

PROJECT MANUAL

BID SET

June 22, 2026



Asset Protection Project General Site Labor

550/600 Union Ave, Fairfield, California, 94533

PREPARED BY:

GENERAL SERVICES DEPARTMENT
Capital Projects Management Division
675 Texas Street, Suite 2500, Fairfield, California



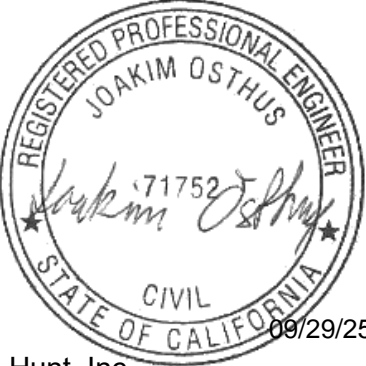





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SECTION 00 01 07 - SEALS PAGE

DESIGN PROFESSIONALS OF RECORD

<p>Civil Engineer: Divisions 02, 31, 33, 35</p>  <p>09/29/25</p> <p>Mead & Hunt, Inc. Jacquelyn O. Hader</p>	<p>Structural Engineer: Divisions 03, 04, 05, 09, 22</p>  <p>09/29/25</p> <p>Mead & Hunt, Inc. Todd W. Petrik</p>
<p>Civil Engineer: Divisions 10, 32</p>  <p>09/29/25</p> <p>Mead & Hunt, Inc. Joakim Osthus</p>	<p>Mechanical Engineer: Division 22</p>  <p>09/29/25</p> <p>Mead & Hunt, Inc. Thomas E. Darlington</p>
<p>Electrical Engineer: Div 22, 26</p>  <p>09/29/25</p> <p>Mead & Hunt, Inc. Robert Thayer</p>	<p>Communications: Divisions 27, 28</p>  <p>09/29/25</p> <p>Guidepost Solutions, LLC Ali Mortazavi</p>

Landscaping: Division 03, 32



WRA, Inc.
Jeanine Strickland

09/29/25

END OF SECTION



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SECTION 00 11 00 - NOTICE TO BIDDERS

NOTICE IS GIVEN THAT SOLANO COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF CALIFORNIA, will receive bids for the furnishing of all labor, materials, coordination, transportation, and services necessary for the completion of the:

**Asset Protection Project – General Site Labor
at 550/600 Union Ave, Fairfield, CA**

- I. General Statement of Work: The Asset Protection Project – General Site Labor at 550/600 Union Ave, Fairfield, CA (“Project”) includes installation of flood protections around County of Solano (“County”) property for water intrusion onto county property from adjacent city roadways. The Project site is approximately bordered by Texas Street on the north, Clay Street on the west, Delaware Street on the south and Union Ave on the east. This Project has been funded with a grant from OES/FEMA and is being bid in a multi-prime manner by the County. The specific scope of this bid is general site labor. This scope is further defined in section 01 11 00.
- II. Each bid must be in accordance with the bid documents, construction drawings and specifications. Additional FEMA requirements are included in the Supplementary Conditions 00 73 00. Bidders may view copies of the Drawings and Specifications from the Solano County website and any of the following plan rooms, where documents are on file on or about **the bid posting date**.

Marin Builders Association 660 Las Gallinas Avenue San Rafael, CA 94903 Phone: 415-462-1220 Fax: 415-462-1225 Email: mba@marinbuilders.com Website: www.marinbuilders.com	Sacramento Regional Builders’ Exchange 5370 Elvas Avenue Sacramento, CA 95819 Phone: 916-442-8991 Fax: 916-446-3117 Email: planroom@srbx.org Website: www.srbx.org
Placer County Contractors Association & Builders Exchange 10656 Industrial Avenue, Suite 160 Roseville, CA 95678 Phone: 916-771-7229 Fax: 916-771-0556 Email: planroom@srbx.org Website: www.pccamembers.com	Builders’ Exchange of San Joaquin 4561 Quail Lake Drive, Suite B2 Stockton, CA 95207 Phone: 209-478-1000 Email: planroom@besonline.com Website: http://www.bxsj.org

Contractor is responsible for downloading and printing the documents at bidder’s expense either in house or at a reprographics business of their choice.

- III. Sealed bid will be accepted until **2:00 p.m.**, local time, **July 9, 2026**, via OpenGov.
- IV. A pre-bid conference will not be required for this bid.
- V. All inquiries pertaining to this project shall be directed to the Issue for Bid (IFB) Coordinator via the Solano County OpenGov E-Procurement Portal at <https://procurement.opengov.com/portal/solanocounty>



- VI. Contractor must possess a current A, B, or C-5 Contractor's License from the State of California and the required classification(s) of Contractor's License at the time the Bid is submitted (Business and Professions Code § 7028.15).
- VII. Solano County forms are provided in the specifications and shall be used for all proposals. Bidders shall read and review the bid documents carefully and shall familiarize themselves thoroughly with all requirements.
- VIII. A bid bond or certified check in the amount of 10% of the bid is required. A signed bid bond certificate should be uploaded to OpenGov with a wet notarized copy delivered to 675 Texas Street, Suite 2500, Fairfield, CA 94533, care of Asset Protection Project in accordance with 00 21 00 section 1.05(B)(1).
- IX. Within five (5) calendar days after issuance of the Notice to Proceed, the successful bidder shall be required to furnish a "Labor and Materials Payment Bond" and "Performance Bond," both in an amount equal to 100% of the Contract amount.
- X. Bids shall not expire for a period of 90 calendar days from the bid opening date.
- XI. Wage rates and restrictions on working days and times shall meet all requirements of the Labor Code of the State of California for public contracts. The bidder may contact the Director of the Department of Industrial Relations, phone number (415) 703-4774, to obtain a schedule of the general prevailing wages applicable to the location and work to be done. A copy of the prevailing rate of per diem wages are on file at the principal office, which shall be made available to any interested party on request. The contractor and the contractor's subcontractor are responsible for compliance with the requirements of Section 1777.5 and 1777.6 of the Labor Code of the State of California regarding employment of apprentices.
- XII. All Contractors and subcontractors must be registered with the California Department of Industrial Relations (DIR) at the time of bid of this project pursuant to Cal. Labor Code Section 1725.5.
- XIII. The County will make a bid selection based on lowest, responsive and responsible bidder of the Lump Sum Base Bid and who meets the minimum qualifications. County further reserves the right to reject all bids and cancel the solicitation at their sole discretion.

END OF SECTION 00 11 00



SECTION 00 21 00 - INSTRUCTIONS TO BIDDERS

1.00 Bid proposals must comply with these Instructions to Bidders to be considered responsive.

1.01 DOCUMENTS

- A. Bidders may obtain digital copies of the Drawings and Specifications via the Solano County OpenGov E-Procurement Portal at <https://procurement.opengov.com/portal/solanocounty>

1.02 EXAMINATION

- A. Before submitting a bid, bidders shall carefully examine the Drawings and Specifications, and related documents, visit the site of the work and fully inform themselves as to all existing conditions and limitations, and shall include in the bid a sum to cover the cost of all items included in the work.
- B. A pre-bid conference will not be required for this bid.

1.03 INTERPRETATIONS, ADDENDA

- A. Should a bidder find discrepancies, inconsistencies or omissions from, the Drawings and Specifications and Related Documents, or should a bidder be in doubt as to their meaning, they shall submit Request for Information (RFI) in the Solano County OpenGov E-Procurement Portal under Question and Answer. Request for Information will be received until the close of business day of the RFI deadline. Thereafter, inquiries will not be responded to. An addendum, answering questions received during the allotted time, will be issued. Addenda containing material changes in the Contract Documents will not be issued **less than 72 hours before the bid opening unless the bid opening is extended by at least 72 hours.**
- B. Any Addenda issued by the County during the time of bidding are to be considered in the Bid and will become a part of the Agreement Between Contractor and County. Bidders shall acknowledge receipt of all Addenda on the Bid Form in the space provided. Addenda will be made available on OpenGov

1.04 SUBSTITUTION OF MATERIALS

- A. Materials other than those specified shall be approved by Addenda issued by the Architect/Engineer prior to bid opening; otherwise the bidder assumes the risk that the Architect/Engineer may not approve the desired substitution.

