectors, on lines and grades furnished by the City of San Rafael's. All material will be tested for meeting of

specifications for design, strength, shape, weight, and coating. Mill certificates confirming compliance with the herein described components will be submitted for approval upon request.

### **2.03 FABRICATION**

- A. According to Manufacturer's Details and Specifications.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

#### A. GENERAL - Related Work

1. Neatly excavate post holes per fencing post and footing chart requirements listed above. Holes shall be clean and free from loose dirt and water before placing posts and concrete.
2. Hand trim grade at fence lines as necessary to lower high spots away from bottom edge of fabric.
3. Paving or other surfaces receiving posts shall be neatly cut prior to drilling post holes. Upon completion of post setting and concrete work at said locations, earth disturbed shall be backfilled and compacted to 95% density and the cut paving or other surfacing shall be neatly repaired to the original condition.

### **3.02 CHAIN LINK INSTALLATION**

- A. Posts shall be set plumb on all sides and with tops uniformly aligned. Set posts, post sleeves and strikes in round concrete footings in grade as shown or required. Concrete shall be thoroughly compacted by rodding as placed; bevel tops and finish smooth. Set and grout posts into sleeves where required; neatly finish smooth and flush with adjacent surfaces.

#### B. Post:

1. Terminal Post: Locate terminal end, corner, and gate posts per ASTM 567 and terminal pull posts at changes in horizontal or vertical alignment changes of fifteen (15) degrees or more.
2. Line Posts: Install for all intermediate locations between end, corner and gate posts. Uniformly space at not over 10' center to center, 8' center to center for 12' high fence, measured parallel to grade, or space as shown.
3. Corner Posts: Install at points where a change in alignment is 300 or greater. Where an alignment change occurs adjacent to a gate opening, use gate post in lieu of corner post.
4. End Posts: Install at each terminal end of individual runs of fencing, except adjacent to gates.
5. Gate Posts: Install each side of each gate opening.

- C. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish fabric wire, spaced a maximum of 24 inches O.C. Install tension wire before stretching fabric.

1. Top Tension Wire: Install tension wire through post cap loops.

2. Bottom Tension Wire: Install tension wire within 6 inches of bottom fabric and tie to each post with not less than same gage and type wire.
- D. Top Rail: Install according to ASTM F 567, maintain plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.
- E. Intermediate Rail: Install in one piece, spanning between post, using fittings, special offset fittings and accessories.
- F. Bottom Rail: Install, spanning between posts, using fittings and accessories.
- G. Chain Link Fabric: Apply fabric to inside of enclosing framework. Leave a minimum clearance of 1 inch, maximum 1-3/4 inch between finish grade and surface and bottom selvage, unless otherwise directed by City of San Rafael's Representative. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released and displays no sagging or buckling.
- H. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
- I. Maximum Spacing: Tie fabric to line posts 12 inches O.C. and to braces 24 inches O.C.
- J. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- K. Vinyl Coated Windscreen Fabric: Install per manufacturers requirements, and as shown in the contract drawings.
- L. Acoustical Barrier Fabric: Install per manufacturers requirements, and as shown in the contract drawings.

### **3.03 GATE INSTALLATION**

- A. Install gates according to manufacturer's written instructions, with all required hardware, level, plumb and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust gate and hardware to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

### **3.04 CLEAN-UP**

- A. Remove from the site all debris resulting from the work of this section.



## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 6' HT CHAIN LINK SINGLE GATE**

- A. **Measurement:** Measurement of "6' HT Chain Link Single Gate" shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in "6' HT Chain Link Single Gate" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "6' HT Chain Link Single Gate", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.02 6' HT CHAIN LINK DOUBLE GATE**

- A. **Measurement:** Measurement of "6' HT Chain Link Double Gate" shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in "6' HT Chain Link Double Gate" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "6' HT Chain Link Double Gate", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.03 6' HT X 12' WIDE MAINTENANCE SLIDING GATE**

- A. **Measurement:** Measurement of "6' HT x 12' Wide Maintenance Sliding Gate" shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in "6' HT x 12' Wide Maintenance Sliding Gate" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "6' HT x 12' Wide Maintenance Sliding Gate", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.04 6' HT X 20' WIDE VEHICULAR MAINTENANCE SLIDING GATE**

- A. **Measurement:** Measurement of "6' HT x 20' Wide Vehicular Maintenance Sliding Gate" shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in "6' HT x 20' Wide Vehicular Maintenance Sliding Gate" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "6' HT x 20' Wide Vehicular Maintenance Sliding Gate", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.05 8' HT CHAIN LINK SINGLE GATE**

- A. **Measurement:** Measurement of "8' HT Chain Link Single Gate" shall be per each (EA).

- B. **Payment:** The contract unit prices paid for the various items in “8’ HT Chain Link Single Gate” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “8’ HT Chain Link Single Gate”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**4.06 8’ HT X 20’ WIDE VEHICULAR MAINTENANCE SLIDING GATE**

- A. **Measurement:** Measurement of “8’ HT x 20’ Wide Vehicular Maintenance Sliding Gate” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “8’ HT x 20’ Wide Vehicular Maintenance Sliding Gate” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “8’ HT x 20’ Wide Vehicular Maintenance Sliding Gate”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**4.07 6’ HT CHAIN LINK FENCE**

- A. **Measurement:** Measurement of “6’ HT Chain Link Fencing” shall be by the Linear Foot (LF).
- B. **Payment:** The contract unit prices paid for the various items in “6’ HT Chain Link Fencing” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “6’ HT Chain Link Fencing”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**4.08 8’ HT CHAIN LINK FENCE**

- A. **Measurement:** Measurement of “8’ HT Chain Link Fencing” shall be by the Linear Foot (LF).
- B. **Payment:** The contract unit prices paid for the various items in “8’ HT Chain Link Fencing” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “8’ HT Chain Link Fencing”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**4.09 BACKSTOP**

- A. **Measurement:** Measurement of “Backstop” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Backstop” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Backstop”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 32 31 13**

**SECTION 32 84 00**  
**IRRIGATION**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. The CONTRACTOR shall provide all labor, materials, supplies, tools, and transportation and perform all operations in connection with and reasonably incidental to complete the installation of the automatic sprinkler irrigation systems as shown on the drawings. Items hereinafter are included as an aid to take off, and are not necessarily a complete list of work items.
1. Keep existing valves operational as required.
  2. Relocate and adjust existing sprinkler heads to achieve and maintain head to head coverage as required.
  3. Trenching, stockpiling, excavation, materials, and refilling trenches.
  4. Furnishing materials and installation for complete system including piping, valves, fittings, sprinkler heads, dripline and fittings, automatic controls, and final adjustment of heads to insure complete coverage.
  5. Line voltage connections to the irrigation controllers and low voltage control wiring from controllers to remote control valves.
  6. Replacement of unsatisfactory materials.
  7. Re-sod or seed all irrigation trenches through existing sod areas.
  8. Clean-up, inspection and approval.
  9. All work of every description mentioned in the specification and/or addenda thereto, all other labor, and materials reasonably incidental to the satisfactory completion of the work, including clean-up of the site, as directed by the Project Representative.
  10. Tests.
  11. As-built record drawings.
- B. Work Specified Elsewhere:
1. Irrigation water stub-out.
  2. 120 volt A.C. electrical stub-out to controller location.
  3. Irrigation sleeves.

**1.02 RELATED SECTIONS:**

- |    |                  |                               |
|----|------------------|-------------------------------|
| A. | Section 01 56 39 | Tree Preservation and Pruning |
| B. | Section 32 23 00 | Excavation and Fill           |
| C. | Section 31 23 33 | Trenching and Backfilling     |
| D. | Section 32 90 00 | Planting                      |

- E. Section 32 05 23 Cement and Concrete for Exterior Improvements

### **1.03 RELATED REQUIREMENTS**

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.
- B. These Contract Specifications are part of the Contract Drawings and shall include all labor, materials, equipment, reasonable incidentals, and services necessary for the execution of the Work installed complete in place.
- C. Refer to all other sections, determine the extent and character of related work, and coordinate all work to produce a complete, properly constructed product.

### **1.04 QUALITY CONTROL AND ASSURANCE**

- A. **Qualifications:** The Contractor, personally or through an authorized and competent representative, shall supervise the work constantly, and shall as far as possible keep the same foreman and workmen on the job from commencement to completion. The workmanship of the entire job must in every way be first class, and only experienced and competent workmen will be allowed on the job. A minimum of five years' experience of installing irrigation systems of similar scope, size and complexity as the system being installed under this scope of work is required for all on-site job superintendents.
- B. **Manufacturer's installation instructions and best practices:** Manufacturer's installation instructions shall be followed in all cases when not shown in the Drawings or Specifications.
- C. **O.S.H.A. Compliance:** All articles and services covered by this specification shall meet or exceed the safety standards established under the Federal Occupational Safety and Health Act of 1970, together with all amendments in effect as of the date of this specification.
- D. All irrigation systems shall be installed to meet or exceed the requirements set forth in the California Department of Water Resources Model Water Efficient Landscape Ordinance.
- E. All materials supplied for this Project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to City.
- F. **Codes and Standards:** Comply with all applicable codes and standards.
  - 1. All work and materials shall be in full accordance with the latest rules and regulations of the National Electric Code; published by the Western Plumbing Officials Association; California Code of Regulations, Title 23, Division 2. Department of Water Resources, Chapter 2.7. Model Water Efficient Landscape Ordinance; and other State or local laws regulations. Nothing in these drawings or specifications is to be construed as to permit work not conforming to these codes.
  - 2. When the specifications call for materials or construction of a better quality or larger size than required by the above mentioned rules and regulations, the provision of the specifications shall take precedence over the requirements of said rules and regulations.

3. Contractor shall furnish, without extra charge, any additional material and labor when required by the compliance with these rules and regulations, though the work be not mentioned in these particular specifications or shown on the drawings.
4. The Contractor shall erect and maintain barricades, guards, warning signs, and lights as necessary or required by O.S.H.A. regulations for the protection of the public or workmen.
5. Any existing buildings, equipment, piping, pipe covering sewers, etc., damaged by the Contractor during the course of his work shall be replaced or repaired by the Contractor in a manner satisfactory to the Project Representative and at Contractor's own expense, before final payment is made. The Contractor shall be responsible for damage caused by leaks in the piping systems being installed or having been installed under this contract. He/she shall repair, at his/her own expense, all damage so caused, in a manner satisfactory to the Project Representative.
6. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the Work of this section.

#### **1.05 SUBMITTALS**

- A. Product Data: Submit manufacturer catalog information on all material to be used on the project as specified on the legend, notes, details and plans. Redline or highlight exact items on page to be submitted. Complete material list shall be submitted prior to performing any work.
- B. Substitutions: No substitution will be permitted without prior written approval by the Project Representative. If the product is approved and, in the opinion of the Project Representative, the substituted product does not perform as well as the specified product, the Contractor shall replace it with the specified product at no additional cost to the Project Representative.
- C. All equipment or materials installed or furnished without prior approval of the Project Representative may be rejected and the Contractor may be required to remove the equipment or material at their own expense.

#### **1.06 CLOSEOUT SUBMITTALS**

- A. Project As-built Record Documents:
  1. The Contractor shall maintain in good order in the field office, one complete set of black line prints of all sprinkler drawings which form a part of the contract, showing all water lines, electrical, sprinklers, valves, stub-outs. In the event any work is not installed as indicated on the drawings, such work shall be corrected and documented accurately on the working drawings.
  2. Dimension from two permanent points of reference, such as building corners, sidewalks, road intersections or monuments, the following items:
    - a. Connection to water source
    - b. Backflow preventor
    - c. Gate valves
    - d. Routing of pressurized mainlines and lateral lines
    - e. Remote control valves

- f. Quick coupling valves
    - g. Flow sensor, master valve, and irrigation controller
  - 3. Deliverables shall be one full size colored hard copy of the contract drawings with redlines and dimensions or a full sized colored scanned PDF version.
- B. Controller Chart:
  - 1. Provide one laminated (hermetically sealed between two pieces of 10 mil. plastic) controller chart showing the area covered by controller for each automatic controller supplied at the maximum size controller door will allow. Chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.
  - 2. Controller chart shall be a blackline print with a different color used to show area of coverage for each station. Charts must be completed and approved by the Project Representative prior to final inspection of the irrigation system.
  - 3. Locate all dripline flush valves and dripline indicators on colored plans if the locations differ from design plans.
- C. Controller Cloud Based Communication and Flow Sensor installation confirmation:
  - 1. Provide written confirmation that the cloud-based communications are set up and operational between controller(s) and cloud-based server.
  - 2. If controller is a two-wire type controller. Provide confirmation that the controller is communicating with each decoder valve on system and there are no error messages logged on the cloud-based communication system. Provide a printout of information to Landscape Architect or Irrigation Consultant.
  - 3. Provide written confirmation from the distributor/manufacturer's representative that the controller is communicating with flow sensors and that the correct "k" and "offsets" are setup and utilized properly. The "k" and "offsets" are pre-set numbers you plug into the controller software based on the flow sensor size and type when calibrating the flow sensor. Confirm that flow values have been "learned" and recorded for each valve on the controller, and the correct gpm per valve is shown and verified on a printout and provided to Landscape Architect or Irrigation Consultant. Flow alarms and automatic shut offs should be set up after plant establishment.
- D. Maintenance and Operating Instructions and Manuals:
  - 1. Contractor shall prepare an Operation and Maintenance Manual, organized in a 3-ring binder, containing the following information.
    - a. Contractor's name, address, and telephone number. Duration of guarantee, periods as specified herein, list of equipment with names and addresses of local manufacturer's representatives with duration of written warranties. Complete operating and maintenance instructions on all equipment spare parts lists and related manufacturer's information.
  - 2. Submit the Operation and Maintenance Manual to the Project Representative within 10 Calendar Days of completion of work of this Section and as a condition of project acceptance.
- E. Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis:

1. All landscape irrigation audits shall be conducted by a local agency landscape irrigation auditor or a third party certified landscape irrigation auditor. Landscape audits shall not be conducted by the person who design the landscape or installed landscape.
2. In large projects or projects with multiple landscape installations (i.e. production home developments) an audit rate of 1 to 7 lots or approximately 15% will satisfy this requirement.
3. For new construction and rehabilitated landscape projects installed after December 1,2015, as described in Section 490.1:
  - a. The project applicant shall submit an irrigation audit report with the Certificate of Completion to the local agency that may include, but is not limited to: inspection, system tune-up, system test with distribution uniformity, reporting overspray or run off that causes overland flow, and preparation of an irrigation schedule, including configuring irrigation controllers with application rate, soil types, plant factor, slop, exposure and any other factors necessary for accurate programming.

**1.07 EXISTING CONDITIONS**

- A. Protection of Existing Structures and Utilities
  1. The Drawings show, if applicable, existing above and below grade structures and utilities that are known to the Project Representative. Locate known existing installations before proceeding with construction operations that may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. Verify with Project Representative if As Built drawings are available.
  2. If other structures or utilities are encountered, request Project Representative to provide direction on how to proceed with the Work. If a structure or utility is damaged, take appropriate action to ensure the safety of persons and property.
- B. Trench Interference with Existing Tree Root Systems: Prior to trenching, layout main and lateral line locations within drip Line of trees and review locations with Project Representative. Relocate any lines that may interfere with existing root systems to avoid or reduce damage to root systems as accepted by Project Representative.
- C. Provide barricades, coverings, warning signs, lights and other protection required by local code or OSHA to prevent damage to existing improvements to remain and to protect the public.

**1.08 DELIVERY, STORAGE AND HANDLING:**

- A. Protection: Use all means necessary to protect irrigation system materials before, during and after installation and the installed work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Project Representative and at no additional cost to the project.
  1. Exercise care in handling, loading, unloading and storing plastic pipe and fittings under cover until ready to install; transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load. Protect pipe from sunlight.

2. Repair all dented and damaged pipe by cutting out the dented or damaged section and rejoining with a coupling.

### **1.09 LAYOUT OF WORK**

- A. The Contractor shall stake out the irrigation system as shown on the drawings. These areas shall be checked by the Contractor and Project Representative before construction is started. Any changes, deletions or additions shall be determined at this check.
- B. Due to the scale of the Drawings, it is not possible to indicate all piping offsets, fittings, sleeves, etc., which may be required. Carefully investigate the conditions affected all of the work and plan accordingly, and furnish all required fittings. Install system in such a manner to avoid conflicts with planting, utilities and architectural features.
- C. Do not install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in arc dimensions exist that might not have been considered. Bring such obstruction or differences to the attention of the Project Representative. Notify and coordinate irrigation Work with applicable contractors for location and installation of piping and sleeves through or under walls, pavement and structures. In the event this notification is not given, the Contractor shall assume full responsibility for any revision necessary.

### **1.10 SEQUENCING AND SCHEDULING**

- A. Acceptance: Do not install main line trenching prior to acceptance by Project Representative of rough grades completed under another Section.
- B. Coordination: Coordinate with the all other trades the sleeving, power requirements of the project, prior to the start of construction.

### **1.11 EXISTING IRRIGATION SYSTEM**

- A. This Contract requires that the existing irrigation system be kept intact on all areas of the park not yet worked on to permit normal watering during construction. On areas that have been installed according to these plans and specifications, irrigation shall be programmed to operate via the controller. On areas being worked on, the Contractor shall afford the City every opportunity to hand water during the period of shutdown.
- B. After the new irrigation system is fully functional, all existing sprinklers, valves, valve boxes, and quick coupling valves in the work areas will be removed by the Contractor. Fill all void with backfill material leaving 6" near the surface for topsoil. Compact by mechanical tamping to a minimum compaction of 85% relative compaction. Add a minimum of 6" of topsoil to compacted backfill. The topsoil shall be placed and blended to the satisfaction of the Project Representative. In turf areas, re-seed the topsoil with an approved seed mix.



## 1.12 INSTRUCTION

- A. After the system has been installed and approved, the Contractor shall instruct the Project Representative and or Maintenance Contractor, in complete operation and maintenance of the irrigation system.

## **PART 2 - PRODUCTS**

### 2.01 PIPE AND FITTINGS

- A. PVC Pressure Mainline pipe and fittings.
  - 1. Pressure mainline piping:
    - a. 2.5" AND LARGER: Shall be PVC 1120-315 plastic pipe.
    - b. 2" AND SMALLER: Shall be PVC 1120-Schedule 40 plastic pipe.
    - c. Pipe shall be made from NSF approved Type 1, Grade 1 PVC compound conforming to ASTM D1785.
  - 2. Schedule 40 pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting and/or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality.
  - 3. All PVC pipe shall bear the following markings:
    - a. Manufacturer's name
    - b. Nominal pipe size
    - c. Class or Schedule
    - d. Pressure rating in PSI
    - e. NSF
    - f. Date of extrusion
  - 4. Use solvent weld pipe for mainline pipe with a nominal diameter less than 3-inches or where a pipe connection occurs in a sleeve. Use Schedule 40 , Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784 at changes in direction or branch mains. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.
  - 5. Connections between main lines and RCV's shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.
  - 6. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.D. schedule and NSF Seal of approval.
  - 7. Inside diameter of pipe shall be the same size as iron pipe.
  - 8. PVC Type I shall not be threaded.
  - 9. PVC fittings shall be PVC Type II, Schedule 40 NSF approved.
  - 10. Caution shall be utilized in handling Type I pipe due to the possibility of cracking or splitting.
  - 11. When connection is plastic to metal, male adapters shall be used unless otherwise noted or detailed. The Male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base (Teflon paste or equal).