1.05 BIDS

- A. Bids must be made upon the "Bid Form" included in these Specifications, or a copy thereof, all blank spaces filled, the signature shall be in longhand, and the completed form shall be without alterations or erasures. All amounts must be in words as well as in figures. Any discrepancy between the words and figures shall be resolved using the amount stated in words. The "Bid Form" must be filled out in ink or be typewritten. Where the bidder is a corporation, the "Bid Form" must be signed using the name of the corporation followed by



the name of the state of incorporation and the signatures of an officer authorized to bind the corporation to a Contract. A bid that is incomplete, incorrect or non-conforming may be disregarded, at the sole discretion of the County.

- B. Bids will be accepted until the date and time stated in the Advertisement for Bid, or in any notification extending that date and time, in the Solano County OpenGov E-Procurement Portal. Also, to be included in the bid submission shall be:
 - 1. An electronic certified Bid Bond followed by a wet notarized copy within 7 calendar days from the bid submission deadline or certified check for 10% of the bid amount referring to the Project bid upon.
 - 2. No bid will be valid without the complete listing of all subcontractors **with the signature of the prime contractor submitting the bid in the space indicated.** Lists submitted by unsuccessful bidders will not be accepted.
 - 3. A completed, notarized Non-Collusion Affidavit referring to the Project bid.
- D. All bids shall remain valid for a period of 90 calendar days after the date of bid opening.
- E. Bids may not be modified after the designated or extended time for bid opening. Upon presentation of satisfactory identification, bidders may withdraw and resubmit bids at any time before the designated or extended bid opening. No bid may be withdrawn until ninety (90) calendar days after the bid opening.
- F. County will determine at its own discretion whether a bidder is responsive and responsible, and County's determination will be final.
- G. If Alternates are called for, the contract may be awarded at the election of the County to the lowest responsible bidder on the Lump Sum Base Bid. County reserves the right to include any, or all, of the Alternates in the final award.
- H. County reserves the sole discretion to reject any or all bids or to waive informalities and minor irregularities in the Bid Form or the Bid process.
- I. Bids expressing exceptions or qualifications on Technical Specifications may be disregarded, in the sole discretion of the County.
- J. In accordance with the General Conditions, include in the Bid, all costs for full performance of the work.

1.06 BID SECURITY

- A. Each bidder shall submit with their bid, a certified or cashier's check upon a solvent bank, or a Bid Bond in an amount equal to 10% of the Base Bid made payable to County. This bid security shall be given as a guarantee that the bidder will enter into the Agreement if awarded to bidder and will produce the required bonds and certificates of insurance coverage and **shall be retained as liquidated damages if bidder refuses to enter into said Agreement** upon request to do so by County. Bid security will be returned to all unsuccessful bidders, and to each successful bidder upon the County's receipt of a



satisfactory Performance Bond, Payment Bond, Certificate of Insurance, Worker's Compensation Insurance Certificate, Automobile Insurance Certificate executed Agreement and all other documents required by the Contract Documents prior to the execution of the Agreement by the County. Bid Bonds shall be executed on the form included in these specifications or a copy thereof.

1.07 NON-COLLUSION AFFIDAVIT

- A. Each bidder shall submit to County with their bid, a Non-Collusion Affidavit covering the bidder and all subcontractors. The Non-Collusion Affidavit shall be executed on the form included in Section 00 45 19 of the Specifications and submit a certified electronic copy with the bid submission followed by a wet notarized copy within 7 calendar days from the bid submission deadline

1.08 FORM OF AGREEMENT

- A. The Agreement, in which the successful bidder, as Contractor, will be required to be executed in three (3) originals, will be in the form of the Agreement Between County and Contractor included in these Specifications.

1.09 PERFORMANCE BOND, PAYMENT BOND

- A. The successful bidder shall file with County, a 100% Performance and a 100% Payment Bond.
The Payment and Performance Bonds required by these specifications will neither be accepted nor approved by the County unless the bonds are underwritten by a California admitted surety, and the requirements of California Code of Civil Procedure section 995.630 are met. Bonds shall be executed in three (3) originals, on the form included in these Specifications or facsimile thereof.

1.10 CONTRACTOR'S LICENSE

- A. The successful bidder shall possess a valid and current Contractor's License, classification **"A" General Engineering Contractor, "B" General Building Contractor, and/or "C-5 Framing and Rough Carpentry Contractor,** and the required classification(s) of contractor's license issued by the State of California in order to perform the work described in the Contract Documents.
- B. All Contractors and subcontractors must be registered with the California Department of Industrial Relations (DIR) at the time of bid of this Project pursuant to Cal. Labor Code Section 1725.5.
- C. This Project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations.

1.11 CONTRACTOR'S INSURANCE

- A. Coverage: Contractor shall maintain for the duration of the work and warranty period required under the Agreement, all Insurance in the minimum amounts, and with all certificates and endorsements, required by Article 11 of the "GENERAL CONDITIONS."



It is highly recommended that Bidders confer with their respective insurance carriers or brokers to determine in advance of bid submission the availability of the insurance certificates and endorsements required. A bidder, who is awarded a contract and thereafter fails to comply strictly with the insurance requirements, will be deemed to be in default of its obligations.

END OF SECTION 00 21 00



SECTION 00 22 00 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.00 FEMA Requirements

- A. The project is federally funded, and the contractors and sub-tier contractors shall comply with all FEMA requirements.
- B. Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended)
 - a. Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.
 - b. The contractor must sign and submit to the non-federal entity the 44 C.F.R. PART 18 – certification regarding lobbying. The form is listed below in this section.
- C. Additional FEMA requirements are listed in section 00 73 00, Supplementary Conditions.



APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The Contractor, _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official

Name and Title of Contractor's Authorized Official

Date



END OF SECTION 00 22 00



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SECTION 00 31 30 - BIDDER INFORMATION SHEET

Bidder must check one of the following classifications that fit its type of business organization and furnish all information required under that classification.

Please type or print your answers.

☐ BIDDER IS AN INDIVIDUAL

Bidder's name as it appears on State Contractor's license is:

☐ BIDDER IS A PARTNERSHIP

Bidder's firm name, individual or partnership, as it appears on State Contractor's License is:

The full names of all the partners as they appear on State Contractor's License are:

☐ BIDDER IS A CORPORATION

The full name of the corporation as it appears on the State Contractor's License is:

Corporation is incorporated in the State of _____

Submitted by: _____

Date: _____

END OF SECTION 00 31 30



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SECTION 00 31 40 - STATEMENT OF EXPERIENCE

Provide a listing of work completed in the last five (5) years. Indicate size of project (square footage), year completed, type of project, original contract value and total cost including all change orders.. Submitted projects should be of similar size and nature to the project being bid upon. Also, indicate the number of change orders on each job. Include references from two of the individuals / firms on the list.

END OF SECTION 00 31 40



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SECTION 00 41 00 - BID FORM

1.1 GENERAL BID INFORMATION

Bid for: Asset Protection Project – General Site Labor
550/600 Union Avenue, Fairfield, California 94533

Engineer: Mead & Hunt
180 Promenade Circle, Suite 240
Sacramento, CA 95834

- A. We, the undersigned, having familiarized ourselves with the local conditions, the Advertisement for Bids, Instructions to Bidders, General Conditions, Bid Form, Supplement to Bid Form, Agreement Between County and Contractor, the Drawings and Specifications and Addenda issued by the Architect and Solano County, do hereby propose to furnish all labor, materials, necessary tools, expendables, equipment, utility and transportation services, including State of California and local sales or use taxes, license, necessary to complete the Work required for the above Project in strict accordance with the contract documents, including all Addenda.
- B. Undersigned declares that the cost of a Performance Bond and Payment Bond in the full amount of the Agreement, and a one (1) year Warranty Bond for 10% of the Final Contract Amount, is included in this bid.
- C. Undersigned agrees to enter into and execute an Agreement, if awarded on the basis of this Bid, and to furnish Bonds and Insurance in accordance with Contract Documents, within five (5) calendar days after date of receipt of Notice to Proceed.
- D. **Liquidated Damages for Failure to Enter into the Agreement:**
Enclosed is Certified Check or Bid Bond, made payable to the County, which is not less than 10% of the total amount of the Base Bid. Should Contractor's bid be accepted, and Contractor thereafter fail to enter into the Agreement on the basis of this bid, IT IS UNDERSTOOD AND AGREED that it is, and will be, difficult or impossible to determine the actual damage which County will sustain in the event of, and by reason of, such failure to enter into the Agreement. Undersigned further agrees that said check or Bid Bond shall be forfeited as liquidated damages (not as a penalty), if undersigned fails to enter into an Agreement on the basis of this bid, after receiving Notice of Award.
- E. Undersigned acknowledges receipt of the following Addenda:
1. Addendum No. ____ Dated _____
 2. Addendum No. ____ Dated _____
 3. Addendum No. ____ Dated _____
- F. This Bid is valid for ninety (90) calendar days following the date for Bid opening.
- G. Undersigned proposes to enter into a contract for the following amounts:



- H. **LUMP SUM BASE BID** for work included in this Contract necessary to complete the Asset Protection Project located at 550/600 Union Avenue, Fairfield, California 94533 as shown in the drawings and specifications. Contractor shall Substantially Complete the Project within **278** calendar days from the Notice to Proceed. The undersigned is aware the Agreement includes provisions for Liquidated Damages as specified in Section 00 73 00 of the Bidding and Contract Requirements if the Project is not completed within the agreed time of completion.