12. Threaded Nipples – ASTM D2464, Schedule 80 with molded threads.
- B. PVC Non-pressure lateral line and fittings
    1. Lateral lines (non-pressure): 3/4" and larger shall be Schedule 40 PVC plastic pipe.
    2. Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12245-B, Type 1, Grade 1.
    3. Fittings – All lateral lines shall be connected with Schedule 40, Type I, Grade I, PVC solvent weld fittings.
    4. Threads – Injection molded type (where required).
    5. Tees and ells – Side gated.
    6. Threaded Nipples – ASTM D2464, Schedule 80 with molded threads.
    7. Refer to “trenching and backfilling” elsewhere in these specifications for minimum depths.
  - C. Solvent for all PVC pipe shall be #711 Gray, along with #P-70 primer, NSF approved as manufactured by Industrial Polychemical Service, Gardena, California, or approved equal.
  - D. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as RectorSeal #5.
  - E. PVC Flexible Pipe: Extruded from flexible vinyl chloride compound.
    1. ½ inch pipe: 0.50 inch inside diameter, 0.090 inch wall thickness
    2. Material shall conform to ASTM designation D-2287.
  - F. Swing joints shall be as shown on construction details.

## **2.02 SLEEVES**

- A. Sleeve below all hardscape elements with SCH 40 or Class 200 PVC twice the diameter of the pipe or wire bundle within, or as delineated on the plans.
- B. Under Hardscape Crossings: Sleeves shall extend a minimum of 24 inches beyond all sidewalks, or shall be extend 24" beyond the back edge of the curb, where noted on the plans.

## **2.03 BACKFLOW PREVENTION DEVICE**

- A. Backflow prevention devices are existing to remain as shown on the drawings.

## **2.04 BACKFLOW PREVENTION DEVICE ENCLOSURE**

- A. Enclosure shall be sized to completely enclose backflow device.
- B. Install enclosure device as detailed.

## **2.05 MASTER CONTROL VALVE**

- A. Master control valve shall be a normally open 24 VAC solenoid actuated globe pattern valve.
- B. Valves shall be made of durable glass-filled nylon with a minimum pressure rating of 150 PSI
- C. Valve shall have external and internal bleed for manual operation.
- D. Valve model and size shall be as shown on drawings.

## **2.06 FLOW SENSORS**

- A. Inline flow sensors shall be installed in accordance with the manufacturer's installation instructions. Contractor is responsible for the installation, all required materials and connections of the flow sensors for complete operation with the irrigation controller.
- B. Flow sensor size and model shall be listed on the drawings.

## **2.07 FLOW SENSOR CABLE AND CONDUIT**

- A. Flow sensor wire shall be shielded cable Paige model 7171D or approved equal.
- B. Maximum cable distance from controller to flow sensor shall be 2000 ft.
- C. Install flow sensor cable in a 1" grey SCH 40 PVC conduit with long sweep elbows.
- D. Conduit and flow sensor cable shall be routed with mainline wherever possible. Provide a minimum 6" separation between conduit and pressure main line.
- E. Provide 10" round gray electrical pull boxes a minimum of every 200 ft, at each change in direction and adjacent to each controller. Heat brand lid of pull box "FSB".

## **2.08 GATE VALVES**

- A. Gate valves 3" and smaller shall meet the following requirements:
  - 1. Valves shall be of stainless steel (304 or higher) or bronze/brass construction with non-rising stem, cross handle and threaded connections.
  - 2. Valves shall be Leemco Model #LGT-SS, Nibco T-113-K or approved equal. Size as shown on the drawings
  - 3. Install in 10" diameter plastic valve box as detailed.

## **2.09 BRASS BALL VALVES**

- A. Valves shall be two-piece forged brass body (ASTM B283 Alloy C37700), full port, blowout-proof stem, TFE seats, steel plated handle and nut, brass pack gland (ASTM B16) Virgin PTFE packing stem, 430 stainless flat washer fluorocarbon O-ring, reinforced PTFE thrust washer brass stem, Virgin PTFE packing seat ring, Brass ball with chrome plate (ASTM B16 Alloy C36000), and forged brass end piece (ASTM B283 Alloy C37700). Nibco T-FP-600A-LF, or approved equal.

## **2.10 QUICK COUPLING VALVES**

- A. Quick coupling valves shall be as shown on the drawings.
- B. Install in 10" diameter plastic valve box as detailed.

## **2.11 CONTROLLERS**

- A. Controller's size and model shall be as listed on the drawings.
- B. Final location(s) of controller shall be approved by the Project Representative.
- C. Controller requires 120v power. Maximum power output of controller is 2.5 amps.
- D. Install Controller and accessories as detailed and per Manufacturer's details.

## **2.12 CONTROL WIRE**

- A. Irrigation Low Voltage Control Wire: All wiring to be used for connecting the automatic controller to the electric solenoid actuated remote control valve shall be Type UF-600V, solid copper, PVC insulation, single conductor, UL approved underground feeder cable, approved for direct burial.
- B. Control wire: Size #14-1 wire with an insulating jacket of color other than white or yellow. Runs over 2,000 lineal feet shall be size #12-1.
- C. Common ground wire: Size #12-1 wire with a white insulating jacket.
- D. Spare wires: Size #14-1 wire with a yellow insulating jacket. Provide a minimum of two spare control wires into each RCV box for future.
- E. Provide different color (not yellow) control wires for each controller and a separate ground wire for each controller.
- F. Splices shall be made with 3M-DBY seal packs.

## **2.13 LOW VOLTAGE CONDUIT**

- A. All relocated, existing low voltage wiring, and new low voltage wiring shall be housed in conduit large enough to contain all wiring. 2" minimum.
- B. Plastic: Schedule 40 PVC, approved for use as non-metallic raceway for 90 degree Centigrade conductors. Carlon, CertainTeed, or Kraloy.
- C. Provide fittings and accessories approved for the purpose equal in all respects to the conduit or raceway.
- D. Color: GREY

- E. Solvent for all PVC pipe shall be #711 Gray, along with #P-70 primer, NSF approved as manufactured by Industrial Polychemical Service, Gardena, California, or approved equal.
- F. Burial depths for conduit and sleeving below finished grade per the drawings.
- G. Pull rope to be included for all empty conduit.
- H. Pull boxes shall be placed at all angle points in conduit runs.

#### **2.14 ELECTRIC REMOTE CONTROL VALVES**

- A. Electric remote control valves sizes shall be shown on drawings.
- B. Electric remote control valve shall be a normally closed 24 VAC solenoid actuated globe pattern valve.
- C. Valves shall be made of durable glass-filled nylon with a minimum pressure rating of 150 PSI
- D. Valve shall have external and internal bleed for manual operation.
- E. All valves that service dripline or drip systems shall include a plastic wye filter and pressure regulator on the valve or a solid set 40 PSI plastic regulator downstream of the valve. Filters shall be rated to 120 psi, includes a 150 mesh disk or stainless steel screen.

#### **2.15 DRIP ELECTRIC REMOTE CONTROL VALVE ASSEMBLY7**

- A. Electric remote control valves sizes shall be shown on drawings.
- B. Electric remote control valve shall be a normally closed 24 VAC solenoid actuated globe pattern valve.
- C. Valves shall be made of durable glass-filled nylon with a minimum pressure rating of 150 PSI
- D. Valve shall have external and internal bleed for manual operation.
- E. All valves that service dripline or drip systems shall include a plastic wye filter and pressure regulator on the valve or a solid set 40 PSI plastic regulator downstream of the valve. Filters shall be rated to 120 psi, includes a 150 mesh disk or stainless steel screen.

#### **2.16 IDENTIFICATION TAG**

- A. Identification tags for all electric control valves shall be manufactured by Christy. Tag numbers shall match stationing in controller and as shown on as-built drawings. Provide one yellow station number tag for each electric control valve as follows:
  - 1. Potable water systems: Christy ID.STD.Y1
- B. Identification tags for all quick coupling valves are ONLY required for recycled water systems. Tags shall be Christy model ID.MAX.P2.RC006.

#### **2.17 REMOTE CONTROL VALVES BOXES**

A. **ELECTRIC REMOTE CONTROL VALVE BOXES:**

1. All electric remote control valve boxes that service non-drip systems shall be installed within a Carson model 1419 (14"x19") or 1220 (13" x 20") plastic valve box with bolt down plastic lid or approved equal. Size of box is dependent on the size of valve. Lid shall be marked: "Irrigation Control Valve."
2. Use black colored boxes in shrub and groundcover areas and green in turf areas.
3. Heat brand controller letter and numbers into lid. Minimum text height to be 2".

**2.18 DRIP REMOTE CONTROL VALVES BOXES**

A. **ELECTRIC REMOTE CONTROL VALVE BOXES:**

1. All electric remote control valve boxes that service dripline or drip systems shall be installed within a Carson model 1220 (13" x 20") plastic valve box with bolt down plastic lid or approved equal. Lid shall be marked: "Irrigation Control Valve."
2. Use black colored boxes in shrub and groundcover areas and green in turf areas.
3. Heat brand controller letter and numbers into lid. Minimum text height to be 2".

B. **GATE VALVE AND QUICK COUPLING VALVE BOXES:**

4. All gate valve and quick coupling valve shall be installed within a Carson Model 910-18" depth plastic valve box with plastic lid or approved equal. Use 8" or 10" sleeve to encase gate valve.
5. Use black colored boxes in shrub and groundcover areas and green in turf areas.
6. Heat brand the letters "GV" into lid. Minimum text height to be 2".

C. **DRIP COMPONENT BOXES:**

1. All drip components shall be installed within a 6" round black plastic valve box with plastic lid. Carson Model 708 plastic valve box with plastic lid or approved

**2.19 SPRINKLER HEADS**

- A. All sprinkler heads shall be as listed on the drawings.
- B. Pop-up spray sprinklers shall include a built in check valve in the body to hold up to 14 feet of head.
- C. Pop-up spray sprinklers shall include built in pressure regulation in the body.
- D. Use 30 psi regulators for all spray nozzles and 45 psi regulators for all rotating nozzles. Use 12" pop-ups in shrub and ground cover areas and 6" pop-ups in turf areas.
- E. Riser units and nipples shall be the same size as the inlet to the sprinkler body.

**2.20 BUBBLERS**

- A. Bubblers shall be as listed on the drawings.
- B. Bubblers shall be pressure compensating from 20 psi to 60 psi.
- C. The bubbler body shall be manufactured with UV Stabilizers and have ½" FIPT threads for connection to ½" MNPT male adaptor or nipple.

- D. Flow rate molded onto the bubbler for easy identification
- E. Where low head drainage occurs, each bubbler shall have a check valve installed. Hunter HC-50F-50M or approved equal.

## **2.21 DRIPLINE & DRIPLINE COMPONENTS**

- A. Dripline shall be as listed on the drawings.
- B. Tubing shall be low density, UV resistant, polyethylene tubing with internal pressure-compensating, drip emitters impregnated into the tubing spaced at 12 or 18 inches
- C. The built-in emitters shall be capable of delivering 0.6 gallons per hour per emitter.
- D. All dripline systems shall have a manual flush valve at each isolated zone within the systems. Multiple flush valves may be required per drip zone.
- E. All dripline systems shall have air relief valve(s) at the highest elevation point(s) within each isolated zone. Install one air relief valve for every 500 linear feet of dripline.

## **2.22 CHECK VALVE**

- A. Spring check valve shall be Schedule 40 PVC with ½ lb spring and stem rated at 150 PSI.
- B. Check valves shall be NDS. Use KSC series swing check valve for all uphill flow direction valves and KC series spring check for all downhill flow direction valves. Size per line size of lateral line.

## **2.23 MISCELLANEOUS INSTALLATION MATERIALS**

- A. Solvent cement and primer for solvent weld joints shall be of make and type approved by manufacturer(s) of pipe and fittings. Cement shall be maintained at proper consistency throughout use.
- B. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as RectorSeal #5.

## **2.24 MISCELLANEOUS EQUIPMENT**

- A. Provide all equipment called for by the drawings.
- B. Provide to the Project Representative at completion of the maintenance period, three (3) each of all operating and servicing keys and wrenches required for complete maintenance and operation of all heads and valve. Include all wrenches necessary for complete disassembly of all heads and valves.

# **PART 3 - EXECUTION**

## **3.01 PREPARATION**

- A. Schedule and coordinate placement of materials and equipment in a manner to effect the earliest completion of work in conformance with construction and progress schedule.

### **3.02 HANDLING AND STORAGE**

- A. Protect work and materials from damage during construction and storage as directed by the Project Representative.
- B. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight. Any section of pipe that has been damaged will be discarded and removed and replaced if installed.

### **3.03 LAYOUT**

- A. Lay out work as accurately as possible in accordance with diagrammatic drawings.
- B. Where site conditions do not permit location of piping, valves and heads where shown, notify Project Representative immediately and determine relocation in joint conference.
- C. Prior to installation, the Contractor shall stake out the routing of all pressurized main lines and sprinkler heads for approval by Project Representative.
- D. Run pipelines and automatic control wiring in common trenches wherever practical.

### **3.04 EXCAVATING AND TRENCHING**

- A. Work shall be performed when soils are reasonably dry and not saturated.
- B. Trenching
  1. Excavations shall be open vertical construction sufficiently wide to provide free working space around the work installed and to provide ample space for backfilling and compacting.
  2. In existing turf areas remove sod with sod cutter. Roll and set aside. Replace immediately after installing conduit (three days maximum), backfilling and compacting.
  3. Depth of trenches shall be pipelines deep enough to provide minimum cover from finish grade as follows.
    - a. 24" minimum cover over main lines to control valves and quick coupling valves. Refer to legend for depth requirements.
    - b. 24" minimum cover over control wires from controller to valves. Refer to legend for depth requirements.
    - c. 18" minimum cover over RCV controlled lateral lines to sprinkler heads. 18" depth will be required at all 12" pop-up sprinklers. Refer to legend for depth requirements.
  4. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, or depths of cover indicated on the drawings, and at uniform slopes between indicated elevations.
  5. Whenever cobbles larger than 2 inches in size are present in earthen subgrade, the trench section shall be excavated to the lines required. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and



consolidated. Trenches shall be excavated with approximately vertical sides between the elevation of the bottom of the pipe and an elevation one foot above the top of the pipe.

6. When two pipes are to be placed in the same trench, maintain a six-inch space between pipes as minimum.
7. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by the Project Representative.
8. Restore surfaces, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in a manner approved by the Project Representative.

C. Backfilling:

1. Backfill materials shall be approved native soil in all landscaped areas. Unsuitable material, including clods and rocks over 2 inches in size shall be removed from the premises by Contractor and disposed of legally at no cost to the Project Representative.
2. Backfill only after piping has been tested, inspected and approved.
3. Place backfill materials in 6" layers and compact by jetting or tamping to a minimum compaction of 90 percent of original soil density.
4. Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfill is completed.
5. All backfilling shall be properly compacted so as to avoid future settlement.
6. If settlement occurs along trenches, and adjustments in pipes, valves and sprinkler heads, soil, sod or paving are necessary to bring the system, soil, sod or paving to the proper level or the permanent grade, the Contractor, as part of the work under this contract, shall make all adjustments without extra cost to the project.

D. Re-sod Turf Areas

1. The contractor shall sod cut all existing turf areas that require trenching. Keep existing sod cuts moist and relay rolls as quickly as possible to prevent loss and stress.
2. If sod cut turf does not survive, Contractor shall re-sod any turf areas damaged due to trenching, excavation, or equipment damage such as tire tracks, to the satisfaction of the Project Representative. If approved by Project Representative re-seeding of damaged areas may be allowed.
3. Contractor shall furnish topsoil approved by the Project Representative in sufficient quantities needed to perform the work and feather in all edges to eliminate any lips.
4. Sod shall be placed over the top of all excavations through grass areas. Backfill of trenches should be held short of adjacent finished grade by 1/2 inch, minimum, to accommodate sod. Roll sod with a roller to eliminate any lips where existing and new sod transition.
5. If necessary, the edge of new sod and existing turf shall be blended by using a topsoil on the turf surface to eliminate the lip. The topsoil shall be placed and blended until the lip has been blended to the satisfaction of the Project Representative.
6. Roll sod after installation, a minimum of 3 passes, to remove air pockets and promote establishment of sod.

### **3.05 INSTALLATION OF SLEEVING UNDER ASPHALT OR CONCRETE**

- A. General: Layout of the piping system shall be per the drawings and to the depth specified above.

- B. Under Existing Pavement:
  1. Piping under existing pavement may be installed by jacking, boring or hydraulic driving, except that no hydraulic driving will be permitted under asphaltic concrete pavement.
  2. Where cutting of existing pavement is necessary, provide alternate routes for vehicular traffic. After placement of pipes, backfill trench and compact to 95%. Replace entire section of base rock and hardscape to match existing conditions.
- C. Inspection of Pipe and Fittings: Carefully inspect all pipe fittings before installation, removing all dirt, scale and burrs; ream as required. Install all pipe with all markings up for visual inspection and verification.
- D. Installation of Sleeving:
  1. Sleeving shall be installed a minimum of 24 inches below grade.
  2. Sleeving shall extend 24 inches beyond the edge of finished concrete surface.
  3. Trenches containing sleeves shall be backfilled with material that consists of unwashed creek or bank gravel, crushed gravel, crushed rock, sand or a mixture of these materials. It must be free from roots, vegetable matter or other deleterious substance and shall be of such nature and so graded that it will bind readily when watered and compacted. Backfill with such material to the bottom of the concrete or hardscape section and compacted to a minimum of 90%. Where the sleeve extends beyond the edge of the hardscape or concrete, the sleeve shall be backfilled with native soil or imported topsoil, whichever is specified. If nothing is specified, use previously excavated native soil.
  4. Prior to placement of concrete, the ends of the sleeves shall be marked with a stake that shall be exposed approximately 2"-3" above rough, or finished grade to identify sleeve locations. On all street crossing, the location shall be marked at the edge of concrete or hardscape with a chiseled line or "x", and the stake removed.

### **3.06 ASSEMBLING PIPELINES**

- A. PVC pipe shall be installed in a manner which will provide for expansion and contraction as recommended by the pipe manufacturer. Pipe routing is diagrammatic and shall be installed in such a manner as to conform with the details.
- B. In joining, use only the specified solvent and make all joints in strict accordance with the manufacturer's recommended methods. Give solvent welds at least 16 minutes set-up time before moving or handling and 24 hours curing time before filling with water.
- C. All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.
- D. Install 3" wide detectable warning tape above all pressurized main lines as shown in the details. Use Christy model #TA-DT-3-BIRR for potable irrigation systems
- E. Solvent Weld Joint:
  1. Prepare joint by first making sure the pipe end is square. Then, de-burring the pipe end, and clean pipe and fitting of dirt, dust and moisture.
  2. Dry insert pipe into fitting to check for proper sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.
  3. Coat the inside socket surface of the fitting and the male end of the pipe with P-70 primer (manufactured by Weld-On). Then without delay, apply Weld-On 711 cement liberally to

the male end of the pipe and also apply 711 cement lightly to the inside of the socket. At this time, apply a second coat of cement to the pipe end.

4. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Pipe and fitting shall be aligned properly without strain to either.
5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.
6. Cure joint a minimum of thirty (30) minutes before handling, at least six (6) hours before allowing water in the pipe.

F. Threaded Joint:

1. Field threading of plastic pipe or fittings is not permitted. Only factory formed threads will be permitted.
2. Factory made nipples shall be used wherever possible. Field cut threads in metallic pipe will be permitted only where absolutely necessary. When field threading, cut threads accurately on axis with sharp dies.
3. All threaded joints shall be made up with pipe joint compound. Apply compound to male threads only.
4. Where assembling metallic pipe to metallic fitting or valve, not more than three (3) full threads shall show when joint is made up.
5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.
6. Where assembling plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.
7. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly.
8. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.
9. For plastic-to-steel connections, work the steel connections first; use a non-hardening non-lead base pipe dope on all threaded plastic-to-steel connections and use only light wrench pressure. All plastic-to-steel connections shall be made with SCH 80 PVC nipple or plastic male adapters.