1.2 SCHEDULE OF WORK AND PRICES

Refer to Section 01 11 00 – Summary of Work, under Project Description for more information.

	\$	
Total Amount in Words for BASE BID		Numbers



Bid submitted by:

Type of Organization: _____
(Individual, Partnership, Corporation, Etc.)

Company's Name: _____

Partner's Names: _____
(If Partnership)

Seal (If Corporation):

(Date)

By: _____
(Signature of Contractor)

(Type Name of Contractor)

(Address)

(Telephone)

Contractor License:

Class: _____ Number: _____ Expiration Date: _____

CA DIR Registration No: _____

Attachments:

- Corporate Resolution Authorizing Signature of Document (if corporation)
- Certification Regarding Lobbying (00 22 00 1.00.B.b)
- Bidder Information Sheet (00 31 30)
- Statement of Experience (00 31 40)
- Subcontractor List Form (00 43 15)
- Non-Collusion Declaration (00 45 19)
- Certification Concerning Worker's Compensation (00 45 26)
- Bid Bond (00 50 00)

END OF SECTION 00 41 00



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SECTION 00 43 15 - SUBCONTRACTOR LIST FORM

This attachment to the Bid Form shall be submitted with the Bid Form. If no subcontractors are to be involved, and work is to be performed by the Contractor, so state.

Pursuant to the provision of Section 4100 to 4113, inclusive, of the Public Contract Code of the State of California, every Bidder shall set forth the name and location of the place of business of each subcontractor who will perform work or labor in or about the construction of the work or improvement in an amount in excess of one-half (1/2) of one percent (1%) of the Bidder's total bid. If the Bidder fails to specify a subcontractor for any portion of the work in excess of one-half (1/2) of one percent (1%) of the Bidder's total bid, he agrees to perform that portion himself. The following is the required list of subcontractors:



BIDDER'S LIST OF SUBCONTRACTORS

(Use other side & extra sheets if necessary)

Subcontractor Cost								
DIR Registration No.								
License Type								
License No.								
Name and Address of Subcontractor								
Type of Work								

(Subcontractor List continued)



Subcontractor Cost								
DIR Registration No.								
License Type								
License No.								
Name and Address of Subcontractor								
Type of Work								

Date: _____

Contractor's Signature: _____



Subcontractor Cost								
DIR Registration No.								
License Type								
License No.								
Name and Address of Subcontractor								
Type of Work								

Date: _____

Contractor's Signature: _____

END OF SECTION 00 43 15



SECTION 00 43 43 - STATE WAGE DETERMINATION

1.1 INSTRUCTIONS:

- A. The general contractor is required to post the state wage determination on the job site for the project in a conspicuous location available to all workers.

END OF SECTION 00 43 43



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SECTION 00 45 19 - NON-COLLUSION DECLARATION

Title 23 United States Code Section 112

And

Public Contract Code Section 7106

The undersigned declares:

I am the _____ of _____, 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.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

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].

END OF SECTION 00 45 19



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SECTION 00 45 26 - CERTIFICATION CONCERNING WORKER'S COMPENSATION

STATE OF CALIFORNIA, SOLANO COUNTY

The undersigned is aware of the provisions of Section 3700 of the Labor Code of the State of California which require every employer to be insured against liability of worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and the undersigned will comply with such provisions, and will require all subcontractors to comply with such provisions, before commencing the performance of the work of this Contract.

Date: _____

Contractor Signature: _____

END OF SECTION 00 45 26



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SECTION 00 45 46 - PAYROLL INFORMATION

1.1 INSTRUCTIONS:

A. UPON REQUEST THE GENERAL CONTRACTOR WILL PROVIDE THE COUNTY OR PROJECT MANAGER ANY RECORDS REQUESTED FOR PAYROLL ON THIS PROJECT WITHIN 48 HOURS INCLUDING BUT NOT LIMITED TO:

1. Name, Address, Social Security Number and Ethnic Code of Employee or Employees
2. Number of withholding exemptions
3. Work classification
4. Day, Date and Hours Worked
5. Total Hours
6. Rate of Pay
7. Gross Pay
8. Deductions
9. Net Wages Paid

END OF SECTION 00 45 46



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SECTION 00 50 10 - BID BOND

BIDDER'S BOND TO ACCOMPANY PROPOSAL

(Penalty of this Bond must be 10% of the Bid Amount)

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as principal _____ and _____, as surety, are held and firmly bound unto Solano County in the sum of _____ dollars, (\$_____), to be paid to the said County or its certain attorney, its successors and assigns; for which payment, well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors or assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the certain proposal of the above bounden for _____ dated _____ is accepted by Solano County and if the above bounden _____, his heirs, executors, administrators, successors and assigns, shall duly enter into, execute and deliver a signed Agreement for such construction, and shall execute and deliver the required performance bond, payment bond, liability insurance certificate and worker's compensation certificate, within seven calendar days from the date of the receipt of a Notice of Award to the above bounden _____ from Solano County, then this obligation shall become null and void; otherwise it shall be and remain in full force and virtue.

Witness our hands this _____ day of _____, 2026.

Principal

Seal

By

Surety

Seal

By

Agency of Record

END OF SECTION 00 50 10



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SECTION 00 52 00 – AGREEMENT BETWEEN OWNER AND CONTRACTOR

THIS AGREEMENT is made as of the ____ day of _____, 2026 (“Effective Date”) between the COUNTY OF SOLANO, a political subdivision of the State of California, (referred to as ‘Owner’) and CONTRACTOR NAME. (referred to as “Contractor”) for the following Project:

The Project: **Asset Protection Project**

Architect/Engineer: Mead & Hunt, Inc.
180 Promenade Circle, Suite 240
Sacramento, CA 95834

The Owner and the Contractor agree as set forth below.

ARTICLE 1
THE CONTRACT DOCUMENTS

The Contract documents consist of this Agreement, the General Conditions and those documents enumerated in Sub-paragraph 1.1.1 of the General Conditions, which documents are incorporated into and made a part of this Agreement

ARTICLE 2
THE WORK

The Contractor shall perform all the Work required by the Contract Documents for **ASSET PROTECTION PROJECT, 550/600 Union Avenue, Fairfield, CA.**

ARTICLE 3
TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

The Work to be performed under this Contract shall commence no later than five (5) calendar days after the Notice to Proceed is issued to the Contractor and shall be carried out and completed according to the schedule set forth in Document 00 73 00/ Supplementary Conditions, Section 00 11 00/ Notice to Bidders and Section 01 32 16/ Construction Progress Schedules and Reports.

The Contractor agrees that the Work will be substantially completed in **278** calendar days from the Notice to Proceed. The Contractor agrees that the County will suffer economic damages, which may be difficult to quantify, in the event that the Work is not completed within this time period and therefore, Contractor agrees to pay the County liquidated damages in the amount outlined in Document 00 73 00/ Supplementary Conditions, Article 1.4, Liquidated Damages for each and every calendar day of delay beyond the **278** calendar days provided above.



ARTICLE 4
CONTRACT SUM

The County shall pay the Contractor for the performance of the Work, subject to additions and deductions by Change Order or as otherwise provided in the Contract Documents, a total Contract Sum of \$_____.

ARTICLE 5
PROGRESS PAYMENTS

Based upon Applications for Payment submitted to the Project Manager by the Contractor and Project Certificates for Payment issued by the Project Manager/Architect, the County shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents as follows:

Progress Payments: The Contractor shall on or before the first day of each month, make an estimate of the work performed during the preceding month and submit same to the Project Manager for checking and approval. On or about the 20th day of the month following the month in which the work was performed, the County shall pay to the Contractor ninety-five (95%) percent of the value of said work in place, as checked and approved by the Project Manager. The balance of five (5%) percent of the estimate shall be retained by the County until the time of final acceptance of said work.