### **3.07 REMOTE CONTROL VALVES**

- A. Install where shown on drawings and group together where practical. Limit one remote control valve per box.
- B. Locate valve boxes 12" from and perpendicular to walk edges, buildings and walls. Provide 12" between valve boxes where valves are grouped together.
- C. Thoroughly flush main line before installing valves.
- D. Install in shrub or groundcover areas where possible.
- E. Label control line wire at each valve with an I.D. tag, indicating identification number of valve (controller and station number). Attach label to control wire.
- F. Flow control stems shall be adjusted or tuned per manufacturer recommendations.

- G. Install 18GA ½” x ½” square stainless-steel Type 304 wire mesh under all valve boxes and wrap up the sides of the valves. Adhere wire mesh to sides of box with stainless-steel screws and washers as required. Refer to details for more information.

### **3.08 AUTOMATIC CONTROL WIRE**

- A. Run lines along mains wherever practical. Tie wires in bundles with pipe wrapping tape at 10’ intervals and allow slack for contraction between strappings.
- B. Loop a minimum of three (3) feet of extra wire in each valve box; both control wire and ground wire.
- C. Connections shall be made by crimping bare wires with brass connectors and sealing with watertight resin sealer packs.
- D. Splicing will be permitted only on runs exceeding 2500’. Locate all splices at valve locations within valve boxes.
- E. Where control lines pass under paving, they shall pass through Schedule 40 electrical PVC conduit. Do not tape wire in bundles inside conduit.

### **3.09 AUTOMATIC CONTROL WIRE IN CONDUIT:**

- A. Install wire in PVC electrical conduit with pull/splice boxes located as shown on plans and as required. This conduit shall be dedicated to irrigation control wires only.
- B. For all wire runs, pull/junction boxes will be required every 250 linear feet of conduit run.
- C. All electrical equipment and wiring shall comply with local and state codes and be installed by personnel skilled and licensed in the trade.
- D. Connecting and splicing of wire at the valves shall be made using approved materials and shall be made by crimping bare wires with brass connectors and sealing with watertight resin sealer packs. No other splices will be allowed.
- E. All such splices shall be placed within a valve box. Leave a 36” long coil, 1” in diameter at each pull box, or splice location.
- F. Install a minimum of two (2) spare control wire of a different color (yellow) along the entire main line. Loop 36” of excess wire into each valve box.
- G. Provide and install automatic irrigation controller in approximate locations shown on drawings. The exact location will be determined on the site by the Project Representative. Provide conduit and wire and connect to 120 volt switch accessible to controller for ease of maintenance.
- H. Connect control lines to controller in sequential arrangement according to assigned identification number on valve. Each control line wire shall be labeled at controller with a permanent non-fading label indicating station number of valve controlled. Attach label to control wire.
- I. Provide each irrigation controller with its own independent low voltage common ground wire.
- J. All sprinkler heads shall be set perpendicular to finish grade of the area to be irrigated unless

otherwise designated on the plans.

- K. In lawn areas, all sprinkler heads shall be offset a minimum of 3 inches and a maximum of 6 inches from the edge of adjacent hardscape.
- L. Flush and adjust irrigation outlets, bubblers and nozzles for optimum performance and to prevent overspray onto field, walks, roadways, and/or buildings as much as possible. This shall include selecting the best degree of arc and radius to fit the existing site conditions and throttle the flow control at each valve to obtain the optimum operating pressure for each control zone.

### **3.10 QUICK COUPLING VALVES**

- A. Thoroughly flush lines before installing quick coupling valves.
- B. Locate quick coupling valves as shown in the drawings and details.
- C. Locate valve boxes 12" from and perpendicular to walk edges, buildings and walls. Provide 12" between other valve boxes where valves are grouped together.

### **3.11 DRIPLINE AND DRIPLINE COMPONENTS**

- A. Thoroughly flush all driplines.
- B. Install dripline a minimum of 12" away from all buildings and 6" off hardscapes for shrubs and groundcover. 2" of paving for all no-mow or sod type grasses.
- C. Space driplines equally throughout the planting area as detailed. Refer to legend for emitter and row spacing of dripline. Adjust alternate rows so emitters are spaced in a triangular pattern.
- D. All dripline tubing shall be buried 4" below finish grade and stapled down every 4' and at each change in direction with a 6" tubing stake.
- E. For slopes greater than 10:1, modify dripline row spacing on the bottom 1/3 of the slope to be 25% greater at the bottom of the slope.
- F. Install flush valves at the low end of each drip zone minimum of 2 valves are required for each valve. Refer to manufacturer details for installation instructions.
- G. Install air vacuum relief valve(s) at high point(s) of each planting area. Refer to drawings for approximate locations. Revise locations in field based on actual grades of the site. Locate 1 valve per every 500' of dripline. Refer to manufacturer details for installation instructions.
- H. Thoroughly saturate soil prior to planting. Provide additional surface watering as required to keep plant root systems moist during planting establishment period.

### **3.12 FIELD QUALITY CONTROL**

- A. Coverage Tests:
  - 1. Perform coverage tests in the presence of Project Representative, after sprinkler or drip system is completed. Test system to assure that all areas are irrigated completely and uniformly.

2. Do not spray onto pavement or structures. Adjust arc nozzles as needed to provide full coverage without over spray.

B. Adjusting and Cleaning:

1. System adjustment:
  - a. Valves: Adjust flow for proper operation.
  - b. Heads: Adjust for alignment and coverage.
  - c. If it is determined that coverage could be improved by adding additional driplines or a nozzle change, make such changes as required to provide adequate coverage to all plant material.
  - d. Perform final cleaning of all risers, dripline, heads, and equipment for proper operation. Demonstrate operation and uniform coverage in the presence of the Project Representative prior before final acceptance.

### 3.13 TESTING

A. General

1. Notify the Project Representative at least three (3) days in advance of testing.
2. Furnish all necessary testing equipment and personnel.
3. Perform testing at his/hers own expense.
4. Correct all leaks and retest until acceptance by the Project Representative.
5. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered.

- B. Closing uninspected work: Do not allow or cause any of the work of this section to be covered up or enclosed until it has been inspected, tested and approved by the Project Representative and other authorized agencies.

- C. Flushing: Before backfilling the main line, and with all control valves in place but before lateral pipes are connected, completely flush and test the main line and repair all leaks. Flush out each section of lateral pipe before sprinkler heads are attached.

- D. Perform test as specified below. Remake any faulty joints with all new materials. Use of cement or caulking to seal leaks is absolutely prohibited.

E. Pressure Testing Procedure:

1. Apply the following tests after welded plastic pipe joints have cured at least twenty-four (24) hours.
  - a. Solvent Weld Mainline: Remove all the air from the piping system then test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for six (6) hours. The lines shall be restored to the original test pressure. The Contractor shall make tests and repairs as necessary until test conditions are met.
  - b. Test RCV controlled lateral lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

- F. Final Inspection
  - 1. Thoroughly clean, adjust and balance all systems.
  - 2. Demonstrate the entire system to the Irrigation Consultant and/or, if required, authorized agent and other governing agencies providing that all remote control valves are properly balanced, that all heads are properly adjusted for radius and arc of coverage, and that the installed system is workable, clean and sufficient.

### **3.14 GUARANTEE**

- A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for one year following completion and acceptance of the job.
- B. The Contractor shall also guarantee all materials, equipment and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within one year after installation is accepted, any and all defective parts that may be found.

### **3.15 MAINTENANCE**

- A. Continuously maintain irrigation system in areas indicated in the Contract during the progress of work and for a period of 90 days after substantial completion.
- B. It is Contractor's responsibility to turn over the irrigation in a first-class condition at the end of the maintenance period.
- C. Maintenance Schedule: Contractor shall submit schedule of maintenance tasks to be performed for Project Representative review and approval. At a minimum, maintenance staff shall be on-site two times per month. It is not the intention of these Specifications to allow a "quick cleanup" at the end of the maintenance period, but rather that the work be continuous and ongoing.
- D. Proper irrigation system maintenance includes the overall supervision of the system, controller scheduling, routine adjustments and necessary repairs.
- E. Maintain irrigation system for optimum performance, as per manufacturer's specifications, by inspecting the entire system on an on-going basis. This includes cleaning and adjusting all bubbler heads, dripline and valves for proper coverage.

### **3.16 CLEAN-UP**

- A. Preservation and Cleaning: The Contractor shall clean up the work as it progresses. At frequent intervals, and at all times when directed by the Project Representative, the Contractor shall remove and dispose of accumulations of rubbish and debris of all kinds. At the time of completion, the entire site shall be cleared of tools, equipment, rubbish, etc., all of which shall be removed from the site; and the entire project, including surrounding premises, shall be left in proper, clean condition ready for acceptance.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 IRRIGATION SLEEVING**

- A. **Measurement:** Measurement of “Irrigation Sleeving” shall be per Linear Feet (LF).
- B. **Payment:** The contract prices paid for the various items in “Irrigation Sleeving” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Sleeving”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.02 IRRIGATION MAINLINE PIPE**

- A. **Measurement:** Measurement of “Irrigation Mainline Pipe” shall be per Linear Feet (LF).
- B. **Payment:** The contract unit prices paid for the various items in “Irrigation Mainline Pipe” shall include full compensation for furnishing all labor, materials, fittings, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Mainline Pipe”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.03 IRRIGATION LATERAL PIPE**

- A. **Measurement:** Measurement of “Irrigation Lateral Pipe” shall be per Lump Sum (LS).
- B. **Payment:** The contract unit prices paid for the various items in “Irrigation Mainline Pipe” shall include full compensation for furnishing all labor, materials, fittings, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Mainline Pipe”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.04 IRRIGATION DRIP SYSTEM**

- A. **Measurement:** Measurement of “Drip System” shall be per square foot (SF).
- B. **Payment:** The contract unit prices paid for the various items in “Drip System shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Drip System”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.05 IRRIGATION SPRAY HEADS**

- A. **Measurement:** Measurement of “Irrigation Spray Heads” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Irrigation Spray Heads” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Spray Heads”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional



compensation shall be provided.

#### **4.06 IRRIGATION SHRUB BUBBLERS**

- A. **Measurement:** Measurement of “Irrigation shrub Bubblers” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Irrigation Shrub Bubblers” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Shrub Bubblers”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.07 IRRIGATION TREE BUBBLERS**

- C. **Measurement:** Measurement of “Irrigation Tree Bubblers” shall be per each (EA).
- A. **Payment:** The contract unit prices paid for the various items in “Irrigation Tree Bubblers” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Tree Bubblers”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.08 REMOTE CONTROL VALVES**

- A. **Measurement:** Measurement of “Remote Control Valves” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Remote Control Valves” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Remote Control Valves”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.09 DRIP IRRIGATION REMOTE CONTROL VALVE ASSEMBLY**

- A. **Measurement:** Measurement of “Drip Irrigation Remote Control Valve Assemblies” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Remote Control Valves” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Drip Remote Control Valve Assemblies”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.10 QUICK COUPLER VALVES**

- A. **Measurement:** Measurement of “Quick Coupler Valves” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Quick Coupler Valves” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Quick Coupler Valves”, as shown on the

plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.11 IRRIGATION GATE VALVES**

- A. **Measurement:** Measurement of “Irrigation Gates Valves” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Irrigation Gates Valves” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Gate Valves”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.12 QUICK COUPLER VALVE & GATE VALVE FOR SYNTHETIC TURF**

- A. **Measurement:** Measurement of “Quick Coupler Valves” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “Quick Coupler Valve & Gate Valve for Synthetic Turf” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Quick Coupler Valves” and “ Gate Valves” dedicated to the synthetic turf maintenance, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.13 IRRIGATION CONTROLLER**

- A. **Measurement:** Measurement of “Irrigation Controller” shall be per each (S). EA
- B. **Payment:** The contract unit prices paid for the various items in “Irrigation Controller” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Controller” (including, but not limited to: conduit, control wires, valve wires, master valve, flow sensor, & flow sensor wire), as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.14 IRRIGATION MASTER VALVE AND FLOW SENSOR**

- C. **Measurement:** Measurement of “Irrigation Controller” shall be per each (S). EA
- D. **Payment:** The contract unit prices paid for the various items in “Irrigation Master Valve and Flow Sensor” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Irrigation Master Valve and Flow Sensor” (including, but not limited to: Master valve wires, master valve, flow sensor, & flow sensor wire), as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.15 BACKFLOW PREVENTER ENCLOSURE AND FREEZE COVER**

- A. **Measurement:** Measurement of “Backflow Preventer Enclosure” shall be per each (EA).

- B. **Payment:** The contract unit prices paid for the various items in “Backflow Preventer Enclosure and Freeze Cover” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Backflow Preventer Enclosure and Freeze Cover”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 32 84 00**

**SECTION 32 90 00**  
**LANDSCAPE PLANTING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES:**

- A. The scope of work outlined in this Section includes the following items of work, as detailed in these Contract Specifications, as shown on the Contract Drawings or reasonably implied therefrom and is not limited to the following items:
1. Furnish all labor, materials, equipment, rentals, facilities, transportation, incidentals, excavations, submittals and services for installation of plant material and related work as shown on the drawings and/or specified herein including all topsoil, compost, headers, fertilizer, organic materials, plant materials, plant labels, tree stakes, mulch, maintenance, warranties and all other incidentals to planting work and as necessary for a complete and full installation of Landscape Planting.
  2. Bark mulch
  3. Gravel mulch
  4. 24" Box Trees
  5. 15 Gallon Trees
  6. 5 Gallon Shrubs
  7. 1 Gallon Shrubs
  8. Plant Establishment Period
  9. Gopher Control
  10. Pre-emergent
  11. Tree Staking System
  12. Root Barrier
  13. Weed Fabric
  14. Sod
  15. Gopher Wire
  16. Headers
  17. Soils
  18. Fertilizer
  19. Fertilizer Tablets
  20. Compost
  21. 12 Month Plant Warranty

**1.02 RELATED SECTIONS:**

- |    |                  |              |
|----|------------------|--------------|
| A. | Section 01 33 00 | Submittals   |
| B. | Section 31 20 00 | Earth Moving |

- C. Section 31 10 00 Site Clearing
- D. Section 32 05 23 Cement & Concrete for Exterior Improvements
- E. Section 32 15 40 Decomposed Granite
- F. Section 32 84 00 Irrigation Systems

**1.03 RELATED REQUIREMENTS**

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.
- B. These Contract Specifications are part of the Contract Drawings and shall include all labor, materials, equipment, reasonable incidentals, and services necessary for the execution of the Work installed complete in place.
- C. Refer to all other sections, determine the extent and character of related work, and coordinate all work to produce a complete, properly constructed product.
- D. Contractor shall fully acquaint himself with the existing conditions particularly in reference to underground piping. Any damage caused by contractor to work of other trades shall be repaired by him at no cost to the City of San Rafael.
- E. Irrigation system shall be installed and operative before beginning planting operation

**1.04 RELATED DOCUMENTS**

- A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.
- B. References:
  1. Nomenclature: "Western Garden Book," Sunset Publishing Co., Menlo Park, CA, 2007 edition or current edition.
  2. Plant Material Standards: "American Standard for Nursery Stock", American Hort, 525 9th St NW, Suite 800, Washington, DC, or current edition.
  3. Staking and guying procedures: "Staking Landscape Trees", University of California Extension, Publication #2576, or current publication.
  4. Pruning procedures: "Tree Pruning Guidelines", International Society of Arboriculture, Atlanta, GA, 2018 or current edition, conforms to ANSI-A300-tree pruning specifications and guidelines.
  5. Manufacturer's recommendations.

**1.05 REGULATORY REQUIREMENTS**

- A. Perform work in accordance with all applicable laws, codes, and regulations required by the City of San Rafael and any other authorities having jurisdiction over such work. Provide for all

inspections and permits required by Federal, State, and local authorities in furnishing, transporting, and installing materials.

- B. No planting area earthwork, planting, or seeding shall occur during weather conditions that will adversely affect materials or when soil is in a muddy condition. Contractor shall not plant at the end of the day, on Fridays, or before holidays unless a special crew has been assigned to care for plants on next Day and on weekends and holidays. Soil used within landscaped areas shall be in a friable condition at time of displacement including during transportation, placement, cultivation, and planting.
- C. Friable refers to the structure and moisture content of soil. Friable soil shall be understood to mean soil that crumbles easily in the hand, does not stick to the hand, and does not form a ball when squeezed. Friable soil is not wet or muddy but is moist and damp. Obtain the Landscape Architect's determination of soil condition acceptability prior to installation and working of soils.

#### **1.06 PERFORMANCE REQUIREMENTS**

- A. Supervision: Assign a full-time employee to the job as Foreman for the duration of the Contract with a minimum of four (4) years experience in landscape installation. Foreman to be present during the entire installation. Notify City of San Rafael's Representative of all changes in supervision.

#### **1.07 VISIT TO THE SITE**

- A. The contractor shall visit the construction site and shall take all measurements and obtain any other information as may be necessary for a complete and conclusive bid.

#### **1.08 QUALITY ASSURANCE**

- A. Personnel:
  - 1. All planting and turf work shall be performed by competent and efficient personnel familiar with planting and turf procedures under the supervision of a Qualified Foreman.
  - 2. Installing contractor shall have successfully completed within the last 3 years at least 3 planting applications similar in type and size to that of this project.
- B. Plant Material Standards:
  - 1. Plant Certification: All plants must meet specifications of Federal, State, and County laws requiring inspection for plant disease and insect infestations. Inspection certifications required by law shall accompany each shipment, invoice and order for stock.
  - 2. Codes and Standards: Nursery stock shall meet the standards of the current edition of the "American Standard for Nursery Stock", "Agricultural Code of California" and the "Regulations of the Director of Agriculture Pertaining to Nursery Stock". They shall be true to type and name in accordance with "Standardized Plant Names", Second Edition.
  - 3. Use only nursery-grown stock that is free from insect pests and diseases. Any required clearances shall be obtained prior to shipment of plant material.
  - 4. Plants shall be subject to inspection and approval of the Landscape Architect at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Wherever the terms

"approve", "approval" or "approved" are used herein they mean approval of the Landscape Architect in writing.

5. Contract Grown Plants: Contract grown plant material does not relieve the landscape contractor of providing materials which do not match or exceed standard nursery stock. Plants which do not meet standards shall be rejected and the Contractor shall provide nursery grown stock as required at no additional cost to the City of San Rafael or contract.

#### **1.09 SUBSTITUTIONS**

- A. Substitutions: Substitutions of plant materials will not be permitted unless authorized in writing by City of San Rafael's Representative. If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price. Such proof shall be substantiated and submitted in writing to City of San Rafael's Representative.
- B. The Contractor shall submit a list of un-available plants per project plant list and a list of all nurseries and plant brokers contacted a maximum of **15** days after Notice to Proceed.
- C. The Landscape Architect reserves the right to require the Contractor to replace at the Contractor's cost any plants which the Contractor has installed without the Landscape Architect's approval.

#### **1.10 PROOF OF PLANT AVAILABILITY**

- A. These provisions shall not relieve Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials. Contractor shall secure all material and provide proof of such within **30** days of Notice to Proceed in order to guarantee plant availability at time of planting. .
- B. Payment for the procurement of plant material, including possible incidentals such as storage and maintenance at nursery after purchase or contract growing plants, is the full responsibility of the Contractor.

#### **1.11 SUBMITTALS**

All submittal data shall be forwarded in a single package to the City of San Rafael's Representative within 15 days of award of contract.

- A. Furnish digital copies of manufacturers' literature for the following items:
  1. Erosion Control Netting
  2. Fertilizer
  3. Fertilizer Tablets
  4. Filter Fabric
  5. Iron and Sulfate Amendment
  6. Organic Amendment
  7. Pre-Emergence Weed Killer
  8. Root Control Barriers
  9. Bioretention Soil Mix

10. Top Mulch
11. Weed Fabric
12. Tree Support Poles
13. Tree Ties

B. Plant Sources: Submit name and address of proposed suppliers of plant materials to the Landscape Architect within 30 days of notice to proceed. List plants to be obtained from each source. For any plant found to be unattainable, show suggested substitute species or size, with source. Obtain Landscape Architect's acceptance of sources and/or substitutions.