The remaining retention would be held until 35 days after the Notice of Completion is filed with the Solano County Recorder's Office and completed according to Section 01 77 00/ Contract Closeout Procedures.

ARTICLE 6
FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the County to the Contractor when the Work has been completed, the Contract fully performed, the Architect has issued a Project Certificate for Payment which approves the final payment due the Contractor, Board of Supervisors of Solano County has formally accepted the project as complete by Resolution and Notice of Completion filed by the County Recorder's Office.

ARTICLE 7
MISCELLANEOUS PROVISIONS

7.1 **Terms.** Terms used in this Agreement, which are defined in the Document 00 72 00/ General Conditions of the Contract for Construction, shall have the meanings designated in those Conditions.



7.2 **Notices.** Notices shall be addressed as follow:

OWNER:

COUNTY OF SOLANO

Ian Goldberg, County Administrator

675 Texas Street, Suite 2500

Fairfield, CA 94533

CONTRACTOR:

(CONTRACTOR)

(Contact name)

(Address)

7.3 **Prevailing Wages.** The Contractor agrees that State Prevailing Wages apply to this Project and that the Contractor will pay the rates for each trade or craft and shall require the subcontractors on the project to pay the rates for each trade and craft. The Payroll Submittal Information attached as Section 00 45 46 - Payroll Information is incorporated as if set forth in full and is a part of this Contract. A copy of the prevailing rate of per diem wages are on file at the principal office, which shall be made available to any interested party on request. The Contractor agrees to repay the County any and all amounts paid to any subcontractor in violation of Public Contract Code Section 6109.

7.4 **Execution of Contract in Counterparts.** This Contract may be executed in two or more counterparts, each of which together shall be deemed an original, but all of which together shall constitute one and the same instrument, it being understood that all parties need not sign the same counterpart. In the event that any signature is delivered by facsimile or electronic transmission (e.g., by e-mail delivery of a ".pdf" format data file), such signature shall create a valid and binding obligation of the party executing (or on whose behalf such signature is executed) with the same force and effect as if such facsimile or electronic signature page were an original signature.

ARTICLE 8

EXECUTION OF AGREEMENT

The parties have executed this Agreement as of the day and year first above written.

COUNTY:

CONTRACTOR:

By: _____

Ian Goldberg, County Administrator

By: _____

Name

Contractor

APPROVED AS TO FORM:

County Counsel of Solano County, California

By: _____

NOTE: If the Contractor is a corporation, attach to this Contract a certified copy of the by-laws, resolutions, or excerpts of a meeting of the Board of Directors of the Corporation authorizing the person executing this Agreement to do so for the Corporation

END OF SECTION 00 52 00



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SECTION 00 61 13 - STATUTORY PERFORMANCE BOND

STATUTORY PERFORMANCE BOND PURSUANT TO
California Public Contract Code
Section 20129

(Penalty of this bond must be 100% of the Contract Amount)

KNOW ALL MEN BY THESE PRESENTS:

That, _____ (Hereinafter called the Principal), as Principal and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____, (hereinafter called the Surety), as Surety, are held and firmly bound unto **COUNTY OF SOLANO**, (hereinafter called the obligee) in the amount of _____ Dollars (\$ _____), for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Agreement with the Obligee, dated the _____ day of _____, 2026, **Asset Protection Project - General Site Labor**, 550/600 Union Avenue, Fairfield, CA, which Agreement is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THE OBLIGATION IS SUCH, that if said Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, and conditions of said Agreement during the original term of the Agreement and any extension thereof, with or without notice to the Surety, and during the life of any guarantee required under the contract, and shall also perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized extensions or modifications of said contract that may hereafter be made, notice of said extensions or modifications to the Surety being hereby waived; then the above obligation shall be void. Otherwise, said obligation shall remain in full force and effect.

That this bond is executed pursuant to the provisions of California Public Contract Code, section 20129 and all liabilities on this bond shall be determined in accordance with the provisions of Part 2, Title 14, Chapter 2 of California Code of Civil Procedure, which is incorporated in full herein. The prevailing party in a suit on this bond shall recover as a part of his judgment such reasonable attorney's fees as may be fixed by a judge any court of competent jurisdiction.

Witness our hands this _____ day of _____, 2026.

Principal

Seal

By



Surety

Seal

By

Agency of Record

END OF SECTION 00 61 13



SECTION 00 61 14 - STATUTORY PAYMENT BOND

STATUTORY PAYMENT BOND PURSUANT TO
California Civil Code
Sections 3247 through 3252
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL THESE MEN BY THESE PRESENTS:

That, _____ (hereinafter called the Principal), as Principal, and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ (hereinafter called the Surety), as Surety, are held and firmly bound unto COUNTY OF SOLANO (hereinafter called the Obligee), in the amount of _____ Dollars (\$____) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 2026, to the **Asset Protection Project - General Site Labor**, 550/600 Union Avenue, Fairfield, CA, which contract is hereby referred to and made a part hereof as fully and to the same extent as if copies at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall promptly pay all moneys due to all persons supplying labor or materials to him or his subcontractors in the prosecution of the work provided for in said contract, then this obligation shall be void, otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond having been required of the said Principal in order to comply with the provisions of California Civil Code, sections 3247 through 3252, all rights and remedies on this bond shall inure solely to such persons and shall be determined in accordance with the provisions, conditions and limitations of said Statutory Provisions to the same extent as if they were copied at length herein.

The prevailing party in a suit on this bond shall recover as a part of his judgment such reasonable attorney's fees as may be fixed by a judge of the Court.

Witness our hands this _____ day of _____, 2026.

Principal

Seal

By

Surety

Seal

END OF SECTION 00 61 14



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SECTION 00 65 19 - WAIVER AND RELEASE SUBMITTAL INFORMATION

1.1 INSTRUCTIONS FOR WAIVER AND RELEASE (LIEN WAIVER) SUBMITTALS

A. GENERAL INSTRUCTIONS

1. Waiver and Releases must be submitted on forms provided by Solano County. Copies of said forms that comply with Civil Code § 8132 - 8138 are at the end of this Section.
2. Comply with General Conditions Section 9.3.7.
3. Waiver and Release submittal sequence.
 - a) Upon initial submittal for progress payment, submit for each subcontractor, material or equipment supplier a **"CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT"**. If initial submittal is also a final submittal for any or all subcontractors, material or equipment suppliers, submit a **"CONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT"**.
 - b) Upon each subsequent submittal for progress payment, submit for each subcontractor, material or equipment supplier a **"CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT"** for a total amount reflecting the current progress payment. Also submit an **"UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT"** reflecting the previous progress payment aggregate sum.
 - c) Upon final submittal for progress payment, submit for each subcontractor, material or equipment supplier a **"CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT"**. Also submit an **"UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT"** reflecting the previous progress payment aggregate sum.
 - d) Prior to Final Completion and Final Payment, submit for each subcontractor, material or equipment supplier an **"UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT"**.
4. Comply with General Conditions Section 9.8.2.

**CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT**

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

Identifying Information

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Conditional Waiver and Release

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

Maker of Check: _____

Amount of Check: \$ _____

Check Payable to: _____

Exceptions

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:
Date(s) of waiver and release: _____
Amount(s) of unpaid progress payment(s): \$ _____
- (4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Signature

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

**UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT**

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

Identifying Information

Name of Claimant:

Name of Customer:

Job Location:

Owner:

Through Date:

Unconditional Waiver and Release

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

\$

Exceptions

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Signature

Claimant's Signature:

Claimant's Title:

Date of Signature:

**CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT**

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

Identifying Information

Name of Claimant:

Name of Customer:

Job Location:

Owner:

Conditional Waiver and Release

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

Maker of Check:

Amount of Check: \$

Check Payable to:

Exceptions

This document does not affect any of the following:

Disputed claims for extras in the amount of: \$

Signature

Claimant's Signature:

Claimant's Title:

Date of Signature:



UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

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

Identifying Information

Name of Claimant:

Name of Customer:

Job Location:

Owner:

Unconditional Waiver and Release

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

Exceptions

This document does not affect any of the following:

Disputed claims for extras in the amount of: \$

Signature

Claimant's Signature:

Claimant's Title:

Date of Signature:



END OF SECTION 00 65 19



SECTION 00 72 00 - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

TABLE OF ARTICLES

1. CONTRACT DOCUMENTS
2. ADMINISTRATION OF THE CONTRACT
3. COUNTY
4. CONTRACTOR
5. SUBCONTRACTORS
6. WORK BY COUNTY OR BY SEPARATE CONTRACTORS
7. MISCELLANEOUS PROVISIONS
8. TIME
9. PAYMENTS AND COMPLETION
10. PROTECTION OF PERSONS AND PROPERTY
11. INSURANCE
12. CHANGES IN THE WORK
13. INSPECTION, UNCOVERING AND CORRECTION OF WORK
14. TERMINATION OF THE CONTRACT
15. ADDITIONAL INSTRUCTIONS



ARTICLE 1
CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General and other Conditions), the Drawings, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Agreement. A Modification is (1) a written amendment to the Agreement signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Project Manager pursuant to Subparagraph 2.2.7 and 2.2.8, or (4) a written order for a minor change in the Work issued by the Project Manager pursuant to Paragraph 12.4. The Contract Documents shall also include the Notice to Bidders, Instructions to Bidders, accepted Bid Form, the Payment Bond, Performance Bond, Warranty Bond, Insurance Certificates and Notice to Proceed.

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Subparagraph 1.1.1. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Project Manager and the Contractor, but the Project Manager shall be entitled to performance of the obligations of the Contractor intended for their benefit and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the County, the Project Manager and any Subcontractor or Sub-subcontractor.

1.1.3 THE WORK

The Work comprises the completed construction required of the Contractor by the Contract Documents, and includes all labor, materials, equipment and services necessary to produce such construction, and all materials, other permits (see article 4.7.1) and equipment incorporated or to be incorporated in such construction.

1.1.4 THE PROJECT

The Project, as defined in the Owner-Contractor Agreement, is the total construction of which the Work performed under the Contract Documents is a part.



1.2 EXECUTION, CORRELATION AND INTENT

- 1.2.1 The Contract Documents shall be signed through AdobeSign.
- 1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with the local conditions under which the Work is to be performed, and has correlated personal observations with the requirements of the Contract Documents.
- 1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable as being necessary to produce the intended results. Words and abbreviations that have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.
- 1.2.4 If the Contractor observes any errors, discrepancies or omissions in the Contract Documents, he shall promptly notify the Project Manager requesting clarification. If the Contractor proceeds with work affected by such errors, discrepancies or omissions, without having received such clarification, he does so at his own risk. Any adjustments involving such circumstances made by the Contractor, prior to approval by the Project Manager, shall be at the Contractor's risk and the settlement of any complications or disputes arising shall be at the Contractor's sole expense and Contractor shall indemnify, hold harmless and defend County, and Project Manager from any liability or loss with respect to said adjustments.
- 1.2.5 Subject to Article 15.10.1, in cases of discrepancy concerning dimension, quantity and location, the Drawings shall take precedence over the Specifications. Explanatory notes on the Drawings shall take precedence over conflicting drawn indications. Large Scale details shall take precedence over smaller scale details and figured dimensions shall take precedence over scaled measurement. Where figures are not shown, scale measurements may be followed but shall in all cases be verified by measuring actual conditions of Work already in place. In cases of discrepancy concerning quality and application of materials and non-technical requirements over materials, the specifications shall take precedence over Drawings. In the case of discrepancy between the General Conditions and the Division 1 - General Requirements, the Division 1 - General Requirements shall take precedence.
- 1.2.6 All work and material of the respective kinds specified or indicated shall be new. Should any workmanship or materials be required which are not directly or indirectly called for in the Specifications and/or shown on the Drawings but which are necessary for proper fulfillment of the obvious intent thereof, said workmanship or materials shall be the same for similar parts that are detailed, indicated or specified, and the Contractor shall



understand the same to be implied and provide for it in his tender as if it were particularly described or delineated.

1.3 OWNERSHIP AND USE OF DOCUMENTS

- 1.3.1 All Drawings, Specifications and copies thereof furnished shall remain the property of the County. With the exception of one contract set for each party to the Contract, such documents are to be returned by Contractor or suitably accounted for to the County on request at the completion of the work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect/Engineer's common law copyright or other reserved rights. The County's use of the documents will not increase the Architect/Engineer's design liability beyond the Project and the site for which the design was originally intended. Contractor is entitled to make copies of drawings, specifications and other Contract Documents in connection with the Project but shall not distribute any copies of plans and details to other parties for use other than related to this Project. Architect/Engineer retains all common law copyrights for documents prepared by the Architect/Engineer.

ARTICLE 2 **ADMINISTRATION OF THE CONTRACT**

2.1 THE COUNTY CAPITAL PROJECTS DIVISION MANAGER

- 2.1.1 The County Capital Projects Management (CPM) Division Manager represents Solano County for all purposes relevant for this Project.

2.2 THE PROJECT MANAGER

- 2.2.1 The "Project Manager" is the Capital Projects Management Division's staff. The Project Manager reports to the County's Department of General Services Capital Projects Division Manager. All communications from and to the Contractor will be channeled through the Project Manager. However, the Project Manager does not have the authority to bind the County in matters affecting adjustments to the time or cost of the project as defined in the Owner – Contractor Agreement.
- 2.2.2 The Project Manager will be the County's representatives during construction and warranty periods, and until final payment to all contractors is due. The Project Manager will advise and consult with the County. All instructions to the Contractor shall be forwarded through the Project Manager. The Project Manager will have authority to act on behalf of the County only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with Subparagraph 2.2.16.



- 2.2.3 The Project Manager will determine in general whether the Work of the Contractor is being performed in accordance with the Contract Documents and will endeavor to guard the County against defects and deficiencies in the Work of the Contractor.
- 2.2.4 The Project Manager will be on site during construction to monitor the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. On the basis of on-site observations and communication with the Contractor, the Project Manager will keep the County informed of the progress of the Work and will endeavor to guard the County against defects and deficiencies in the Work of the Contractor.
- 2.2.5 The Project Manager shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so that the Project Manager may perform their functions under the Contract Documents.
- 2.2.6 Based on the Project Manager's observations, and an evaluation of the Contractor's Application for Payment, the Project Manager will determine the amount owing to the Contractor and will issue to the County Certificates for Payment incorporating such amount, as provided in Paragraph 9.4.
- 2.2.7 The Project Manager will render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with agreed upon time limits.
- 2.2.9 Claims, disputes and other matters in question between the Contractor and the Project Manager relating to the execution or progress of the Work or the interpretation of the Contract Documents shall be referred to the CPM Division Manager of Solano County (or his/her designee).
- 2.2.10 All interpretations and decisions of the Project Manager shall be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in graphic form.
- 2.2.11 The Project Manager will have the authority to reject, and or recommend to the County the rejection of, Work that does not conform to the Contract Documents. Whenever, in the Project Manager's opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Project Manager will have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.7.2 whether or not such Work be then fabricated, installed or completed.
- 2.2.12 The Project Manager will receive from the Contractor and review-required Shop Drawings, Product Data and Samples, and forward same to Architect and County for review and approval. Non-specified submittals, product data and samples may be reviewed or returned un-reviewed.



- 2.2.13 Following consultation with the County, the Project Manager will take appropriate action on Change Orders in accordance with Article 12 and will have authority to order minor changes in the Work as provided in Subparagraph 12.4.1.
- 2.2.14 The Project Manager will conduct inspections to determine the date of Substantial Completion and Final Completion, and will receive and forward to the County, for the County's review, written warranties and related documents required by the Contract and assembled by the Contractor. The Project Manager will issue a final Project Certificate for Payment upon compliance with the requirements of Paragraph 9.8. The Project Manager will monitor all warranties for a period of one year after final completion, unless otherwise specified as a longer term.
- 2.2.15 The duties, responsibilities and limitations of authority of the Project Manager, as the County's representatives during construction as set forth in the Contract Documents, will not be modified or extended without written consent of the County, the Contractor and the Project Manager, which consent shall not be unreasonably withheld. Failure of the Contractor to respond within ten days to a written request shall constitute consent by the Contractor.
- 2.2.16 In case of the termination of the employment of the Project Manager, the County shall appoint a Project Manager, whose status under the Contract Documents shall be that of the former Project Manager, respectively.