1. Ordering of Plants: Submit documentation, within 20 days following acceptance of nursery sources, that plant material has been ordered. Indicate size of plant, container size and quantity of each on order form. Instruct nursery to label each plant with botanical name.
2. Plant Substitutions: Comply with the Contract Document planting plans and plant sizes and selections. Plant substitutions will not be permitted unless the Contractor furnishes the Landscape Architect with written evidence from no less than six nurseries within northern California and 3 nurseries from other locations that the plants specified are not obtainable. Such evidence shall be submitted within 15 Days after the effective date of the Notice to Proceed.
3. A minimum of 1 month prior to the delivery of plants, e-mail to The Landscape Architect for review photographs of trees and shrubs. Photos shall be labeled with the botanical name, including species and cultivar of the plants. Photos of trees shall be representative of trees to be delivered and clearly showing the overall branching structure. Include a person in the photos for scale. Landscape Architect reserves the right to reject plant materials prior to delivery on the basis of the photos. Plants, which are rejected, shall be replaced with acceptable plants. Review of photos does not constitute pre-acceptance of plants delivered to the Worksite.

C. Soil Testing: Provide soil analysis from an approved testing laboratory (Waypoint Analytical or approved equal). Soil analysis using Saturate Media Analysis will not be allowed and rejected outright for soil analysis. Soil analysis shall include pH, salinity, sodium hazard, boron hazard, lime content, organic matter, soil texture and available nutrient levels. Submit test results, analysis, and recommendations for:

1. Existing site topsoil (6 samples per acre)  
Top Soil Analysis: After approval of rough grading and topsoil placement, obtain 3 representative samples of topsoil taken from approved site locations and submit to approved testing agency for "agricultural suitability" analysis report, including evaluation of physical and chemical properties of soil and recommendations for adding amendment and fertilizers to the soil. Upon approval of the Laboratory's report by the City of San Rafael's Representative, the report recommendations become a part of the Specifications. Adjust the quantities of soil amendment, fertilizer and other additives to conform to the report.
2. Import top soil  
Imported Top Soil Analysis: Submit sample to approved testing agency for "agricultural suitability" analysis report, including evaluation of physical and chemical properties of soil and recommendations for adding amendment and fertilizers to the soil. Upon approval of the Laboratory's report by the City of San Rafael's Representative, the soil and report recommendations become a part of the Specifications. Adjust the quantities of soil, soil amendment, fertilizer and other additives to conform to the report.



3. Imported Soil Fill  
Imported Soil Fill shall fall within acceptable tolerances for plant fertility and suitability and shall have a pH value between 6 and 7.5. Imported soil fill that exceed acceptable levels for Macro and Micro – Nutrients for plants as indicated in soil laboratory testing will be rejected and shall not be used for project.
  4. Storm Bioretention Soil Mix.
  5. Organic Amendment.
- D. Submit specification sheet and one (1) quart sample each of mulch and organic amendment.
- E. Certificates of Compliance, receipts, and /or delivery tickets for the following:
1. Soil amendment, chemical and physical properties. Do not deliver amendment to the site without approval of submittals by City of San Rafael’s Representative.
  2. Bioretention Soil Mix. Do not deliver soil mix to the site without approval of submittals by City of San Rafael’s Representative.
  3. Quantity of soil amendment delivered to site for incorporation into soil.
  4. All other soil amendments, soils, compost, and mulch delivered to the site.
- F. Pre-construction documentation
1. Prior to construction activities the landscape contractor shall document & photograph all existing field conditions including existing trees health, a minimum of 4 soil tests of pre-construction soils, existing landscaping to remain & irrigation to remain. All documentation shall be submitted as a record the contractor and engineer prior to construction

**1.12 ADDITIONAL SAMPLES AND TESTS**

- A. City of San Rafael’s Representative reserves the right to take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon request by City of San Rafael’s Representative. Rejected materials shall be immediately removed from the site at Contractor’s expense. Cost of testing of materials not meeting specifications shall be paid by Contractor.

**1.13 SELECTION AND TAGGING OF PLANT MATERIAL**

- A. Contractor shall select and tag all plant material within **30** days of Notice to Proceed. Plant material which is not available, or not possible to contract grow shall be noted to the Landscape Architect within **15** days of Notice to Proceed so substitutions may be selected. Contractor shall source material from out of state or thru a plant broker if not locally available. Contractor shall submit lists of all nurseries and plant brokers contacted for availability.
- B. Plants shall be subject to inspection and approval by City of San Rafael’s Representative at place of growth if the City of San Rafael’s Representative so chooses, and upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Submit written request for inspection of plant material at place of growth to City of San Rafael’s Representative. Written request shall state the place of growth and quantity of plants to be inspected. City of San Rafael’s Representative reserves right to refuse

inspection at this time if, in his judgment, a sufficient quantity of plants is not available for inspection.

#### **1.14 PROJECT SITE CONDITIONS**

- A. Site Visit: At beginning of work, visit and walk the site with the City of San Rafael's Representative to clarify scope of work and understand existing project site conditions. Identify location of utilities and other improvements. Notify City of San Rafael's Representative of conflicts prior to start of work for resolution.
- B. Access: Inspect project site and become familiar with the accessing requirements and restrictions. At time of submitting bid, provide written notice of any conditions that would prevent installation of the specified plant material.

#### **1.15 JOB CONDITIONS**

- A. Delivery:
  - 1. Deliver manufactured materials in original containers with brand and maker's name marked thereon. Materials in broken containers or showing evidence of damage will be rejected and must be immediately removed from the site. Odorous materials shall not be brought to the site until they are to be used. Deliver quantities necessary to complete the work shown on the Drawings. Any discrepancy in the quantities given on the plans shall not entitle Contractor to additional remuneration.
  - 2. Deliver Bulk materials to the job site and store to deter mixing with other bulk materials, saturation by rainwater, contamination and/or contact with other deleterious substances or materials.
  - 3. Deliver plants with identification labels.
    - a. Labels should state correct name and size.
    - b. Use durable, water-proof labels with water resistant ink that will remain legible for at least 60 days.
  - 4. Protect plant materials during transport to prevent damage to rootball or desiccation of leaves.
  - 5. Remove unacceptable plant materials immediately from job site.
  - 6. Contractor shall endeavor to coordinate delivery with installation schedule so that plant material is installed on the same day.
- B. Storage:
  - 1. Plants: Maintain plant material in healthy growing condition at all times. Protect plants from drying winds, vandals and animals. Keep plants that cannot be installed immediately in the shade, if shade plants and in the sun, if sun plants. Water and feed as necessary. City of San Rafael's Representative reserves the right to reject plants that decline in quality after delivery to site.
- C. Under no circumstances shall any work be performed if the temperature exceeds 90 degrees or is below 40 degrees. No planting shall be done with the soil saturated with water.

## **1.16 PROTECTION OF EXISTING PLANTS TO REMAIN**

- A. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of any existing plant to remain except as actually required for construction in those areas.
- B. Provide barricades, fences or other barriers as necessary at the drip line to protect existing plants to remain from damage during construction.
- C. Notify City's Representative in any case where Contractor feels grading or other construction called for by Contract Documents may damage existing plants to remain.
- D. If existing plants to remain are damaged during construction, Contractor shall replace such plants of the same species and size as those damaged at no cost to City. Determination of extent of damage and value of damaged plant shall rest solely with City's Representative.

## **PART 2 - PRODUCTS**

### **2.01 SOIL AMENDMENTS**

- A. The following organic amendments, soil amendments, and fertilizer rates and quantities are to be used for bid basis only. Contractor shall arrange and pay for testing by an accredited soils laboratory of existing site soil after rough grading operations are complete, and shall amend the soils according to said laboratory's recommendations. The soils recommendations shall be considered a part of this specification.
- B. Topsoil: Provide topsoil as required to complete landscape work. Topsoil to be furnished shall be fertile and friable, possessing characteristics of representative productive soils on the site. It shall not contain toxic substances which may be harmful to plant growth. If herbicide contamination is suspected then a radish/rye grass growth trial must be performed. Consult with City of San Rafael's Representative prior to decision to test. It shall be uniformly textured and free of all objectionable foreign materials, oil, or chemicals which may be injurious to plant growth. Natural topsoil shall possess a pH factor between 5.5 and 7.5, a sodium adsorption ratio (SAR) of less than 8, a boron concentration of the saturation extract of less than 1 ppm, and salinity of the saturation extract at 25 degrees C. of less than 4.0 millimhos per centimeter.

Obtain topsoil from naturally well- drained sites where topsoil occurs in a depth of not less than 4 inches; do not obtain from bogs or marshes. Topsoil from the project stockpile which meets the requirements is acceptable.

- C. Imported Topsoil:
  - 1. Import topsoil as needed to complete the job with the following properties:
    - a. Fertile, friable, natural, productive, even textured soil containing a normal amount of humus, capable of sustaining healthy plant life, free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash or other harmful substances, with no nematodes or other noxious animal life or toxic substances. Obtain soil from well-drained, arable land, where no noxious weeds such as Morning Glory, Sorrel, or Bermuda Grass are growing. "Sandy Loam" or "Loam" as classified in accordance with USDA Standards.

- b. Imported planting soil pH value to be between 6.0 and 7.5 with boron concentration of the saturation extract of less than 1 ppm, salinity of the saturation extract at 25 degrees C. of less than 4.0 millimoles, and a sodium absorption rate (SAR) of less than 8.
- c. Silt and clay content of imported planting soil is not to exceed that of the existing soil it is to be placed over.
- d. Do not deliver topsoil to the site until City of San Rafael's Representative has reviewed soils report and has approved submittals by City of San Rafael's Representative.

D. Imported Soil Fill

- 1. Import soil fill as needed to complete the job with the following properties:
  - a. Fertile, friable, natural, productive, even textured soil containing a normal amount of humus, capable of sustaining healthy plant life, free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash or other harmful substances, with no nematodes or other noxious animal life or toxic substances. Obtain soil from well-drained, arable land, where no noxious weeds such as Morning Glory, Sorrel, or Bermuda Grass are growing. "Sandy Loam" or "Loam" as classified in accordance with USDA Standards.
  - b. Imported planting soil pH value to be between 6.0 and 7.5 with boron concentration of the saturation extract of less than 1 ppm, salinity of the saturation extract at 25 degrees C. of less than 4.0 millimoles, and a sodium absorption rate (SAR) of less than 8.
  - c. Silt and clay content of imported planting soil is not to exceed that of the existing soil it is to be placed over.
  - d. Do not deliver topsoil to the site until City of San Rafael's Representative has reviewed soils report and has approved submittals by City of San Rafael's Representative.

E. Organic Amendment:

- 1. For bidding purposes, assume Soil Amender Compost, available from Vision Recycling, ph. 510-429-1300 or approved equal. Application rate per 1000 square feet:
 

6 cubic yards	Organic Compost
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- 2. Organic Amendment: Feedstock shall be no longer recognizable. Compost amendment shall contain fairly uniform particle size, no weed sprouts. Submit a nutrient analysis and testing data from a third party or soil lab, such as the STA Seal of Testing Assurance by the US Composting Council; or OMRI, Organic Materials Review Institute. Organic Compost shall meet the following criteria:
  - a. Particle size: 100% passing a 1" screen or smaller.
  - b. Salt Concentration: Must be reported; may vary but < 4.0 mmhos/cm preferred. Soil should be test. <2.5 mmhos/cm preferred for soil/compost blend.
  - c. Feedstock Materials shall be specified and include at one or more of the following: landscape/yard trimmings, grass clippings, food scraps, and agricultural crop residues.
  - d. Nutrient Content: provide analysis detailing nutrient content including N-P-K; Ca; Mg; S; and Bo. Nitrogen content 1% or above preferred.

- e. Trace Contaminants Metals (Lead, Mercury, etc.). Product must meet US EPA, 40 CFR 503 regulations.
  - f. pH: pH shall be between 5.5 and 8.
  - g. Visible Contaminants: compost shall be relatively free of inert ingredients, including glass, plastic and paper, < 0.1 % by weight or volume.
  - h. Moisture Content shall be between 35% - 55% of dry solids.
  - i. Organic Matter Content: 50% - 60% by dry wt. preferred, 30-70% acceptable.
  - j. Carbon and Nitrogen Ratio: C:N < 20:1.
  - k. Stability/Maturity: shall have a dark brown color and a soil-like odor. Compost exhibiting a sour or putrid smell, containing recognizable grass or leaves, or is hot (120F) upon delivery or rewetting is not acceptable.
  - l. Weed seed/pathogen destruction: provide proof of process to further reduce pathogens (PFRP). For example, turned windrows must reach min. 55C for 15 days with at least 5 turnings during that period.
- F. Bioretention Soil Mix: Soil mix shall have a minimum percolation rate of 5" per hour and be amended per Waypoint Analytical test results. Depth of soil shall be as specified on the Civil Engineer plans. Mix shall meet or exceed the BASMAA clean water requirements.
- G. Fertilizer:
- 1. Turf and groundcover areas:
    - a. 6N-20P-20K, 25 lbs. per 1,000 square feet or 6N-24P-24P, 15 lbs per 1,000 square feet.
    - b. Starting one month after planting, on a monthly basis until start of Maintenance Period, apply 12N-8P-16K fertilizer. 7 lbs. per 1,000 square feet.
  - 2. Shrubs and trees:
    - a. 21 gram tablet 20N-10P-5K slow release fertilizer tablets as manufactured by Agriform or approved equal. Apply according to Manufacturer's instructions and as follows:
      - 1) 36" Box shall receive 36 tablets
      - 2) 24" Box shall receive 24 tablets
      - 3) 15 Gallon shall receive 10 tablets
      - 4) 5 Gallon shall receive 3 tablets
      - 5) 1&2 Gallon shall receive 2 tablets
    - b. Starting one month after planting, on a monthly basis until start of maintenance Period, apply 12N-8P-16K fertilizer 7 lbs. per 1,000 square feet.

**2.02 TOP MULCH**

- A. Recycled Pro-Chip Decorative Mulch, dark brown Available from Republic Services, 209-616-4912, or approved equal.

**2.03 WEED FRABRIC**

- A. Contractor 20-year Landscape Fabric available from American Nettings and Fabric, 1-800-811-7444, or approved equal.

## **2.04 GROUNDCOVERS, TREES, AND SHRUBS**

- A. All plant materials shall be nursery grown in accordance with the best known horticulture practices and under climatic conditions similar to those in the locality of the project. Container stock shall have grown in the containers in which delivered for at least six (6) months, but not over two years. No container plants that have cracked or broken balls of earth when taken from container shall be planted except upon special approval by City of San Rafael's Representative.
- B. Roots to be healthy and extend to the bottoms and sides the container with no signs of restriction due to kinked, circular or distorted growth or deformed or circling roots at the liner stage. Rooting to be extensive enough to hold the rootball together during planting, but not as dense as to discourage root establishment into surrounding soils. No plants with roots that have encircled themselves will be accepted. In case of any unsatisfactory root system, a total group of plants may be rejected.
- C. Plants shall be vigorous and shall have a normal habit of growth. Plants shall be free of damage by insects, pests, diseases or wind; burns from insecticides or fertilizer; and stunted growth due to lack of water, lack of food, diseases, or other causes. Plants shall be in conformity with the sizes shown on the drawings.
- D. Trees: Unless otherwise specified, tree trunks shall be straight with leader intact, undamaged, and uncut. All old abrasions and cuts are acceptable only if completely callused over.
- E. Quantities: Quantities necessary to complete the work as shown on the drawings shall be furnished.

## **2.05 TREE SUPPORT POLES**

- A. Peeled, lodge pole pine logs, treated with Chemonite or ACQ or approved equal, clean, smooth, new, and sized as follows:
  - 1. Three inch (3") diameter by ten (10') long for trees greater than 8 feet high and 1 inch caliper.

## **2.06 TURF SOD**

- A. Sod shall be one year old and dense with grass, having been mowed at 1 in. height before lifting from field. All grown on fumigated soil. Sod shall be in vigorous condition, dark green in color, free of disease and harmful insects.
  - 1. Sod shall be 90% Tall Fescue/10% Bluegrass by Delta Bluegrass or approved equal.

## **2.07 TREE TIES**

- A. Flexible strap, 24 inch minimum length without sharp edges adjacent to trunk, V.I.T. cinch-tie, or approved equal.

## **2.08 EROSION CONTROL NETTING**

- A. New, with a uniform, open plain-weave, flame-retardant mesh. The mesh shall be [natural brown-tan] and made from unbleached single jute yarn. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than one-half its normal diameter. Furnish jute mesh in rolled strips to meet the following requirements:
  - 1. Width: 48 inches, with tolerance of one-inch wider or narrower.
  - 2. Not less than 78 warp ends per width.
  - 3. Not less than 41 weft ends per yard.
  - 4. Weight shall average 1.22 pounds per liner yard, with tolerance of 5 percent heavier or lighter.
- B. Install jute mesh loosely up and down the slope in accordance with manufacturer's specifications and as follows. Fit the soil surface contour and hold in place with 12 inch long, 11-gauge (minimum) steel wire staples driven vertically into the soil at 18-24 inch spacing, Jute mesh strips shall overlap along all edges at least 6 inches. Ends of side stripes shall be buried into the soil at least 6 inches. Drive staples along to securely anchor mesh to ground.

## **2.09 WATER SOURCE**

- A. Water source shall be provided by City of San Rafael. Contractor shall provide transport as required.

## **2.10 ROOT CONTROL BARRIERS**

- A. Deep Root Model UB 24-2, Deep Root (415) 344-1464. Root barrier shall be used on all trees 5' or closer to pavement, utilities, curbs, etc. Or approved equal.

## **2.11 FILTER FABRIC**

- A. Filter Fabric: Polyester non-woven filter fabric with uniform fiber distribution by "Mirafi, Inc." #140NS, or approved equal.

## **2.12 PRE-EMERGENCE WEED KILLER**

- A. Clean non-staining as recommended by a licensed pest control specialist and as approved by City of San Rafael's Representative in compliance with the City of San Rafael's Representative's Integrated Pest Management Policy.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Inspections by the Landscape Contractor:
  - 1. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities.

2. In the event of discrepancy, immediately notify the City of San Rafael's Representative. Do not proceed with this installation in areas of discrepancies until all such discrepancies have been fully resolved.
3. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.
4. Inspect trees, shrubs and ground cover plants for injury, insect infestations, and proper pruning.
5. General contractor shall coordinate rough grading of site to ensure the Landscape Contractor shall receive all planting areas graded to  $\pm 0.10$  ft. of finish grades shown on the Drawings. Allow for depth of soil amendments and mulch in determining the difference between finished subgrade in groundcover and shrub beds. Verify that subgrades are not compacted. Do not proceed until detrimental conditions are corrected. Contractor shall take precautions during the excavation of all planting areas to not undermine or damage all adjacent pavements, footings and their associated subgrades.

### **3.02 FIELD QUALITY CONTROL/INSPECTIONS**

- A. Progress observations: In addition to the installation observations specified below, the City of San Rafael's Representative may make periodic progress observations.
- B. Installation observations: Request at least 4 working days in advance:
  1. Observation of finish grading.
  2. Observation of plant material upon delivery to site.
  3. Observation of layout and placement of plant material at time of planting.
  4. Observation of any planting drainage problems, as identified by Contractor.

The above shall be considered check points and the Contractor shall only proceed with the work after the City of San Rafael's Representative has visited the site and determined that the work is proceeding satisfactorily.

- C. Maintenance Observations: For the purpose of establishing the start of Maintenance Period and observing completion of the Work of this Section through Final Acceptance. Request at least 7 working days in advance:
  1. Observation for Maintenance Period commencement.
  2. Observation for Final Acceptance.