2.3 THE PROJECT ARCHITECT/ ENGINEER OF RECORD

- 2.3.1 The "Project Architect" is the architect/engineer or firm engaged as an independent contractor by the County to design the Project, and all sub-consultants or joint ventures of the Project Architect, identified as such in the Owner-Contractor Agreement. The authority of the Project Architect to bind the County is limited to that authority specified in the Contract Documents and Agreement between County and Architect, no additional authority has been granted, nor shall be inferred. The Project Architect includes all architect, engineering, sub-consultants and other consultants or sub-contractors employed by the Project Architect or an entity lawfully practicing engineering.
- 2.3.2 The Project Architect advises the Project Manager in all aspects of the construction phase of the Project, including the correct interpretation and application of the Contract Documents. However, the Project Manager is the County's representative on the Project, not the Project Architect. The Project Architect is not authorized independently to issue Addenda, Clarifications, Field Orders, Work Authorizations, or Change Orders, or in any other way to bind the County in discussions with the Contractor. The Project Architect reports to the Project Manager.
- 2.3.3 The Project Architect shall at all times have access to the Work wherever it is in preparation



and progress. The Contractor shall provide facilities for such access so that the Project Architect may perform their functions under the Contract Documents.

- 2.3.4 The Contractor shall deliver all correspondence relating to the proper execution of the Work to the Project Manager, with a copy delivered to the Project Architect. The Project Manager reserves the right to consult with the Project Architect and County prior to responding to the Contractor's correspondence.
- 2.3.5 When discussions between the Contractor and the Project Manager occur either on the site or elsewhere, but the Project Architect is not present, the Project Manager reserves the right to consult with the Project Architect and County prior to issuing his/her final decision or instruction.
- 2.3.6 The Project Architect will review or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and the information given in the Contract Documents. Such action shall generally be taken within ten (10) working days, however under certain circumstances such as very complex submittals or if large number of submittals are submitted at one time, such review may take longer. In such situations, the Contractor will be notified and given the opportunity to advise the Project Manager and Project Architect of priorities. The Project Architect's review of a specific item shall not indicate approval of an assembly of which the item is a component.

2.4 THE COUNTY INSPECTOR OF RECORD

- 2.4.1 The County's Inspector of Record observes the Work for compliance with the Contract Documents and reports the results of those inspections to the Project Manager and County. The County's Inspector of Record reports to the Project Manager.
- 2.4.2 The County's Inspector of Record is the person or firms engaged by Solano County to perform contract compliance and building code inspections.
- 2.4.3 The County's Inspector of Record is not authorized to issue addenda, clarifications, field orders, work authorizations, or change orders, or otherwise to bind the County in discussions with the Contractor.
- 2.4.4 The Contractor nor his subcontractors shall not attempt to influence the County's Inspector of Record in the performance of their duties, nor request the County's Inspector of Record to exceed their authority.

2.5 ADDITIONAL PERSONNEL OR CHANGE IN PERSONNEL

- 2.5.1 The County reserves the right to assign additional persons to the positions set forth in Section 3.1, or change the personnel assigned to the positions so set forth.



- 2.5.2 The Contractor shall be notified in writing by the County CPM Division Manager of any personnel changes.
- 2.5.3 In all cases, the County CPM Division Manager reserves the right to obtain assistance from other County personnel, independent contractors or other consultants employed by the County.

ARTICLE 3 **COUNTY**

3.1 DEFINITION

- 3.1.1 The County is the person or entity identified as such in the Owner-Contractor Agreement. The term County means the County or the County's authorized representative for this project.

3.2 INFORMATION AND SERVICES REQUIRED OF THE COUNTY

- 3.2.1 Except as provided in Subparagraph 4.7.1, the County shall secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.
- 3.2.2 Information or services under the County's control shall be furnished by the County with reasonable promptness to avoid delay in the orderly progress of the Work and Contractor shall be entitled to rely on the accuracy and completeness of the information provided notwithstanding anything to the contrary in the Contract Documents.
- 3.2.3 The Contractor will be furnished not more than **TWO (2)** copies of the Drawings and Specifications, free of charge. The Contractor, at Contractor's expense of reproduction, may obtain additional copies over this number.
- 3.2.4 The County shall forward all instructions to the Contractor through the Project Manager.
- 3.2.5 The foregoing is in addition to other duties and responsibilities of the County enumerated herein and especially those in respect to Work by County or by Separate Contractors, Payments and Completion, and Insurance in Articles 6, 9 and 11, respectively.

3.3 COUNTY'S RIGHT TO STOP THE WORK

- 3.3.1 If the Contractor fails to correct defective Work as required by Paragraph 13.2, or persistently fails to carry out the Work in accordance with the Contract Documents, the County, by a written order signed personally or by an agent specifically so empowered by the County in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the County to stop the Work shall not give rise to any duty on the part of the County to exercise this right for the benefit of any Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.



3.4 COUNTY'S RIGHT TO CARRY OUT THE WORK

- 3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails after written notice from the County to correct such default or neglect with diligence and promptness, the County may, after an additional written notice and without prejudice to any other remedy the County may have, make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the additional services of the Project Manager, Architect/Engineer or other Professionals made necessary by such default, neglect or failure. Such action by the County and the amount charged to the Contractor are both subject to the prior approval of the Project Manager. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County, or County may call performance or warranty bonds.

ARTICLE 4 **CONTRACTOR**

4.1 DEFINITION

- 4.1.1 The Contractor is the person or entity identified as such in the Owner-Contractor Agreement. The term Contractor means the Contractor or the Contractor's authorized representative.

4.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS

- 4.2.1 The Contractor shall carefully study the Contract Documents and shall at once report to the Project Manager any error, inconsistency or omission discovered. The Contractor shall not be liable to the County or the Project Manager for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such error, inconsistencies or omissions and knowingly failed to report it to the Project Manager. The Contractor shall perform no portion of the Work at any time unless authorized by the Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.
- 4.2.2 Neither the County nor the Project Manager or Architect/Engineer assume any responsibility for an understanding or representation made by any of their agents or representation prior to the execution of the Agreement unless (1) such understanding or representations are expressly stated in the Agreement, and (2) the Agreement expressly provides that responsibility therefore is assumed by the County.
- 4.2.3 Failure by the Contractor to acquaint himself with all available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the Work.
- 4.2.4 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Project Manager within one (1) calendar day of discovery.



- 4.2.5 Before submitting any Request for Information (RFI), or other Contractor initiated request for information the Contractor shall determine that the information requested is not clearly provided in the Contract Documents. RFI's shall be submitted to the Project Manager only from the Contractor, or County, and not from any subcontractor, supplier or other vendor, and shall be on a form approved by the Project Manager and County. The Contractor shall provide a revised and updated RFI Priority Schedule on a weekly basis. The RFI Priority Schedule shall rank RFI's in order of priority and include a brief statement of reason for priority. County initiated RFI's will not be listed on the contractor's RFI Priority Schedule. The County will provide the Project Manager a separate list of County initiated RFI's upon request of the Project Manager. The Project Manager will endeavor to respect the order of priorities as requested by the Contractor or County for the overall benefit of the Project. The RFI process is for information and clarification only and may not be utilized to obtain approval for changes in the work.

4.3 SUPERVISION AND CONSTRUCTION PROCEDURES

- 4.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor and its subcontractors shall be solely responsible for all construction means, methods, techniques, sequences, procedures, or safety procedures at the project site; and shall coordinate all portions of the Work under the Contract.
- 4.3.2 The Contractor shall be responsible to the County for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and any other persons performing any of the Work under a contract with the Contractor.
- 4.3.3 The Contractor shall not be relieved from the Contractor's obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Project Manager in the administration of the Contract, or by inspections, tests or approvals required or performed under Paragraph 7.7 by persons other than the Contractor.

4.4 LABOR AND MATERIALS

- 4.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.
- 4.4.2 The Contractor shall at all times enforce strict discipline and good order among the Contractor's employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned them.
- 4.4.3 The Contractor shall deliver to the Project Manager, prior to final acceptance of the work as a whole, signed certificates from suppliers of materials and manufactured items stating that such items conform to the Contract Documents.
- 4.4.4 The Contractor, immediately upon Notice to Proceed (or where shop drawings, samples, etc., are required, immediately upon receipt of approval thereof) shall place orders for all materials, work fabrication, and/or equipment to be employed by Contractor for that



portion of the work contracted. The Contractor shall keep all materials, work fabrications and/or equipment specified and shall advise the Project Manager promptly, in writing, of all orders placed and of such materials, work available in a timely manner for the purposes of the Contract.

- 4.4.5 Anyone employed by Contractor or its Subcontractors whose work is unsatisfactory to the County or the Project Manager or is considered by the County or Project Manager to be careless, incompetent, unskilled or otherwise unfit shall be dismissed from work under the Contract upon written request to the Contractor from the County or the Project Manager.

4.5 WARRANTY

- 4.5.1 The Contractor warrants to the County that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Project Manager, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Paragraph 13.2.