### **3.03 REVIEW AND ACCEPTANCE OF PLANT MATERIAL**

- A. Do not install material that has not been reviewed and accepted by City of San Rafael's Representative.
- B. Arrange and pay for permits and inspections required for delivery of plant material.

### **3.04 FINE GRADING AND SOIL PREPARATION**

- A. General Fine Grading and Soil Preparation



1. The Contractor shall prepare the site for landscaping. In the areas designated for landscaping on the plans, he shall inspect planting areas and remove all base rock and other foreign material.
  2. Rip in two directions all planting areas full depth of compacted fill (to a minimum of 12 inches) into undisturbed native soil prior to backfilling. Uniformly distribute and spread planting soil backfill in planting areas in layers not to exceed 18" and compact to a maximum of 85% relative compaction.
  3. When the planting soil differs in clay and silt content from the subsoil it is to be placed upon, install a 4-inch thick lift of planting soil on the subgrade and rototill into the subgrade 6 inches deep before installing the remaining required planting soil.
  4. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.
  5. Water settling, puddling, and jetting of fill and backfill materials, as a compaction method is not acceptable.
  6. Maintain moisture content of materials during compaction operations within required moisture range to obtain indicated compaction density.
- B. The Contractor shall alleviate compacted soils before planting, for all landscaped areas that cannot be protected during construction.
1. Scarification: Scarify all planting areas prior to fine grading in order to ensure relative compaction of 85% or less. Any planting areas which become compacted in excess of 85% due to construction activities shall be thoroughly cross-ripped to the maximum depth feasible to alleviate that condition, taking care to avoid all existing drainage and subsurface utility lines. See plans.
  2. Scarification of any planting area that cannot be accomplished with a tractor shall be accomplished by an alternative method approved by the City of San Rafael's Representative to the specified depth to ensure proper drainage.
- C. Drag to a smooth, even surface. Grade to form all swales, pitch to catch basins, streets, curb, etc. to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas that shall be uniformly level or sloped between finish elevations. Provide surface drainage of planted area. Correct drainage conditions that may be detrimental to the growth of plant material or which will result in excessive retention of water in tree pits. Minimum slope in landscape areas shall be two percent (2%) or as shown on drawings. Slope away from building.
- D. Cultivation and Placement of Amendment:
1. Hold finish grade and/or mulch surface in planting areas 1/2-inch below adjacent pavement surfaces, tops of curbs, manholes, etc.
  2. Spread soil amendment, fertilizers and other additives evenly over installed and rough graded topsoil in all planting areas including turf, ground cover and shrub areas at the rates specified in the soils analysis report. For bid basis, use the following rates (Do not apply fertilizer to areas to be hydroseeded):
  3. In areas to be planted with shrubs cultivate to a depth of 18". In turf and groundcover areas, cultivate soil to a depth of 8". Incorporate 6 cubic yards per 1000 square feet of organic amendment. Prior to planting incorporate to a depth of 6" the following fertilizers, per 1000 square feet:
    - a. Gro-Power Plus 5-3-1: 160 lbs per 1,000 square feet.
    - b. Soil Sulfur: 20 lbs per 1,000 square feet.

- c. Agricultural Gypsum: 50 lbs per 1000 square feet
- 4. Areas within the driplines of existing trees shall be hand cultivated.
- E. Finish Preparation in Turf Areas:
  - 1. Roll to compact amended soil to not more than 85% compaction. Finish grade shall be 1" below adjacent paving, curbs, or walls unless otherwise shown on drawings. Finish out smoothing, even surfacing conforming to established grades after settlement. Rake immediately prior to planting.
  - 2. If rain is likely between completion of soil preparation and planting, precautions shall be taken to prevent erosion of the soil.
- F. Soil Mix for Backfill of Shrubs, Trees and Ground Covers: The following ingredients shall be tumbled to achieve a homogeneous mix:
  - 1. Organic amendment      1 cubic yard
  - 2. Topsoil                      3 cubic yards
- G. Contractor to remove any lime treated soil from planting areas and over excavate for drainage prior to the placement of top soil and import soil backfill.

**3.05 HANDLING OF PLANTS**

- A. Prevent damage to plant material. Lift and handle plants only from bottom of rootball.
- B. Do not plant material that has not been reviewed by City of San Rafael’s Representative upon delivery to the project site, or that has been rejected for any reason. Do not plant under unfavorable weather conditions.
- C. The Contractor shall protect all utilities, vegetation, and structures during work.
- D. Trees shall be located a minimum of 3' from walls, overheads, walks, headers, and other trees within the project. If conflicts arise between size of areas and plans, Contractor shall contact City of San Rafael’s Representative for resolution. Failure to make such conflicts known to the City of San Rafael’s Representative will result in Contractor's liability to relocate the materials.

**3.06 SHRUBS AND TREES**

- A. Preparation:
  - 1. City of San Rafael’s Representative will review, for conformance to design intent, locations of all plants in the field prior to planting. Notify City of San Rafael’s Representative and schedule layout review sufficiently in advance of planting to allow for review and adjustment without disrupting construction schedule.
  - 2. Stake layout of trees in field before installing irrigation. Mark tree and shrub locations on site using stakes, gypsum or similar approved means and secure location approval by the City of San Rafael’s Representative before plant holes are dug. Adjust as necessary prior to planting. City of San Rafael’s Representative reserves the right to make minor adjustments in the layout of all plant material; adjust irrigation system as necessary.
- B. Excavation:

1. Excavate container grown tree, shrub, groundcovers and vine pits as follows. If rocks, underground construction work, tree roots or other unknown obstructions are encountered in the excavation of plant holes; City of San Rafael's Representative may select alternate locations. Report all such conditions in writing to the City of San Rafael's Representative. Where locations cannot be changed, submit a written proposal and cost estimate for removing the obstructions to a depth of not less than 6 inches below the required hole's depth. Obtain City of San Rafael's Representative's instructions prior to proceeding with the work affected.

<u>Excavation for</u>	<u>Width</u>	<u>Depth</u>
Boxed Trees	Box + 24"	Box + 12"
Canned Trees/Shrubs (15 gal) or larger	Can + 24"	Can + 12"
Canned Shrubs/Vines (2.5 to 5 gal)	Can + 18"	Can + 8"
Canned Shrubs/Groundcover/Vines (1 gal)	Can + 12"	Can + 6"

All plant pits shall be dug with vertical walls. The sides and bottoms of all planting pits shall be thoroughly scarified to ensure root penetration.

C. Percolation Testing:

1. Contractor shall verify water drainage of all planting pits with a percolation test prior to planting.
2. Fill full sized planting pit with water and observe in 24 hours.
3. Notify City of San Rafael's Representative if planting pit has not fully drained before proceeding with the planting operation for all areas not draining, and all soil conditions considered detrimental to growth of plant material. State condition, and proposal and cost estimate for correcting the condition.
4. Obtain City of San Rafael's Representative's instructions prior to proceeding with work affected.
5. Repeat drainage testing and correction of conditions until tests are passed.
6. Failure to perform drainage tests, or to notify City of San Rafael's Representative in writing of conditions specified above, renders Contractor responsible for all plant failure that occurs as a result of inadequate drainage or detrimental soil conditions, as determined by City of San Rafael's Representative.

D. Plants in Containers:

1. Plants shall be removed carefully from their containers after the containers have been cut on two sides minimum; fifteen-gallon containers shall be opened in three places. In the case of boxed plant specimens, the wood shall be removed at the sides and at the bottom of the box.
2. After removing plant material from its container, stimulate root growth by making four or five vertical cuts 1" deep around the circumference of the root ball.
3. Do not lift or handle plants by the top, stems, or trunk at any time. All plants shall be lifted in such a manner that the root ball is supported from the underside.
4. The Contractor shall check all plants for adequate root systems. If the root system is defective, he shall remove deficient plants from the site and replace them with new ones.

E. Planting:

1. Carefully remove and set plants and trees without damaging the rootball. Do not install plants or trees with damaged rootballs. Cutting or scoring of rootballs to be done only if

species is known to be tolerant of such treatment. Superficially cut tolerant plants' edge roots vertically on three sides using a knife.

2. For trees remove sides of boxes after positioning the plant and partially backfilling.
3. Center plant in pit or trench over tamped mound.
4. Face for best effect.
5. Set plant plumb and hold rigidly in position.
6. All plants shall be set in the ground so that the root ball will be flush with the finish grade. All plants that settle below the finish grade within 30 days of acceptance of the work shall be replanted in the proper position. In case a total section of planting area settles, the Contractor shall lift the plants, import additional soil mix, regrade, and replant, at no additional cost to the City of San Rafael.
7. Back fill:
  - a. Backfill plant holes with soil mix as specified, free from rocks, clods or lumpy material. Backfill native soil free of soil amendments under rootball and foot tamp to prevent settlement.
  - b. Set plants in backfill with top of the rootball 2 inches above finished grade. Backfill remainder of hole and soak thoroughly by jetting with a hose and pipe section. Water backfill until saturated the full depth of the hole. Thoroughly water all plants immediately after planting, eliminating air pockets. Prevent erosion.
  - c. The filled pit shall be flush with surrounding grade when complete.
8. When the plant pit has been approximately one half filled, place planting tablets according to the manufacturer's schedule and per Section 2.01 Subsection K Fertilizer, paragraph 2.
9. Build 5" high watering basin berms around trees and shrubs to drain through rootball. Basins are not required around trees in turf areas.
10. Apply post-planting fertilizer.

### **3.07 GROUND COVER AREAS**

#### **A. Planting:**

1. Plant in neat, straight, parallel and staggered rows as indicated on plan. Plant first row one-half required ground cover spacing behind adjacent curbs, structures, or other plant bed limits. Plant ground cover to edge of water basins of adjacent trees and shrubs.
2. Space plants equally and uniformly at spacing indicated on the Drawings, which are the maximum and in a triangular pattern.
3. Plant pits shall be sufficiently large so that the root can be freely suspended in the pit. After backfilling the pit, firm the soil so that there will be no air space around the roots.
4. Apply post-planting fertilizer.
5. Mulch all ground cover areas with 3" layer of mulch.

### **3.08 TURF SOD**

#### **A. Inspection:**

1. Upon the completion of the placing of the soil and prior to placing sod, the Contractor shall call for an inspection of the turf irrigation system. The sod shall be placed after the Owner's Representative has satisfied himself that the irrigation system is operating satisfactorily and finish grade is in accord with the Drawings.

- B. Laying Sod:
1. Remove all rubble, sticks, rocks and stones 1" or larger from top 2" amended soil.
  2. Arrange for delivery of sod in the morning to insure same-day installation.
  3. Lightly roll surface and re-shape to level humps and hollows. Secure Owner's Representative's approval prior to sodding. Do not sod on dry soil.
  4. Lay first strip of sod along a straight line (use a string in irregular areas). Butt joints tightly, do not overlap edges. On second strip, stagger joints. Use a sharp knife to cut sod to fit curves, edges and sprinkler heads.
  5. When a conveniently large area has been sodded, water lightly to prevent drying. Continue to sod and to water until installation is complete. Lay sod without stretching. Stagger end seams and butt edges as close as possible to each other. Roll with sod roller perpendicular to direction it was laid.
  6. After laying all sod, roll lightly to eliminate irregularities and to form good contact between sod and soil. Avoid a heavy roller and excessive initial watering.
  7. Thoroughly water the completed sod surface to at least 8 inches deep. Repeat sprinkling at regular intervals to keep sod moist at all times until rooted. After sod is established, decrease frequency and increase amount of water per application.
  8. Protect turf areas by erecting fences, barriers and signs necessary to prevent trespass. Keep barriers neat and well maintained.
  9. Apply post-planting fertilizer.
- C. At the time of final inspection the turfs shall be dense, green, and weed free. It is the Contractor's responsibility to eliminate any bare spots, dead areas and weeds.

### **3.09 EROSION CONTROL NETTING**

- A. Install jute mesh loosely up and down the slope in accordance with manufacturer's specifications and as follows. Fit the soil surface contour and hold in place with 12 inch long, 11-gauge (minimum) steel wire staples driven vertically into the soil at 18 - to 24 inch spacing. Jute mesh strips shall overlap along all edges at least 6 inches. Ends of side strips shall be buried into the soil at least 6 inches. Drive staples along edges to securely anchor mesh to ground.

### **3.10 TREE STAKING**

- A. Stake trees as indicated on the Drawings. Drive stake until solid and remove excess stake protruding above top tree tie to prevent rubbing against branches. Allow 1 to 3 inches sway in trunk or branches; do not pull tight.
- B. Tying: Find the proper support height by holding the trunk in one hand and pulling the top to one side and releasing it. The lowest height, at which the trunk will return to the upright position when the top is released, is the height at which to attach tree ties.

### **3.11 ROOT GUARD**

- A. Install as detailed and as specified below. If not shown, install in accordance with manufacturer's recommendations. Install the panels so that the vertical root deflecting ribs on the panels face

inward, toward the root ball. The double top edge of the barrier should be positioned flush with finished grade. Install root barrier as indicated and at locations on drawings.

- B. Install root control barrier for all trees located within 5 feet-0 inches of paved areas, in accordance with manufacturer's recommendations.
- C. Root Barrier shall be installed in a linear fashion and shall never circle a tree.

### **3.12 TREE STAKING**

- A. Stake trees as indicated on the Drawings. Drive stake until solid and remove excess stake protruding above top tree tie to prevent rubbing against branches. Allow 1 to 3 inches sway in trunk or branches; do not pull tight.
- B. Tying: Find the proper support height by holding the trunk in one hand and pulling the top to one side and releasing it. The lowest height, at which the trunk will return to the upright position when the top is released, is the height at which to attach tree ties.

### **3.13 WEED FABRIC**

- A. Preparation:
  - 1. Clear the installation area of any existing vegetation, rocks, debris, or other obstructions. Grade area based on plans and specifications.
  - 2. Installation of weed fabric shall be done prior to planting of trees, shrubs, groundcover and irrigation.
  - 3. Installation of weed fabric shall be in all new planting and/or mulched areas except for bio-retention areas.
- B. Installing Weed Fabric:
  - 1. Measure the installation area and cut the weed fabric to size, leaving an extra 6" to allow for overlapping seams,
  - 2. Lay the weed fabric evenly over the prepared area, ensuring complete coverage.
  - 3. Secure weed fabric to the ground using landscape fabric pins or staples. Place pins or staples every 2 to 3 feet along the edges and seams, and additional pins or staples in the center of large sections.
  - 4. Cut openings in fabric using utility knife to accommodate existing trees, shrubs, and irrigation, and new trees, shrubs, and irrigation.
  - 5. Cover weed fabric with mulch as specified in this specification section.
- C. Maintenance:
  - 1. Periodically inspect the weed fabric for any signs of damage or wear.

2. Replace damaged or worn sections of the fabric as needed.

3. Monitor for weed growth along the edges and seams, and promptly address any issues.

**3.14 PRUNING**

- A. Tree and Shrub: Pruning shall be performed as required to maintain a natural appearance, promote healthy and vigorous growth, and eliminate diseased or damaged growth.
- B. Trees shall be pruned to thin crown and avoid wind damage, eliminate narrow V-shaped branch forks that lack strength, eliminate sucker growth, and maintain a radial branching pattern to avoid crossing branches.
- C. Under no circumstances will stripping of lower branches ("raising-up") of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk).
- D. Major pruning of trees to compensate for root loss or for aesthetic reasons shall be done only with approval of the City of San Rafael's Representative.
- E. Shrubs shall not be clipped into balled or boxed forms, unless such is required by the design and directed by the City of San Rafael's Representative.
- F. All pruning shall be made flush to lateral branches, buds, or trunk. "Stubbing" will not be permitted.
- G. Damage: All cuts over 1" resulting from pruning or wind breakage shall be inspected periodically for insect infestation or disease.

**3.15 WATERING**

- A. Water all trees, shrubs and ground cover immediately after planting. Apply water to all plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering of trees and shrubs during the first 3 weeks of plant establishment as necessary.

**3.16 CLEAN UP**

- A. Keep all areas of work clean and neat at all times. Upon completion of planting, all cans, boxes, and other debris that is a part of the planting operation shall be removed from the site.
- B. All pavements shall be washed off, and site shall be left in an absolutely clean condition. All planting areas shall be cultivated and weed free before final inspection. Clean-up operations shall take place throughout the course of work so that walks and drives are clean at all time.

### **3.17 PRE-MAINTENANCE/PLANT ESTABLISHMENT PERIOD REVIEW AND APPROVAL OF PLANTING**

- A. Notify the City of San Rafael's Representative a minimum of five (5) days prior to requested Punch List and for Final Acceptance Review. Before the reviews, complete the following:
  - 1. Complete all work per Specifications and Plans.
  - 2. Present all planted areas neat and clean with all weeds removed and all plants installed and appearing healthy.
  - 3. Plumb all tree stakes.
  - 4. Seed or hydroseed all areas per plans.
  - 5. Turf sod all areas per plans.
  - 6. Settlement: Reset plants that have shift or settled.
- B. Punchlist Inspection:
  - 1. At this time the Contractor shall have completed all phases of the Plans and Specifications for planting and irrigation. Any discrepancies shall be noted at that time and the Contractor shall make appropriate corrections before the Final Acceptance of the work and the beginning of Maintenance Period is established.
  - 2. No partial approvals will be given.
- C. Final Acceptance
  - 1. Should it be determined at the Final Acceptance visit that any punchlist item is incomplete, any further review of the site will be terminated until all items are guaranteed, in writing, to be complete by the Contractor. The cost of additional site visits by the City of San Rafael's Representative to verify completion of work shall be paid for by the Contractor.

### **3.18 PLANT ESTABLISHMENT PERIOD**

- A. The planting establishment period required shall be for 6 months after all planting is complete, sod is laid, and installation approved.
- B. Establishment period shall not start until all elements of construction, planting, and irrigation for the entire project are complete. Project will not be segmented into maintenance phases, unless specifically authorized in writing by the City of San Rafael's authorized representative.
- C. A longer plant establishment period may be required if the turf is not thick, vigorous and even, or if the plant material is not acceptably maintained during the establishment period. The establishment period may be suspended at any time upon written notice to the Contractor that the landscaping is not being acceptably maintained, and the day count suspended until the landscape is brought up to acceptable standards as determined by the City of San Rafael's Representative.
- D. Contractor shall furnish all labor, material, equipment, and services required to maintain the landscape in a healthy and attractive condition for a period of 365 days.
- E. Maintenance shall include fertilization, watering, insect and disease control, weed control, weekly trash removal, mulching, restaking trees, tightening of guys, resetting plants to proper grades or upright position, and restoration of watering basins.