4.6 TAXES

- 4.6.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the work or portions thereof provided by the Contractor which are legally enacted at the time bids are opened, whether or not yet effective, up to final completion of the project.

4.7 PERMITS, FEES, AND NOTICES

- 4.7.1 Unless otherwise provided in the Contract Documents, the County shall secure the building permit, and permanent utility connection fees. The Contractor shall secure and pay for temporary construction utilities, and all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time bids are opened.
- 4.7.2 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work.
- 4.7.3 It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance in any respect, the Contractor shall promptly notify the Project Manager in writing, and any necessary changes shall be accomplished by appropriate modification.
- 4.7.4 If the Contractor performs any Work knowing it to be contrary to any laws, ordinances, rules and regulations, without notice to the Project Manager, the Contractor shall assume full responsibility therefore and shall bear all costs attributable as a result.



- 4.7.5 Any reference in the Specifications text to codes, standard specifications or manufacturer's instructions shall mean the latest printed edition of each in effect at the time the plans and specifications are approved by the County Building Department.

4.8 ALLOWANCES

- 4.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by such persons as the Project Manager may direct, but the Contractor will not be required to employ persons against whom the Contractor makes a reasonable objection.

- 4.8.2 Unless otherwise provided in the Contract Documents:

- .1 these allowances shall cover the cost to the Contractor, less any applicable trade discount, of the materials and equipment required by the allowance, delivered at the site, and all applicable taxes;
- .2 the Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in the allowance;
- .3 whenever the cost is more or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize changes, if any, in handling costs on the site, labor, installation costs, overhead, profit and other expenses.

4.9 PROJECT MANAGER AND SUPERINTENDENT

- 4.9.1 The Contractor shall employ a competent project manager, superintendent and necessary assistants who shall be in attendance at the Project site at all times during the progress of the Work. The project manager and the superintendent shall represent the Contractor and all communications given to the project manager and superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed upon written request in each case.

- 4.9.2 The Project Manager and Superintendent who begin the Project shall remain on the Project until the Project is completed, as long as the Contractor employs that person. The Project Manager and Superintendent shall not be replaced without the prior approval of the County.

4.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

- 4.10.1 Within ten (10) calendar days after receipt of Notice to Proceed, the Contractor shall submit a Construction Schedule in CPM (Critical Path Method) form to the Project Manager for approval. The Construction Schedule shall be sufficiently detailed to accurately depict all the work required by the contract and include all features per specifications section 01 32 16, Construction Progress Schedules. CPM Construction Schedule shall reflect shop drawings; submittals due and return dates, fabrication and delivery times, crew mix, and equipment loading data. The Contractor shall thereafter adhere to the Project Construction Schedule, as regularly updated, including any revisions therein made by the County during the course of construction. "Slack" or "float" time on the CPM Construction Schedule is



not for the sole benefit of the County or Contractor and shall be apportioned according to the needs of the project and as accepted by the County.

- 4.10.2 Within ten (10) calendar days after the Notice to Proceed, the Contractor shall provide a Submittal and Procurement Schedule indicating time periods for review of Shop Drawings, Data, Samples, and procurement of material and equipment required for the Work, per specifications section 01 33 00, Submittal Procedures. All items that require approval by the Project Manager and/or are not readily available from stock and requiring more than 35 days' lead time shall be included in the Submittal and Procurement Schedule. Items listed in the Submittal and Procurement Schedule shall also be identified as activities on the CPM Construction Schedule.
- 4.10.3 The working day to calendar date correlation shall be based upon the Contractor's proposed work week with adequate allowance for legal holidays, days lost due to weather, and any special requirements of the project.
- 4.10.4 The Construction Schedule and Submittal and Procurement Schedule shall be prepared and maintained by the Contractor.
- 4.10.5 The County, Project Manager, Contractor and other Contractor(s) shall jointly review the progress of the work weekly. Should this review, in the opinion of the Project Manager, indicate that the work is behind the schedule established by currently approved Construction Schedule, the Contractor shall either 1) provide a plan to the Project Manager indicating the steps the Contractor intends to take in order to recover the time behind schedule and conform to the approved Construction Schedule and Submittal and Procurement Schedule; or 2) submit a revised Construction Schedule and Submittal and Procurement Schedule for completion of the work, remaining within the contract completion time, to the Project Manager for approval by the next weekly meeting.
- 4.10.6 The Contractor shall deliver copies of the daily job logs to the Project Manager and County on a daily basis, no later than close of business each day. Failure to comply may result in progress payment withholdings.
- 4.10.7 The Contractor will schedule and coordinate the Work of all sub-contractors on the Project using the critical path method of scheduling. The Contractor will keep the Sub-contractors informed of the Project Construction Schedule to enable the Contractor to plan and perform the Work properly.
- 4.11 RECORDS, DOCUMENTS AND SAMPLES AT THE SITE
 - 4.11.1 The Contractor shall maintain all records of required City, County or State inspections and shall promptly notify the Project Manager of the results of any inspection. Copies of all such records shall be provided to the County upon request.
 - 4.11.2 The Contractor shall secure and maintain required certificates of inspection, testing or approval and shall promptly deliver them to the Project Manager.
 - 4.11.3 The Contractor shall maintain at the Project site, on a current basis, one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop



Drawings, Product Data and Samples. These shall be available to the Project Manager and the County and shall be delivered to the Project Manager for forwarding to the County upon completion of the Project. The Contractor shall advise the Project Manager on a current basis of all changes in the Work made during construction.

- 4.11.4 Prior to approval of the monthly payment application, Contractor shall review above referenced documents with the Construction Manager to assure compliance. Approval of payment application is contingent upon above referenced records being current.
- 4.11.5 If the Contractor requests and receives from the Architect electronic copies and/or specifications, Contractor shall provide Record As-built in electronic form at the close of the Project, in the same format as was provided by the Architect to the Contractor.

4.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- 4.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 4.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
- 4.12.3 Samples are physical examples that illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.
- 4.12.4 The Contractor shall prepare, review, approve and submit to the Project Manager, with reasonable promptness (not to exceed 45 days from pre-construction conference) and in such sequence as to cause no delay in the Work or in the work of the County or any separate contractor, required Shop Drawings, Product Data and Samples required by the Contract Documents.
- 4.12.5 By preparing, approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that the Contractor has determined and verified all materials, field measurements and field construction criteria related thereto, or will do so with reasonable promptness, and has verified the information contained within such submittals with the requirements of the Work, the Project and the Contract Documents.
- 4.12.6 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's review of Shop Drawings, Product Data or Samples under Subparagraph 2.1.6, unless the Contractor has specifically informed the Project Manager in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's approval of them.
- 4.12.7 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. The cost of such certifications shall be borne by the Contractor. County may elect to have an independent



certification performed at its own expense. The County shall have final approving authority for performance-based items.

- 4.12.8 The Contractor shall direct specific attention, in writing or on resubmitted Shop drawings, Product Data, or Samples, to revisions other than those requested by the Architect on previous submittals.
- 4.12.9 No portion of the work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been reviewed by the Architect as provided in Section 01 33 00. All such portions of the Work shall be in accordance with reviewed submittals.
- 4.12.10 Submission of Shop Drawings and Samples to the Project Manager is required for only those items specifically mentioned in the Specification Sections. If Contractor submits Shop Drawings for items other than the above, the Project Manager will not be obligated to distribute or review them. Contractor shall be responsible for the procuring of Shop Drawings for his own use as he may require for the progress of the Work.
- 4.12.11 The term "Shop Drawings" as used here also includes but is not limited to fabrication, erection, layout and setting drawings, manufacturer's standard drawings, descriptive literature, catalogs, brochures, performance and test data, wiring and control diagrams, all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and the positions and layout of each conform to the Contract requirements. As used herein the term "manufactured" applies to standard units usually mass-produced and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall establish the actual detail of all manufactured or fabricated items; indicate proper relation to adjoining Work; amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure; and incorporate minor changes of design or construction to suit actual conditions.
- 4.12.12 Drawings: Following Contractor's review and approval, Contractor shall submit to the Project Manager for approval. The Project Manager will check the submittal to see if it is complete. If complete, the Project Manager will forward the drawings to the Architect. The Architect will check the drawings and affix a stamp to the drawings, indicating the status of acceptance, and will return same to the Contractor, each retaining prints for his records. Comments, if any, will be noted directly on the drawings. The Contractor shall then print and distribute the appropriate number of copies to his subcontractors and job personnel as required. If a drawing is stamped "Rejected", the Contractor shall correct and resubmit as outlined above. When stamped "Implement Exception Noted", or similar instructions, the Contractor shall correct and resubmit for record only, two prints of each drawing.
- 4.12.13 Samples: Following Contractor's review and approval, Contractor shall submit to the Project Manager, two samples of all materials in quantities and sizes as specified herein. Submittals shall be given to the Project Manager at a time determined by the Contractor, which allows for any necessary re-submittal and which will not cause any delay in the work. Samples will be forwarded to the Architect. If a sample is rejected, one sample noted so will be returned to the Contractor. If a sample is marked "Implement Exceptions



Noted", one sample so noted will be returned. Corrected samples shall be resubmitted for approval as per the original submittal.