- F. Maintenance of grass areas shall consist of fertilizing, watering, weeding, mowing, repair of all erosion, and reseeding as necessary to establish a uniform stand of the specified grasses. Areas and parts of areas which fail to show a uniform stand of grass for any reason shall resodded until all areas are covered with a satisfactory stand of grass.
- G. The Contractor's maintenance period will be extended if the provisions required within the plans and specifications are not filled.
- H. General Requirements:
1. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work or maintenance.
  2. Repair all damaged planted areas, and replace plants and reseed or resod grass immediately upon discovery of damage or loss.
  3. Check sprinkler system at each watering; adjust coverage and clean heads immediately. Adjust timing of sprinkler controller to prevent flooding.
  4. Keep Contract area free from weeds by cultivating, hoeing or hand pulling. Use of chemical weed killers will not relieve the Contractor of the responsibility of keeping areas free of weeds over 1-inch high at all times.
  5. Settlement: Reset plants that shift or settle before end of maintenance period. Crowns of trees shall be at the following minimum height above surrounding finish grade at end of maintenance period: 24 inch box and smaller - 2 inches.
  6. Protect all areas against damage, including erosion and trespass, and provide proper safeguards. Maintain and keep all temporary barriers erected to prevent trespass.
- I. Tree, Shrub and Ground Cover Maintenance:
1. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the City of San Rafael's Representative.
  2. Keep watering basins in good condition and weed-free at all times.
  3. Replace all damaged, unhealthy or dead trees, shrubs, vines and ground covers with new stock immediately, size as indicated on the drawings.
- J. Turf:
1. Maintain during the entire establishment period. Cut as frequently as growth of grass requires. Cut to a height of two inches (2"), unless otherwise directed by the City of San Rafael's Representative.
  2. Maintain appropriate soil moisture at all times for healthy and vigorous turf grass.
  3. Trim edges of turf at paving and header boards at time of second cutting, and at each later cutting.
  4. Keep the designated area under trees free of turf at all times. Do not create low area around base of tree.
  5. Keep turf areas free of undesirable weeds and grasses by the application of suitable selective weed killers or hand pulling.
  6. Reseed all damaged areas as soon as evident.
  7. Repair any hollow, settled or eroded areas by filling, rolling and resodding.
- K. Watering:

1. All plants shall be kept watered as often as it is necessary to keep them in optimum, vigorous growth. The turf shall, at no time, show a lack of fresh green color or a loss of resilience due to lack of water. Watering shall be done preferably during the early morning hours.
  2. Water shall be controlled so that there will be no excessive run-off, ponding, or overwatering.
- L. Root Growth: Periodically the Contractor shall check the progress of the root growth within the back fill area. As the root growth increases beyond the root ball, the frequency of watering shall be reduced so that the roots are encouraged to grow to a lower soil depth. Watering then shall be less frequent, but applications shall be very slow and the Contractor shall assure himself that water does penetrate to the depth of the former plant pit.
- M. Weed Control:
1. Weeds shall be kept under control, either by hand or by the application of herbicides designed for use on any type of weeds invading the planting areas.
  2. All equipment used for herbicides shall be properly cleaned before it is used on this project. Herbicides shall be applied at temperatures recommended by the manufacturers. Herbicides shall not be used during windy or gusty days. All possible precautions shall be taken to protect vegetation which is susceptible to damage from the particular herbicides to be used.
  3. The bases of all plants shall be kept completely free of weeds. Periodically, the base of the trees and shrubs shall be cultivated in order to allow better penetration of water, but such cultivation shall be carefully done in order not to destroy surface roots.
- N. Mowing:
1. All mowing shall be done in a neat and orderly manner. Equipment shall be moved onto and off the area to be mowed in such a manner that it will not leave tracks or marks that detract from the finish turf. Timber shall be provided to move equipment over curbs, stairs, or similar constructions.
  2. Mowing equipment shall be kept in optimum operating condition. The equipment shall be washed before initial use on the project so that there will be no chance of introducing foreign seeds or diseases onto the project.
  3. Frequency of mowing shall be determined by the rate of growth of the grass. During seasons of peak growth mowing may have to be done every five days to six days; under normal conditions once a week should be adequate.
  4. The average mowing height shall be 1-1/2". The grass blades must be cut sharply and cleanly. The turf must be cut evenly so that no ridges remain in the finish cut. The direction of mowing shall be alternated each time.
- O. Spraying:
1. All shrubs and trees shall be inspected at least twice a month during the growing period to determine the need for spraying to control insect damage, fungus development or any other disease that might be attacking the plants. Preventative spraying shall be done only with the approval of the City of San Rafael's Representative.
  2. Operators of spray equipment shall take all reasonable precautions to protect themselves, other people and buildings from spray. The Contractor shall have all permits and licenses

required for such an operation. Where applicable, dormant spray shall be applied to shrubs and trees during the winter period.

3. All equipment shall be properly washed before and after use.
4. No spraying shall take place during windy or gusty days.

P. Staking and Guying: Stakes and guys shall be inspected a minimum of two times a month to assure that the wires and ties are tight and no damage has occurred to the tree trunk or branches.

Q. Fertilizing:

1. Fertilize in accordance with the soil analysis lab's maintenance fertilization program and in accordance with Bay Friendly guidelines.
2. Apply ammonium sulfate fertilizer as necessary to maintain vigorous, green grass between fertilizing mentioned above.

R. Litter:

1. The Contractor shall remove promptly after pruning, trimming, and weeding or other work required under the contract, all debris generated by his performance of the work. Immediately after working in the areas of public walks, driveways or paved areas, they shall be vacuumed clean with suitable equipment. All areas covered by this contract shall be kept free of the following items: bottles, cans, paper cardboard or metallic items. Common debris and litter shall be disposed of in an appropriate manner.

S. Pruning:

1. Prune as necessary to remove injured twigs and branches, dead wood, and suckers.

### **3.19 FINAL PLANTING REVIEW AND WRITTEN ACCEPTANCE (TURN OVER ACCEPTANCE)**

A. Final Review: At the conclusion of the planting establishment period, schedule a final review for Final Written Acceptance/Turn Over Acceptance. The conference shall include the City of San Rafael's. Any discrepancies shall be noted at that time and the Contractor shall make appropriate corrections before the Final Written Acceptance of the work and the beginning of Guarantee Period is established.

B. Final Written Acceptance/Turn Over Inspection: A conference including the City of San Rafael shall be held at the completion of all project improvements and all corrective work. The Contractor shall continue to maintain the project at his own expense until all deficiencies have been corrected. Once completed, the Contractor shall request the City of San Rafael's Representative and City of San Rafael's to visit the site and approve the project as complete. The City of San Rafael's Representative will accept the landscape project in writing. The date of the Final Written Acceptance letter shall be the first day of the guarantee period.

C. Prior to either review, weed and rake all planted areas, repair plant basins, mow and edge turf, plumb tree stakes, clear the site of all debris and present in a neat, orderly manner.

D. Submit written notice requesting review at least 5 days before the anticipated review.

### **3.20 GUARANTEE AND REPLACEMENT**

- A. Guarantee period shall be extended for a period of one year from the date of Final Written Acceptance.
- B. All plants shall be guaranteed to be alive and healthy as determined by the City of San Rafael's Representative at the end of the guarantee period.
- C. Plant materials supplied by City of San Rafael shall be under similar warranty against defective workmanship during the planting operations. Plant material exhibiting conditions which are determined by the City of San Rafael's Representative as being unacceptable, due to workmanship by the Contractor, shall be replaced at no additional cost to the City of San Rafael.
- D. The Contractor shall replace, in accordance with the Drawings and Specifications throughout the guarantee period, any plants that die, or in opinion of the City of San Rafael's Representative, are in an unhealthy or unsightly condition, and or have lost their natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, or any other causes due to the Contractor's negligence. The Contractor shall not be held responsible for acts of vandalism occurring after the beginning of the guarantee period.

### **3.21 RODENT CONTROL & DAMAGE**

- A. Contractor shall employ a rodent specialist who shall inspect the site a minimum of 2x per week to bait, trap, and remove all rodents within the project limits, for the duration of the plant establishment period.

## **PART 4 - MEASUREMENT & PAYMENT**

### **4.01 SOD LAWN**

- A. **Measurement:** Measurement of "Sod Lawn" shall be per Square Foot (SF).
- B. **Payment:** The contract unit prices paid for the various items in the installation of "Sod Lawn" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Sod Lawn", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

### **4.02 24" BOX TREES**

- A. **Measurement:** Measurement of "24" Box Trees" shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in "24" Box Trees" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "24" Box Trees", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.03 1 GALLON SHRUBS**

- A. **Measurement:** Measurement of “1 Gallon Shrubs” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “1 Gallon Shrubs” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “1 Gallon Shrubs”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.04 5 GALLON SHRUBS**

- A. **Measurement:** Measurement of “5 Gallon Shrubs” shall be per each (EA).
- B. **Payment:** The contract unit prices paid for the various items in “5 Gallon Shrubs” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “5 Gallon Shrubs”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.05 HYDROSEED**

- A. **Measurement:** Measurement of “Hydroseed” shall be per Square Foot (SF).
- B. **Payment:** The contract unit prices paid for the various items in the installation of “Hydroseed” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Hydroseed”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.06 GOPHER REMOVAL & MAINTENANCE**

- A. **Measurement:** Measurement of “Gopher Removal & Maintenance” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for the “Gopher Removal & Maintenance” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the “Gopher Removal & Maintenance” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

#### **4.07 BARK MULCH**

- A. **Measurement:** Measurement of “Bark mulch” shall be by the cubic yard (CY).
- B. **Payment:** The contract unit prices paid for the various items in “Bark Mulch” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Bark Mulch”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.08 GRAVEL MULCH**

- A. **Measurement:** Measurement of “Gravel Mulch” shall be by cubic yard (CY).
- B. **Payment:** The contract unit prices paid for the various items in “Gravel Mulch” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Gravel Mulch”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.09 ROOT BARRIER**

- A. **Measurement:** Measurement of “Root Barrier” shall be per Linear Foot (LF).
- B. **Payment:** The contract unit prices paid for the various items in “Root Barrier” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Root Barrier”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

#### **4.10 PLANT ESTBALISHMENT PERIOD**

- A. **Measurement:** Measurement of “Plant Establishment Period” shall be by Lump Sum (LS).
- B. **Payment:** The contract lump sum price paid for the “Plant Establishment Period” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the “Plant Establishment Period” as shown on the plans, as specified in these specifications, and as directed by the Engineer and no additional compensation shall be provided.

**END OF SECTION 32 90 00**

GUARANTEE FOR PLANT MATERIAL

WE HEREBY GUARANTEE THAT THE PLANT MATERIAL WE HAVE FURNISHED AND INSTALLED ARE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP, AND THE WORK HAS BEEN COMPLETED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS. WE AGREE TO REPLACE ANY PLANTING WHICH IS IN ANY STATE OF DECLINE, DISEASED, OR HAVE DIED WITHIN THE 12 MONTH WARRANTY PERIOD. WE AGREE TO REPAIR OR REPLACE ANY DEFECTS IN MATERIAL OR WORKMANSHIP, ANY SETTLING OF PLANT MATERIAL, WHICH MAY DEVELOP DURING THE PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE AND ALSO TO REPAIR OR REPLACE ANY DAMAGE CAUSED RESULTING FROM THE REPAIRING OR REPLACING OF SUCH DEFECTS AT NO ADDITIONAL COST TO THE OWNER. ORDINARY WEAR AND TEAR, UNUSUAL ABUSE OR NEGLIGENCE ARE EXCEPTED. WE SHALL MAKE SUCH REPAIRS OR REPLACEMENTS, INCLUDING COMPLETE RESTORATION OF ALL DAMAGED IRRIGATION, PLANTING, PAVING, OR OTHER IMPROVEMENTS OF ANY KIND, 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 THE 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.

PROJECT: \_\_\_\_\_

LOCATION: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

LICENSE NO: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

GUARANTEE TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DATE OF ACCEPTANCE: \_\_\_\_\_

AUTHORIZED REPRESENTATIVE: \_\_\_\_\_



**SECTION 33 11 00**  
**WATER UTILITY DISTRIBUTION PIPING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe and fittings for site water lines including domestic water services.

**1.02 RELATED SECTIONS**

- A. Section 02 40 00 – Demolition.
- B. Section 31 23 33 – Trenching and Backfilling.

**1.03 REFERENCES**

- A. ASTM B 88- Standard Specification for Seamless Copper Water Tube, 2008
- B. ASTM D 1785- Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2004a.
- C. ASTM D 2241-Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2004b
- D. ASTM D 2466- Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2002.
- E. ASTM D 2737-Standard Specification for Polyethylene (PE) Plastic Tubing; 2003
- F. ASTM D 2855- Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Re-approved 2002).
- G. ASTM D 3139- Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Re approved 2005).
- H. AWWA C115- Standard for Flange Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges; American Water Works Association; 2011; (AWWA C115).
- I. AWWA C509- Resilient-Sealed Gate Valves for Water Supply Service; American Water Works Association; 2001; (ANSI/AWWA C509).
- J. AWWA C900-Polyvinyl Chloride (PVC) Pressure Pipe, 4 in through 12 in (100 mm through 300 mm), for Water Distribution; American Water Works Association; 1997 (ANSI/ AWWA C900/ C900a)
- K. AWWA C901-08-Polyethylene (PE) Pressure Pipe and Tubing, ½-in through 3-in for water service; American Water Works Association; (ANSI/AWWA C901/C906)

- L. ANSI A21.51, 1976 or most recent issue.

#### **1.04 SUBMITTALS**

- A. Division 01 Section 01 3000 - Administrative Requirements for submittal procedures. Project Data: Provide data on all pipe materials, pipe fittings, valves and accessories. Manufacturer's Certificate: Certify that projects meet or exceed specified requirements.
- B. Names and addresses of the nearest service and maintenance organization that readily stocks repair parts. Manufacturer's recommended installation procedures.

#### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with all City and AWWA requirements.
- B. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store valves in original shipping containers, with labeling in place.

### **PART 2 - PRODUCTS**

#### **2.01 WATER SERVICE MATERIALS**

- A. Existing water meters and ERT's shall be saved and reinstalled after water service installation.
- B. Polyethylene Pipe 3408, SDR9 ASTM D-2737; AWWA C901:
  - 1. Fittings: ANSI/AWWA C110/C153.
  - 2. Joints: Integrally molded bell ends, ASTM D2672
  - 3. Approved equivalent.
- C. Trace Wire: Green-coated THNN Type #10 or larger AWG standard copper wire.
- D. All bolts, nuts, tie rods, etc. for all portions of the underground mains shall be 316 stainless steel. Double polyethylene bags and mastic are not allowed.
- E. Gaskets for flange fittings shall conform to AWWA STD C115
- F. Water Meter Box Lid; ASTM-D1693:
  - 4. Oldcastle Enclosure Solutions
    - a. Fibrelyte Water Meter Box Lid without reading lid, non-concrete, model FL16D.

- 5. Approved equivalent.
- G. Stainless steel service saddle; ANSI/AWWA C800:
  - 6. The Ford Meter Box Company, Inc. Tapped Repair Clamp, Style FS1.
    - a. Clamp to be Ford stainless steel full circle repair clamp, tapped for 1" IP threads, Model # FS1-745-12.5"-IP4 or FS1-967-12.5"-IP4 for 6" and 8" water mains respectively.
  - 7. Approved equivalent.
- H. Stainless steel full circle repair clamp; ANSI/AWWA C800, C230:
  - 8. The Ford Meter Box Company, Inc. Repair Clamp, Style FS1.
    - a. Clamp to be Ford stainless steel full circle repair clamp.
  - 9. Approved equivalent.

## **2.02 BEDDING AND COVER MATERIALS**

- A. Bedding: As specified in Section 31 23 33 – Trenching and Backfilling.
- B. Cover: As specified in Section 31 23 33 – Trenching and Backfilling.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.
- B. No hot tap shall be made within 4 feet of a joint (measured from joint to centerline of intersecting service).

### **3.02 PREPARATION**

- A. Remove existing saddle connection; clean and de-scale outer pipe seal surface and tube ends to full pipe diameter, remove burrs.

### **3.03 TRENCHING**

- A. See Section 31 23 33 – Trenching and Backfilling for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact then complete backfilling.

### **3.04 LOW PRESSURE INSTALLATION METHOD**

- A. Pipe residual pressure is to be reduced to 20psi prior to the water service installation work.

### **3.05 SERVICE CONNECTIONS**

- A. If existing pipe condition is acceptable, as determined by the Owner's Representative, install new tapped service hole and install full circle, tapped repair clamp and corp stop located over the new service hole.
- B. Contractor shall have at least five full circle repair clamps and a tapping machine available during all working days in which new water services will be installed.
- C. Route pipe in straight line.
- D. Install pipe to allow for expansion and contraction without stressing pipe or joints.

### **3.06 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with Division 01 Requirements.
- B. Closing un-inspected work:
  - 1. Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been approved by the Owner's Representative.
- C. Pressure Tests:
  - 2. Bring newly installed service piping to standard operational pressure for two hours.
  - 3. Carefully examine exposed pipe, joint, and fittings.
  - 4. Replace or remake joints showing visible leakage.
    - a. Remove cracked pipe, defective pipe, and cracked or defective joint, fitting, and valves. Replace with sound material and repeat the test until results are satisfactory.
    - b. Make repair and replacement without additional cost to the Owner.
- D. Leakage test:
  - 5. Conduct leakage test after the pressure test has been completed satisfactorily.
  - 6. Duration of each leakage test: Minimum twelve (12) hours.
  - 7. During the Test, subject water main and services to standard operational pressure.
  - 8. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
  - 9. All pipes and all fittings shall be installed with no leakage.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Measurement of "Water Service Tie in" shall be per each (EA).

#### **4.02 PAYMENT**

- A. The contract unit prices paid for the various items in “Water Utility Distribution Piping” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Water Utility Distribution Piping”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION**

**SECTION 33 30 00**  
**SANITARY SEWERAGE**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

Sanitary gravity sewers and force mains up to five feet from any on-site building

**1.02 RELATED SECTIONS**

Section 31 23 33, Utility Trenching and Backfill

Section 32 13 00, Concrete for Exterior Improvements

**1.03 RELATED DOCUMENTS**

AASHTO

1. M199: Standard Specification for Precast Reinforced Concrete Manhole Sections
2. M252: Standard Specification for Corrugated Polyethylene Drainage Pipe
3. M294: Standard Specification for Corrugated Polyethylene Pipe, 12 to 60-inch Diameter

ASTM

4. A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
5. ASTM A674: Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
6. C143: Standard Test Method for Slump of Hydraulic-Cement Concrete
7. C443: Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
8. C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
9. C923: Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
10. C1173: Standard Specification for Flexible Transition Couplings for Underground Piping Systems
11. C1244: Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
12. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
13. D3034: Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
14. D4101: Standard Specification for Propylene Injection and Extrusion Materials
15. F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

16. F679: Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
17. ASTM F1056: Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings
18. F1336: Standard Specification for Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings

#### AWWA

19. C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
20. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems
21. C110: Ductile-Iron and Gray-Iron Fittings
22. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
23. C115: Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
24. C116: Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
25. C150: Thickness design of Ductile Iron Pipe
26. C151: Ductile-Iron Pipe, Centrifugally Cast
27. C153: Ductile-Iron Compact Fittings
28. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe
29. C512: Air Release , Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
30. C600: Installation of Ductile-Iron Water Mains and Their Appurtenances.
31. C606: Grooved and Shouldered Joints
32. C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. for Water Transmission and Distribution
33. C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. for Water Transmission and Distribution
34. C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. for Waterworks
35. M23: PVC Pipe – Design and Installation
36. M41: Ductile Iron Pipe and Fittings

#### Caltrans Standard Specifications, 2015

37. Section 51, Concrete Structures
38. Section 65, Concrete Pipe
39. Section 75 Miscellaneous Metal
40. Section 90, Concrete

#### Federal Specification

41. SS-S-00210 (GSA-FSS)

### **1.04 DEFINITIONS**

AASHTO: American Association of State Highway and Transportation Officials

ASTM: American Society for Testing Materials

AWWA: American Water Works Association

HDPE: High-density polyethylene

PE: Polyethylene

DIP: Ductile iron pipe

PVC: Polyvinyl Chloride

RCP: Reinforced concrete pipe

NPS: Nominal pipe size

### **1.05 SUBMITTALS**

Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.

Product data for the following:

1. Piping materials and fittings
2. Special pipe couplings
3. Joint sealants
4. Cleanout plugs or caps
5. Sewage air relief valves

Shop drawings: Include plans, elevations, details and attachments for the following:

6. Precast concrete manholes, frames and covers
7. Precast concrete clean out boxes and box covers
8. Force main piping access openings

Design Mix Reports and Calculations: For each class of cast in place concrete

Field Test Reports: Indicate test results for compliance with performance.

### **1.06 DELIVERY, STORAGE AND HANDLING**

Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

Handling

3. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. When handling lined pipe, take special care not to



damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

4. Handle precast concrete pipe, manholes and other precast structures according to manufacturer's written instructions.
5. Protect imported bedding and backfill material from contamination by other materials.

## **PART 2 - PRODUCTS**

### **2.01 PVC PIPE**

Pipe:

1. 4 inch through 15 inch: ASTM D3034, SDR 26
2. 18 inch through 36 inch: ASTM F679, T-1 wall

Bell and spigot joints

Fittings:

3. 4 inch through 27 inch: ASTM F1336
4. 30 inch through 36 inch: ASTM D3034, SDR 26

Joint Gasket: Elastomeric seal, ASTM F477

Special Pipe Coupling: ASTM C1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

### **2.02 REINFORCED CONCRETE PIPE**

Designated by Class, rubber gasketed joints, Type II or V cement

1. Circular Reinforced Concrete Pipe: Caltrans Standard Specification Section 65-2.02C(2), Class III.
2. Oval shaped (Elliptical) Reinforced Concrete Pipe: Caltrans Standard Specification Section 65-2.02D. Class HE-III and VE-III.

Rubber Gasketed Joints: Caltrans Standard Specification Section 65-2.02F

### **2.03 PVC PIPE: SIZES 4 INCH THROUGH 48 INCH.**

Pipe: Pressure [modify pipe class and DR per pipe design pressure and depth] Class 200, DR 14, spigot and gasket bell end, conforming to AWWA C900 (4 inch through 12 inch and AWWA C905 (14 inch through 48 inch).

Fittings: Ductile iron fittings

1. Standard: AWWA C110, sizes 4 inch through 48 inch
2. Compact: AWWA C153, sizes 4 inch through 24 inch
3. All fittings shall be fusion epoxy coated per AWWA C116

Unrestrained Joints: Push-On Bell and Spigot Joint: AWWA C900

Restrained Joints:

4. Push-On Bell and Spigot Joint: Harness assembly as manufactured by EBAA Iron, or approved equal.
5. Plain End PVC to Ductile Iron Mechanical Joint: EBAA Iron, or approved equal

Steel or Ductile Iron Couplings:

6. Plain End Pipe to Plain End Pipe: Ductile iron or steel bolted couplings, manufacturer's shop coating with low alloy steel bolts and nuts. Steel couplings to conform to AWWA C219. Smith-Blair, Inc., Dresser, or approved equal.
7. Plain End Pipe to Ductile Iron or Steel Flanged Pipe: Ductile iron or steel bolted flanged coupling adapters, manufacturer's shop coating with low alloy steel bolts and nuts. Steel flanged couplings to conform to AWWA C219. Smith-Blair, Inc, Dresser or approved equal.

PVC Couplings:

8. Unrestrained Plain End to Plain End Pipe: AWWA C900, as manufactured by CertainTeed or approved equal.
9. Restrained Plain End to Plain End Pipe: AWWA C900, "Fluid-Tite" as manufactured by North American Pipe, or approved equal.

## **2.04 GRAVITY PIPE CLEANOUTS**

Piping: Same as sanitary sewer line if possible

Top Cap: Threaded and of same material as piping if possible

Box Size: As required to provide access and allow easy removal and reinstallation of cap

Box Types:

1. Non-Traffic Areas: Portland cement concrete box and box cover, light duty
2. 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

Box Cover Markings: "SANITARY SEWER" unless otherwise specified

Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to the following:

3. Associated Concrete Products, Inc.
4. Brooks Products Inc.
5. Christy Concrete Products, Inc., or approved equal

## **2.05 MANHOLES**

Manholes shall be pre-cast concrete of the size and shape shown on the Plans and shall conform to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. Concrete shall consist of Caltrans Type I/II cement. Rate for AASHTO H20 loading in traffic areas.

All interior concrete surfaces shall be coated with “Xypex Crystalline” or approved equivalent. Use of a water-resistant admix is acceptable, at Contractor option.

Frames and Covers: As indicated and in accordance with Caltrans Standard Specification Section 75-2.02B. Manhole covers shall have the words “SANITARY SEWER” in letters not less than 2 inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.

Frames and lids for manholes shall be match-marked in pairs before delivery to the job site. The lids shall fit into their frames without rocking.

Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Plans. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.

Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of Caltrans Standard Specifications Section 90 and as specified herein. The concrete shall be Class “A” containing six (6) sacks of portland cement per cubic yard of concrete. The grading of the combined aggregate shall be in accordance with the Caltrans requirements of the three-quarter inch maximum. The consistency of the concrete shall be such that the slump does not exceed four inches, as determined by ASTM C143. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.

Steps: ASTM C478 or AASHTO M199. Manufacture from deformed, ½ inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, or equal.

## **2.06 JOINT SEALANT FOR STRUCTURES AND MANHOLES**

Mortar: Caltrans Standard Specification Section 51-1.02F

1. Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.

Gaskets: Preformed flexible rubber or plastic gasket

2. Rubber Gaskets: ASTM C443
3. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist. Acceptable material is “Ram-Nek,” as manufactured by the Henry Company, or equal

## **2.07 PIPE TO STRUCTURE CONNECTOR/SEAL**

A flexible pipe to manhole connector shall be used for all pipe penetrations to pre-cast and/or cast-in-place concrete structures.

4. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that

it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.

5. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C923. The connector and stainless-steel hardware shall meet or exceed the performance requirements proscribed in ASTM C923.
6. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
7. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

## **2.08 SEWAGE AIR RELIEF VALVE ASSEMBLY FOR FORCE MAINS**

Air release and vacuum valves: Provide valve and service size as shown on the Plans. Valve shall have cast-iron single valve body, and shall conform to AWWA C512. A compound lever system shall have a maximum operating pressure of 300 psi. Provide a protective cap for the outlet of the valve. Provide universal air-vacuum type valves, Crispin, DeZurik/APCO or approved equal.

## **2.09 THRUST BLOCKS FOR FORCE MAINS**

General: Location and configuration as indicated

Portland Cement Concrete: Section 32 13 18, Cement and Concrete for Exterior Improvements

## **PART 3 - EXECUTION**

### **3.01 GRAVITY PIPE INSTALLATION**

General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-2.03 for reinforced concrete pipe and chapter 11.3.3 of AWWA M41 for ductile iron pipe.

Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.

Excavation, Bedding, Backfill, and Compaction: Section 31 21 00, Utility Trenching and Backfill.

Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with the manufacturer's recommendations.

Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by

blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.

Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

Closure: Close open ends of pipes and appurtenance at the end of each day's work or when work is not in progress.

### **3.02 FORCE MAIN PIPE INSTALLATION**

Pipe Depth and Trench Configuration: Conform to elevations, profiles and typical trench section(s) shown on the Plans.

Excavation, Bedding, Backfill, and Compaction: Section 31 21 00, Utility Trenching and Backfill

Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer's recommendations.

Pipe laying and jointing:

1. Provide proper facilities for lowering sections of pipe into trenches.
2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.
3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
4. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.
5. Grade the pipeline in straight lines; avoid the formation of dips and low points
6. Support pipe at proper elevation and grade.
7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
9. Provide anchors and supports where indicated and where necessary for fastening work into place.
10. Make proper provision for expansion and contraction of pipelines.
11. Keep trenches free of water until joints have been properly made.
12. Do not lay pipe when conditions of trench or weather prevent proper installation.
13. All fittings shall be blocked with appropriately sized thrust blocks as shown on the Plans.
14. Installation of Tracer Wire:
15. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
16. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

17. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance. Extend the wire up the outside of the valve box/riser and cut a hole that is 8 inches from the top, extend a 12-inch wire lead to the inside of the box. At other pipeline appurtenances, terminate the 12-inch wire lead inside the enclosure.
18. Splice wire with a splicing device consisting of and electro-tin-plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.

#### Installation of Warning Tape

19. Install tape approximately 1 foot above and along the centerline of the pipe.
20. Where tape is not continuous, lap tape ends a minimum of 2 feet.

Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. If necessary, use shorter than the standard lengths of pipe to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

#### Connections to Existing Lines:

21. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
22. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.

Closure: Close open ends of pipes and appurtenance openings at the end of each day's work or when work is not in progress.

### **3.03 INSTALLATION OF DUCTILE-IRON PIPING**

Install pipe and fittings in accordance with requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

#### Jointing:

1. Provide push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
2. Provide mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and with the recommendations of AWWA C111.
3. Provide flanged joints with the gaskets, bolts, and nuts specified for this type joint.
  - a. Install flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories.
  - b. Align bolt holes for each flanged joint.
  - c. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted.
  - d. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without over straining the flange.

- e. Where flanged pipe and fitting have dimensions that do not allow the installation of a proper flanged joint as specified, replace it by one of proper dimensions.
  - f. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe. Assemble in accordance with the recommendations of the setscrewed flange manufacturer.
4. Provide insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints. Bolts for insulating sleeves shall be full size for the bolt holes.
  5. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.

Exterior Protection: Completely encase buried ductile iron pipelines and underground appurtenances with polyethylene wrap. Install 8-mil linear low-density polyethylene (LLD) film or 4-mil high-density cross-laminated (HDCL) film per manufacturer's recommendations and in accordance with AWWA C105 and ASTM A674.

Pipe Anchorage: Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Plans.

### **3.04 INSTALLATION OF POLYVINYL CHLORIDE PIPING**

Comply with the recommendations for pipe installation, joint assembly and appurtenance installation in AWWA M23.

Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.

Jointing:

1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
4. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
5. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the applicable requirements of AWWA C600 for joint assembly.
6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
7. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

Pipe Anchorage:

8. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Plans.

### 3.05 INSTALLATION OF POLYTHEYLENE PIPING

Install pipe, fittings, and appurtenances in accordance with manufacturer's recommendations.

Jointing:

1. Provide mechanical joints, compression fittings, or flanges as recommended by the manufacturer.
2. Jointing shall be performed using proper equipment and machinery by trained and certified personnel.
3. Joints, fittings and tools shall be clean and free of burrs, oil, and dirt.
4. Butt fusion:
  - a. Pipe ends shall be faced to establish clean, parallel mating surfaces.
  - b. Align and securely fasten the components to be joined squarely between the jaws of the joining machine.
  - c. Heat the ends of the pipe to the pipe manufacturer's recommended temperature interface pressure and time duration. A pyrometer or other surface temperature measuring device should be used to insure proper temperature of the heating tool. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
  - d. Prevent molten plastic from sticking to the heater faces. Molten plastic on the heater faces shall be removed immediately according to the tool manufacturer's instructions.
  - e. Bring the molten ends together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint. Hold the molten joint under pressure until cooled adequately to develop strength. Refer to the manufacturer's recommendations for temperature, pressure, holding, and cooling times.
5. Socket fusion:
  - a. Mixing manufacturers' heating tools and depth gages will not be allowed unless the tools conform to ASTM F1056.
  - b. Pipe ends shall be faced square to establish clean, parallel mating surfaces.
  - c. Clamp the cold ring on the pipe at the proper position using a depth gauge.
  - d. Heat the tool to the pipe manufacturer's recommended temperature. A pyrometer or other surface temperature measuring device should be used to insure proper temperature. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
  - e. Follow manufacturer's recommendations for bringing the hot tool faces into contact with the outside surface of the end of the pipe and the inside surface of the socket fitting.
  - f. Simultaneously remove the pipe and fitting from the tool.
  - g. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion.
  - h. Hold or block the pipe in place during cooling.
6. Electrofusion:
  - a. Unless the operation is for a saddle-type electrofusion joint, pipe ends shall be faced square to establish clean, parallel mating surfaces.



- b. Clamp the pipe and fitting at the proper position in the fixture.
- c. Connect the electrofusion control box to the fitting and to the power source. Apply the electric current using manufacturer's instructions.
- d. Allow the joint to cool before removing the clamping fixtures.

### **3.06 SPECIAL PIPING COUPLINGS**

General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

Installation: Manufacturers' instructions

### **3.07 POURED-IN-PLACE CONCRETE**

Concrete shall be mixed in accordance with applicable provisions of Section 90 of Caltrans Standard Specifications.

Construction of concrete structures shall conform to applicable provisions of Section 51 of the Caltrans Standards Specifications. Unless otherwise noted herein or in the Plans, exposed surfaces of structures shall be Class 1 surface finish.

Curing shall conform to applicable portions in Section 90 of Caltrans Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.

Concrete shall not be cropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

### **3.08 GRAVITY PIPELINE AIR TESTING AND FLUSHING**

All new sections of sanitary sewer shall be tested using the following procedures:

1. Test is conducted between two consecutive manholes, or as directed by the Project Manager.
2. The test section of the sewer shall be plugged at each end. One of the plugs used at the manhole shall be tapped and equipped for the air inlet connection for filling the line from an air compressor.
3. All service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowout.
4. Connect air hose to tapped plug selected for the air inlet. Connect the other end of the air hose to the portable air control equipment, which consists of valves and pressure gauges used to control the air entry rate into the sewer test section, and to monitor the air pressure in the pipeline. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0-5 psi. The gauge shall have minimum divisions of 0.10 psi and an accuracy of 0.40 psi.

5. Connect another air hose between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment set-up. Test operations may commence.
6. Supply air to the test section slowly, filling the pipeline until a constant pressure of 3.5 psig is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig.
7. When constant pressure of 3.5 psig is reached, throttle the air supply to maintain the internal pressure above 3.0 psig for at least 5 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period, it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap plug, release the pressure in the line and tighten all leaky caps and plugs. Start the test operation again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new 5-minute interval must be allowed after the pipeline has been refilled.
8. After the stabilization period, adjust the air pressure to 3.5 psig and shut-off or disconnect the air supply. Observe the gauge until the air pressure reached 3.0 psig. At 3.0 psig, commence timing with a stopwatch until the pressure drops to 2.5 psig, at which time the stop watch is stopped. The time required, as shown on the stopwatch, for a pressure loss of 0.5 psig is used to compute the air loss.
9. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at any time.
10. If the time, in minutes and seconds, for the 0.5 psig drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

#### Requirements for Air Testing

Pipe Size (in inches)	Time	
	Minutes	Seconds
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	30

11. For 8 inch and smaller pipe, only: if, during the 5-minute saturation period, pressure drops less than 0.5 psig after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.

12. 1Multi-pipe sizes: when the sewer line undergoing test is 8 inch or larger diameter pipe and includes 4 inch or 6-inch laterals, the figures in the table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, the Project Manager can compute the “average” size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psig for the “averaged” diameter pipe.
13. Adjustment Required for Groundwater:
  - a. An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased .433 psi for each foot the ground water level is above the invert of the pipe.
  - b. Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.
    - 1) Install a ½ inch diameter pipe nipple (threaded one or both ends, approximately 10-inch-long) through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.
    - 2) Seal pipe nipple with a threaded ½ inch cap.
    - 3) Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the pipe nipple to remove any obstruction, and then connecting a clear plastic tube to the pipe nipple.
    - 4) Hold plastic tube vertically permitting water to rise in it to the groundwater level.
    - 5) After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
    - 6) Determine air pressure correction, which must be added to the 3.0 psig normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.

After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove any rock or other debris that is flushed out during cleaning.

### **3.09 TESTING OF MANHOLES ON GRAVITY LINES**

At the option of the Contractor, either the following hydrostatic or vacuum test shall be performed.

1. Hydrostatic Test: In general, the following hydrostatic test is in conformance with that presented in [enter the agency’s name that has jurisdiction over sewers] Standard Specifications.
2. Insert inflatable plugs in all sewer inlets and outlets.
3. Fill the manhole with water to a point six inches below the base of the manhole frame.
4. Maintain the water at this point for one hour to allow time for absorption.
5. Begin one-hour test period. Measure the amount of water added in one-hour period to maintain the water level at six inches below the base of the manhole frame. Do not allow water level to drop more than 25% of the manhole depth.
6. Determine the allowable leakage by the following formula.

$$L = 0.0002 \times D \times H^{1/2}$$

L = Allowable leakage, gallons per minute.

D = Depth of manhole from top to bottom, feet.

H = Head of water in feet as measured from the surface of the water in the manhole to the sewer line invert or to the prevailing ground water surface out-side the manhole. The lesser height governs.

7. If the leakage exceeds the allowable, determine the cause, take remedial action and re-test the manhole. If the leakage is less than the allowable and leaks are observed, repair the leaks.

#### Vacuum Test:

8. General: Test in accordance with ASTM C1244.
9. Test prior to backfilling around the manhole.
10. Test Preparation: Plug all lift holes and pipes entering or exiting the manhole.
11. Place test head inside the top section of the manhole's cone section and inflate in accordance with the manufacturer's instructions.
12. Draw a vacuum of 10 inches of mercury and shut the pump off.
13. With the valve closed, the time for the vacuum to drop 9 inches shall be measured.
14. The manhole shall pass the test if the time is greater than 60 seconds for a 48 inch diameter manhole, 75 seconds for a 60 inch diameter manhole and 90 seconds for a 72 inch diameter manhole.
15. If the manhole fails the initial test, make necessary repairs with a non-shrink grout while the vacuum is still being drawn. Retest until a satisfactory test is obtained.

### **3.10 HYDROSTATIC AND LEAKAGE TESTING OF FORCE MAINS**

#### General:

1. Provide all necessary materials and equipment, including water.
2. Backfill all trenches sufficient to hold pipe firmly in position.
3. Allow time for thrust blocks to cure prior to testing.
4. Flush all pipes prior to testing to remove all foreign material.
5. Perform pressure and leakage test concurrently.
6. Apply test pressure by means of a pump connected to the pipe.
7. Base test pressure on the elevation of the lowest point in the line.
8. Fill each closed valve section or bulk-headed section slowly. Expel air from section being tested by means of permanent air vents installed at high points or by means of temporary corporation cocks installed at such points. Remove and plug the temporary corporation cocks at the conclusion of the test.
9. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
10. The pressure test on mortar-lined pipe shall not begin until the pipe has been filled with water for at least 24 hours to allow for absorption in the cement mortar lining.
11. Allow the system to stabilize at the test pressure before conducting the leakage test.
12. Do not operate valves in either the opening or closing direction at differential pressures above the valves rated pressure.

13. Maintain test pressure as specified for type of pipe being tested.
14. Pressure Test: Examine any exposed pipe, fittings, valves, hydrants and joints during the test, if no leaks are observed the section of line has passed the pressure test. If leaks are observed, repair any damaged or defective pipe, fittings, valves, or hydrants, and repeat the pressure test.
15. Leakage Test: Perform as specified hereafter for the type of pipe being installed.
16. Preparation for Test
17. Vents shall be provided at the high points of the system and drains provided where means of venting or draining do not exist.
18. Remove or block off, all relief valves, rupture discs, alarms, control instruments, etc. that shall not be subjected to the test pressure.
19. All discs, balls, or pistons from check valves shall be removed if they interfere with filling of the system. Open all valves between inlet and outlet of the section to be tested.
20. Connect pump and provide temporary closures for all of the external openings in the system. Use caution to ensure that the closures are properly designed and strong enough to withstand the test pressure.
21. A joint previously tested in accordance with this specification may be covered or insulated.
22. Expansion joints shall be provided with temporary restraint for additional pressure under test or shall be isolated from the test.
23. Flanged joints, where blanks are inserted to isolate equipment during the test, need not be tested.

DIP Leakage Test: Perform in accordance with AWWA C600. Selected requirements of AWWA C600 are repeated as follows:

24. The pipe shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure, or 150 psi, whichever is greater. In no case shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
25. Maintain the test pressure, +/- 5 psi, for a minimum of four hours.
26. No piping will be accepted if the leakage is greater than that determined by the following formula:  

$$L = (S \times D \times P^{1/2}) / 133,200$$

L = Allowable leakage, gallons per hour.  
S = Length of pipe tested, feet.  
D = Nominal diameter of pipe, inches.  
P = Average test pressure during the leakage test, pounds per square inch (gauge).

PE Pipe Leakage Test:

27. The pipe shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure, or 150 psi, whichever is greater. In no case shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
28. Apply the test pressure and allow the pipe to stand, without makeup pressure, for sufficient time to allow for diametric expansion or pipe stretching to stabilize, approximately two to three hours.
29. After the above stabilization has occurred, return the section being tested to the test pressure. Hold the test pressure for four hours. If the pressure in the test section drops, and it is determined the drop may be the result of expansion resulting from increasing

temperature, a limited amount of additional water may be added to bring the pressure back to the test pressure. Allowable amounts of make-up water, to compensate for expansion due to increasing temperature, are as shown in the following table. Make-up water is only allowed during this final test period and not during the initial stabilization described in the previous paragraph. If the additional water added is less than the allowable shown in the table and there are no visual leaks or significant pressure drops, the tested section passes the test.

Nominal Pipe Size (in.) Test	Allowance for Expansion (U.S. Gals./100 Feet of Pipe)		
	1-Hour Test	2-Hour Test	3-Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.50
10	0.75	1.3	2.1
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

PVC Pipe Leakage Test: Perform in accordance with AWWA M23. Selected requirements of AWWA M23 are repeated as follows:

- 30. The pipe shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure, or 150 psi, whichever is greater. In no case shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
- 31. Maintain the test pressure, +/- 5 psi, for a minimum of four hours.
- 32. No piping will be accepted if the leakage is greater than that determined by the following formula:

$$L = (N \times D \times P^{1/2}) / 7,400$$

L = Allowable leakage, gallons per hour.

N = Number of joints in the length of the pipeline tested.

D = Nominal diameter of pipe, inches.

P = Average test pressure during the leakage test, pounds per square inch (gauge).

### 3.11 DEFLECTION TESTING

Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.

Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.

Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.

#### Pull-Through Device:

1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
  - a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
  - b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
2. Ball, cylinder, or circular sections shall conform to the following:
  - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
  - b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
  - c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
  - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

#### Pull-Through Device:

3. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
4. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.

#### Deflection measuring Device:

5. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
6. Obtain approval of deflection measuring device prior to use.

#### Deflection Measuring Device Procedure:

7. Measure deflections through each run of installed pipe.
8. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.

9. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.

Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

### **3.12 CLEANING**

Thoroughly clean sewer lines and manholes of sediments, dirt, debris, and obstructions of any kind.

### **1.01 TELEVISION INSPECTION**

After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the sewer line shall be televised with a color closed-circuit television with tilt-head camera recorded in DVD format. The original disc and log sheets shall be provided to the Owner for review.

The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:

1. Low spot (1 inch or greater - mainlines only)
2. Joint separations (3/4 inch or greater opening between pipe sections)
3. Cocked joints present in straight runs or on the wrong side of pipe curves
4. Chips in pipe ends
5. Cracked or damaged pipe
6. Dropped joints
7. Infiltration
8. Debris or other foreign objects
9. Other obvious deficiencies
10. Irregular condition without logical explanation

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Measurement of "Sanitary Sewer Service Tie in" shall be per each (EA).

### **4.02 MEASUREMENT**

- A. The contract unit prices paid for the various items in "Sanitary Sewerage" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Sanitary Sewerage", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 33 30 00**



**SECTION 33 40 00**  
**STORM DRAINAGE UTILITIES**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Roadway and/or site storm drainage up to 5-feet of any on-site building.

**1.02 RELATED SECTIONS**

- A. Section 31 23 33 – Trenching and Backfilling
- B. Section 32 05 23 – Cement and Concrete for Exterior Improvements

**1.03 RELATED DOCUMENTS**

A. AASHTO:

- 1. M 252: Corrugated Polyethylene Drainage Tubing.
- 2. M 294: Corrugated Polyethylene Pipe, 12 to 24-inch Diameter.

B. ASTM:

- 1. A 74: Cast Iron Soil Pipe and Fittings.
- 2. A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
- 3. C 443: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- 4. C 564: Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- 5. C 1173: Flexible Transition Couplings for Underground Piping Systems.
- 6. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- 7. D 2235: Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and fittings.
- 8. D 2321: Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- 9. D 2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- 10. D 2751: Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- 11. D 3034: Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- 12. D 4101: Specifications for Propylene Injection and Extrusion Materials.
- 13. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- 14. F 656: Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- 15. F 679: Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.

16. F-1336: Poly (Vinyl Chloride) (PVC) Gasket Sewer Fittings.

C. AWWA:

1. C104: Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1,219 mm) for Water.
4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. C150: Thickness design of Ductile Iron Pipe.
6. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. C153: Ductile-Iron Compact Fittings for Water Service.
8. M41: Ductile Iron Pipe and Fittings.

D. Caltrans Standard Specifications:

1. Section 65, Concrete Pipe.
2. Section 66, Corrugated Metal Pipe.
3. Section 70. Miscellaneous Drainage Facilities.
4. Section 72, Slope Protection.

E. Caltrans Standard Plans:

1. Plan D94A: Metal and Plastic Flared End Sections.
2. Plan D94B: Concrete Flared End Sections.
3. Plan D97A: Corrugated Metal Pipe Coupling Details No.1, Annular Coupling Band Bar and Strap and Angle Connection.
4. Plan D97B: Corrugated Metal Pipe Coupling Details No. 2, Hat Band Coupler and Flange Details.
5. Plan D97C: Corrugated Metal Pipe Coupling Details No. 3, Helical and Universal Couplers.
6. Plan D97D: Corrugated Metal Pipe Coupling Details No. 4, Hugger Coupling Bands.
7. Plan D97E: Corrugated Metal Pipe Coupling Details No. 5, Standard Joint.
8. Plan D97F: Corrugated Metal Pipe Coupling Details No. 6, Positive Joint.
9. Plan D97G: Corrugated Metal Pipe Coupling Details No. 7, Positive Joints and Downdrains.
10. Plan D98A: Slotted Corrugated Steel Pipe Drain Details.
11. Plan D98B: Slotted Corrugated Steel Pipe Drain Details.

## **1.04 DEFINITIONS**

- A. AASHTO: American Association of State Highway and Transportation Officials.
- B. ABS: Acrylonitrile-butadiene-styrene.
- C. ASTM: American Society for Testing and Materials.
- D. AWWA: American Water Works Association.

- E. CMP: Corrugated metal pipe.
- F. DIP: Ductile iron pipe.
- G. HDPE: High-density polyethylene.
- H. NPS: Nominal pipe size.
- I. PE: Polyethylene.
- J. PVC: Polyvinyl chloride.
- K. RCP: Reinforced concrete pipe.

#### **1.05 SUBMITTALS**

- A. Follow submittal procedures outlined in Division 1.
- B. Product Data Shop Drawings, Etc.: For the following:
  - 1. Piping materials and fittings.
  - 2. Special pipe couplings.
  - 3. Polymer-concrete, channel drainage systems (trench drains).
  - 4. Joint sealants.
  - 5. Plastic area drains.
  - 6. Precast concrete catch basins, inlets, curb inlets, and area drains, including frames and grates.
  - 7. Concrete, metal and plastic flared end sections.
- C. Design Mix Reports and Calculations: For each class of cast in place concrete.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Do not store plastic structures, pipe and fittings in direct sunlight.
- B. Protect pipe, fittings, and seals from dirt and damage.
- C. Handle precast concrete pipe and other precast structures according to manufacturer's written instructions.
- D. Protect imported bedding and backfill material from contamination by other materials.

### **PART 2 - PRODUCTS**

#### **2.01 PIPING MATERIALS**

- A. ABS Pipe and Fittings: Smaller than 4-inch, ASTM D 2751, SDR 35. Solvent cement joints.

1. Solvent Cement: ASTM D 2235.
- B. ABS Pipe and Fittings: 4-inch through 12-inch, ASTM D 2751, SDR 35. Bell and spigot joints.
1. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.
- C. Cast Iron Pipe and Fittings: Hub and spigot, 2-inch through 15-inch, ASTM A74, service class.
1. Gaskets: ASTM 564, rubber, compression type, thickness to match class of pipe.
- D. Corrugated Metal Pipe and Fittings: Caltrans Standard Specification Section 66.
1. Bituminous Coating: Caltrans Standard Specification Section 66-1.03.
  2. Bituminous Lining: Caltrans Standard Specification Section 66-1.03.
  3. Bituminous Pavings: Caltrans Standard Specification Section 66-1.03.
  4. Corrugated Aluminum Pipe: Caltrans Standard Specification Section 66-2.
  5. Corrugated Steel Pipe: Caltrans Standard Specification Section 66-3.
  6. Slotted Corrugated Steel Pipe: Caltrans Standard Specification Section 66-3.09.
  7. Details: Caltrans Standard Plans D97A, D97B, D97C, D97D, D97E, D97F, D97G, D98A and D98B.
- E. DIP: Sizes 4-inch through 48-inch.
1. Pipe: AWWA C150 and C151.
  2. Pressure Class: Minimum pressure class for size indicated.
  3. Fittings:
    - a. Standard: AWWA C110, sizes 4-inch through 48-inch.
    - b. Compact: AWWA C153, sizes 4-inch through 24-inch.
  4. Pipe and Fitting Lining: Cement Mortar, AWWA C104.
  5. Pipe and Fitting Coating: Asphaltic, AWWA C151 or C115.
  6. Exterior Soil Corrosion Protection for Pipe and Fittings: Polyethylene encasement, AWWA C105.
  7. Joints:
    - a. Push-On Bell and Spigot Joint: AWWA C111.
    - b. Mechanical Joint: AWWA C111.
    - c. Flanged joint. AWWA C115.
- F. Reinforced Concrete Pipe: Designated by Class, rubber gasketed joints.
1. Circular Reinforced Concrete Pipe: Caltrans Standard Specification Section 65-1.02A(1). Class III.
  2. Oval shaped (Elliptical) Reinforced Concrete Pipe: Caltrans Standard Specification Section 65-1.02B. Class HE-III and VE-III.
  3. Reinforced Concrete Pipe Arch: Caltrans Standard Specification Section 65-1.02C.
  4. Rubber Gasketed Joints: Caltrans Standard Specification Section 65-1.06.
- G. PE Pipe and Fittings: 4-inch through 10-inch, AASHTO M 252 Type S, smooth interior and corrugated exterior. Bell and spigot joints.
1. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.

2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.
- H. PE Pipe and Fittings: 12-inch through 48-inch, AASHTO M 294. Type S, smooth interior and corrugated exterior. Bell and spigot joints.
1. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.
  2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.
- I. PVC Pipe and Fittings-Smaller than 4-Inch: ASTM D1785, Schedule 40.
1. Joints: Solvent Cement, ASTM D 2564. Include primer according to ASTM F656.
- J. PVC Pipe and Fittings, 4-Inch and Larger
1. Pipe:
    - a. 4-inch through 15-inch: ASTM D 3034, SDR 35. Bell and spigot joints.
    - b. 18 inch through 36-inch: ASTM F 679, T-1 wall. Bell and spigot joints.
  2. Fittings:
    - a. 4-inch through 27-inch: ASTM F 1336.
    - b. 30-inch through 36-inch: ASTM D 3034, SDR 35
  3. Joint Gasket: Elastomeric seal, ASTM F 477.

**2.02 SPECIAL PIPE COUPLINGS**

- A. Plastic, Cast Iron and Ductile Iron Pipe: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.
- B. Reinforced Concrete Pipe: Portland cement concrete collar as indicated.
- C. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

**2.03 CURB INLETS, CATCH BASINS, DROP INLETS, AREA DRAINS, ETC.**

- A. General: Size, shape, configuration, depth, etc. of structure and frame, grate, or cover shall be as indicated.
- B. Section 32 05 23 – Cement and Concrete for Exterior Improvements
- C. Precast Structure: Rate for AASHTO H20 loading in traffic areas.
- D. Steps: ASTM C 478 or AASHTO M 199. Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A 615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091).
- E. Frames, Grates and Covers: Caltrans Standard Specification Section 75-1.02, 75-1.03 and 75-1.05.
  1. Galvanize steel frames, grates and covers.

2. Grates and covers shall be non-rocking.
3. Rate for AASHTO H20 loading in traffic areas.

### **PART 3 - EXECUTION**

#### **3.01 PIPE INSTALLATION**

- A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-1.07 for reinforced concrete pipe, Caltrans Standard Specification Sections 66-1.045 and 66-105 for corrugated metal pipe and chapter 11.3.3 of AWWA M41 for cast iron and ductile iron pipe.
- B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.
- C. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Trenching and Backfilling.
- D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer's recommendations.
- E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.
- F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.
- G. Closure: Close open ends of pipes and appurtenance openings at the end of each day's work or when work is not in progress.

#### **3.02 SPECIAL PIPE COUPLINGS**

- A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
- B. Installation: Per manufacturer's instructions.

### **3.03 INSTALLATION OF CURB INLETS, CATCH BASINS, DROP INLETS, AREA DRAINS, ETC.**

- A. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Trenching and Backfilling.
- B. Poured in Place Structures: Install as indicated and Caltrans Standard Specification Section 51.
  - 1. Shape bottoms to convey flows as indicated.
- C. Precast Structures: Install as indicated.
  - 1. Seal all joints and pipe entrances and exits.
  - 2. Place concrete in bottom and shape to convey flows as indicated.

### **3.04 TESTING**

- A. Do not enclose, cover, or put into service before inspection and approval.
- B. Test completed piping systems according to authorities having jurisdiction.
- C. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
- D. Submit separate reports for each test.
- E. Where authorities having jurisdiction do not have published procedures, perform tests in accordance with latest edition of the Uniform Plumbing Code (UPC) Section 1109.0, Testing.
- F. Leaks and loss in test pressure constitute defects that must be repaired.
- G. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Measurement of “Storm Drain 4” pipe” shall be by the Linear Foot (LF).
- B. Measurement of “Storm Drain 6” pipe” shall be by the Linear Foot (LF).
- C. Measurement of “Storm Drain 8” pipe” shall be by the Linear Foot (LF).
- D. Measurement of “Storm Drain 12” pipe” shall be by the Linear Foot (LF).
- E. Measurement of “Storm Drain 15” pipe” shall be by the Linear Foot (LF).
- F. Measurement of “Storm Drain Inlets” shall be per each (EA).
- G. Measurement of “Storm Drain Direct Connection” shall be per each (EA).

H. Measurement of “Storm Drain Cleanouts” shall be per each (EA).

**4.02 PAYMENT**

A. The contract unit prices paid for the various items in “Storm Drainage Utilities” shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of “Storm Drainage Utilities”, as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 33 40 00**



**SECTION 33 46 00**  
**SUBDRAINAGE**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

Subdrains in trenches and subdrains or prefabricated composite drainage panels at walls or foundations

Bioretention and biofiltration areas for storm water treatment

**1.02 RELATED SECTIONS**

Section 31 23 33 – Utility Trenching and Backfill

Section 33 41 00 – Storm Drainage Utilities

**1.03 RELATED DOCUMENTS**

**AASHTO**

1. M288: Standard Specification for Geotextiles Used for Subsurface Drainage Purposes

**ASTM**

2. C1173: Standard Specification for Flexible Transition Couplings for Underground Piping Systems
3. D448: Standard Classification for Sizes of Aggregate for Road and Bridge Construction
4. D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics
5. D1785: Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
6. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
7. D2564: Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
8. D2729: Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
9. D3034: Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
10. D4716: Standard Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
11. F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
12. F656: Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings

13. F1336: Standard Specification for Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings

Caltrans Standard Specifications, 2022

14. Section 68-Subsurface Drains
15. Section 96-Geosynthetics

#### **1.04 DEFINITIONS**

AASHTO: American Association of State Highway and Transportation Officials

ASTM: American Society for Testing and Materials

PVC: Polyvinyl Chloride

#### **1.05 SUBMITTALS**

Follow submittal procedure in accordance with Section 01 10 00 – Supplemental General Requirements.

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

Samples:

9. Drainage Fill

#### **1.06 DELIVERY, STORAGE AND HANDLING**

Do not store plastic structures, pipe, and fittings in direct sunlight.

Protect pipe, pipe-fittings, and seals from dirt and damage.

Protect permeable material from contamination by other materials.

## **PART 2 - PRODUCTS**

### **2.01 PERFORATED WALL AND SOLID WALL PIPE**

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

PVC Pipe and Fittings 4-inch through 15-inch:

4. Pipe: ASTM D3034, SDR 26. Bell and spigot joints
5. Perforation Size, Location, and Spacing: ASTM D2729
6. Fittings: ASTM F1336
7. Joint Gasket: Elastomeric seal, ASTM F477

PE Pipe and Fittings: 4-inch through 10-inch, AASHTO M 252 Type S, smooth interior and corrugated exterior. Bell and spigot joints.

8. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.
9. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.

### **2.02 SPECIAL PIPE COUPLINGS**

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**

Piping: Same as subdrain pipe without perforations.

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.

Cover Markings: "STORM DRAIN" unless otherwise specified.

3. 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**

Description: Prefabricated composite panels, 36 to 60 inches wide and manufactured with geotextile facing laminated to molded drainage core

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

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

3. Survivability Class: 1
4. Apparent Opening Size: No. 70 sieve maximum
5. Permittivity: 0.5 per second, minimum

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:

6. American Wick Drain Corporation
7. Tencate Geosynthetics/Mirafi Inc.
8. Multi-Flow (Prinsburg, MN) (Tel. 800-978-8007)
9. Phillips Fibers Corporation, or approved equal

## **2.05 BIORETENTION OR BIOFILTRATION TREATMENT SOIL**

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**

Permeable Material: Conform to Section 68-2.02F (3) of Caltrans Standard Specifications, Class 2.

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**

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**

Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

Install only after unsatisfactory conditions have been corrected.

### **3.02 PIPING APPLICATIONS**

Refer to Plans for location, size, and material designation for individual subdrains.

### **3.03 INSTALLATION OF PERFORATED PORTIONS OF SUBDRAINS**

Excavation: Section 6 of ASTM D2321 and as indicated.

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.

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.

Initial Subdrain Backfill: After installing drainage piping, add drainage fill up to top of pipe to perform tests.

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.

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.

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**

Conform to Sections Section 31 23 33 – Utility Trenching and Backfill and Section 33 41 00 – Storm Drainage Utilities

### **3.05 INSTALLATION OF RAIN GARDENS, BIORETENTION OR BIOFILTRATION TREATMENT AREAS**

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.

Direct the use of heavy equipment and construction traffic around rain gardens so as to avoid compaction, to the extent possible.

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.

Excavated soils shall be placed with stockpiled fill and properly disposed and stabilized by the Contractor.

Subdrain installation:

3. 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.
4. 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.
5. 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.
6. 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.
7. Attach subdrain piping to overflow structure.
8. Install cleanouts at the ends of the subdrains. Install screw-on end caps set flush with the finished top of treatment soil.

Overflow drain structure:

9. 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.

10. 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.
11. 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.

#### Filter media soil backfill

12. 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.

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.

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**

Coordinate placement with other drainage materials.

Install prefabricated drainage panels in accordance with manufacturer's instructions.

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**

Join PVC pipe and fittings with elastomeric seals according to ASTM D2321 or solvent cement.

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**

Cleanout piping to be the same size as the subdrain piping to which it is attached.

Install cleanouts from subdrainage piping to grade. Locate cleanouts at beginning of piping run, at changes in direction, and other locations indicated.

Do not allow cleanout box to bear on cleanout riser.

### **3.09 CLEANING**

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**

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.

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.

An impervious soil should be used in the upper one foot layer of backfill to reduce the potential for water infiltration.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.01 MEASUREMENT**

- A. Measurement of "Perforated 4" Drainline" shall be by the Linear Foot (LF).
- B. Measurement of "Perforated 6" Drainline" shall be by the Linear Foot (LF).
- C. Measurement of "Bioretention Area" shall be per cubic yard (CY).

### **4.02 PAYMENT**

- A. The contract unit prices paid for the various items in "Subdrainage" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the installation of "Subdrainage", as shown on the plans, as specified in these specifications, and as directed by the Engineer, and no additional compensation shall be provided.

**END OF SECTION 33 46 00**