4.12.14 Brochures: Following Contractor's review and approval, Contractor shall submit to the Project Manager, six (6) copies of all manufacturer's catalogs or brochures as required. Brochures will be forwarded to the Architect/Engineer for review. If a brochure is stamped "No Exception Taken", two (2) copies will be returned to the Contractor. If stamped "Rejected", one marked copy and two (2) unmarked copies will be returned. Corrected copies shall be resubmitted for approval as per the original submittal.

4.12.15 Manufacturer's Instructions: Where any item or work is required by Specifications to be furnished, installed or performed in accordance with a specified product manufacturer's instructions, Contractor shall procure and distribute six (6) copies of such instructions to the Project Manager.

4.12.16 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, and the Architect/Engineer has no information creating doubt as to the reliability of such certification, the Architect/Engineer shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. The County shall have final approving authority for performance-based items.

4.13 USE OF SITE

4.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment. The Contractor shall be liable for any and all damage caused by it to County's premises. The Contractor shall hold and save the County, its agents, representatives, and consultant Project Manager and Project Engineer, free and harmless and defend them from liability of any nature or kind arising from any use, trespass, or damage to premises or third persons to the extent caused by its operations.

4.13.2 The Contractor shall coordinate all of the Contractor's operations with, and secure approval from, the Project Manager before using any portion of the site.

4.14 CUTTING AND PATCHING OF WORK

4.14.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

4.14.2 The Contractor shall not damage or endanger any portion of the Work or the work of the County or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the County or any separate contractor except with the written consent of the County and of such separate contractor. The Contractor shall not unreasonably withhold from the County or any separate contractor consent to cutting or otherwise altering the Work.



4.14.3 In all cases Contractor shall exercise extreme care in cutting operations and perform such operations under adequate supervision by competent mechanics skilled in the applicable trade. Openings shall be neatly cut and shall be kept as small as possible to avoid unnecessary damage. Careless and/or avoidable cutting damage, etc., will not be tolerated, and the Contractor will be held responsible for such avoidable or willful damage.

4.14.4 All replacing, patching and repairing of all materials and surfaces cut or damaged in the execution of the Work shall be performed by experienced mechanics of the several trades involved. Such replacing, repairing or patching shall be done with the applicable materials, in such a manner that all surfaces so replaced, etc., will, upon completion of the Work, match the surrounding similar surfaces.

4.14.5 The Contractor is to provide notification to the County of impending work near all existing facilities, including site work and renovation work in the existing facility if applicable. This will be noted as part of the Contractor's three week look ahead schedule submitted at weekly progress meetings with the County.

4.15 CLEANING UP

4.15.1 The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Contractor's operations. At the completion of the Work, the Contractor shall remove all of Contractor's waste materials and rubbish from and about the Project as well as all the Contractor's tools, construction equipment, machinery and surplus materials.

4.15.2 If the Contractor fails to clean up at the completion of the Work, the County may do so as provided in Paragraph 3.4 and the cost thereof shall be paid by the Contractor.

4.16 ROYALTIES AND PATENTS

4.16.1 The Contractor shall pay all royalties and license fees, shall defend all suits or claims for infringement of any patent rights and shall defend and save the County harmless from loss on account thereof, except that the County shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is selected by the Project Manager. If the Contractor knows that the design, process or product selected is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly given to the others.

4.17 INDEMNIFICATION

4.17.1 To the fullest extent permitted by law, the Contractor shall indemnify, hold harmless and defend the County, its agents, employees, and Project Manager from and against all claims, damages, losses and expenses arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury,



sickness, disease or death, or to injury to or destruction of tangible property, and (2) is caused by any act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 4.17.

4.17.2 In any and all claims against the County, the Project Manager, or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.17 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

4.17.3 The obligations of the Contractor under this Paragraph 4.17 shall not extend to the liability of the County, Project Manager or Engineer, their agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Project Manager, their agents or employees, provided such giving or failure to give directions is the primary cause of the injury or damage, or (3) any other act within the scope of the County's or its agents' control.

4.18 NONDISCRIMINATION CLAUSE

4.18.1 During the performance of this work, Contractor and its Subcontractors shall not deny benefits to any person on the basis of religion, color, ethnic group identification, sex, age, physical or mental disability, nor shall they unlawfully discriminate, harass or allow harassment, against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age (over 40), marital status, or other protected status, nor deny family care leave and or pregnancy disability leave in connection with any program or activity funded in whole or in part by Federal and/or State funds provided through this work.

4.18.2 Contractor and its Subcontractor shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. Contractor and all Subcontractors shall comply with the provisions of the California Fair Employment and Housing Act (Government Code section 12990 et seq.) and the applicable regulations promulgated thereunder.

4.18.3 The applicable regulation of the Fair Employment and Housing Commission implementing Government Code section 12990, set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulation are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its Subcontractors shall give written notice



of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

4.18.4 Contractor shall comply with all applicable nondiscrimination laws and regulations.

4.18.5 The Contractor and its Subcontractor shall include the nondiscrimination and compliance provisions of this clause in all contractors and subcontracts to perform work under this contract.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITION

5.1.1 A Subcontractor is a person or entity that has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor means a Subcontractor or a Subcontractor's authorized representative. The term Subcontractor does not include any separate contractor or any separate contractor's subcontractors.

5.1.2 A subcontractor is a person or entity that has a direct or indirect contract with a subcontractor to perform any of the work at the site. The term subcontractor means a subcontractor or an authorized representative thereof.

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

5.2.1 The Contractor shall only use subcontractors included in its sealed bid unless a substitution is first approved by the County pursuant to statute.

5.2.2 The Contractor shall not use any subcontractor who is ineligible to perform work on a Public Works Project pursuant to section 1777.1 or 1777.7 of the Labor Code.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By an appropriate agreement, written where legally required for enforceability, the Contractor shall require each Subcontractor, to the extent of the work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the County and the Project Manager. Said agreement shall preserve and protect the rights of the County and the Project Manager under the Contract Documents with respect to the work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with their Sub-subcontractors. The Contractor shall make available to each



proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph 5.3 and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to their Sub-subcontractors. Nothing contained herein shall be deemed to create an agency relationship between the County and any Subcontractor or material supplier.

- 5.3.2 The submission or addition of Subcontractors shall be permitted only as authorized by Public Contracts Code Section 4100, et. seq. The Subcontractors employed by the Contractor shall be appropriately licensed in conformity with the laws of the State of California.
- 5.3.3 Nothing contained in this Contract shall create any contractual relationship between any Subcontractor and the County nor create any contractual relationship between any Subcontractor and the Project Manager or the Project Engineer.
- 5.3.4 Jurisdictional disputes between Subcontractors or between Contractor and Subcontractor shall not be mediated or decided by the County, Architect/Engineer or the Project Manager. The Contractor shall be responsible for the resolution of all such disputes based upon his contractual relationship with his Subcontractors.

ARTICLE 6 **WORK BY COUNTY OR BY SEPARATE CONTRACTORS**

6.1 COUNTY'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

- 6.1.1 The County reserves the right to perform work related to the Project with the County's own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract. If the Contractor claims that delay, damage or additional cost is involved because of such action by the County, the Contractor shall make such claim as provided elsewhere in the Contract Documents.
- 6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.
- 6.1.3 The County shall provide for coordination of the activities of the County's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the County in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the County until subsequently revised.



- 6.1.4 Unless otherwise provided in the Contract Documents, when the County performs construction or operations related to the Project with the County's own forces, the County shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract including, without excluding others, those stated in Article 4, this Article 6 and Articles 10, 11 and 13.

6.2 MUTUAL RESPONSIBILITY

- 6.2.1 The Contractor shall afford the County and separate contractor's reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.
- 6.2.2 When any part of the Contractor's Work depends for proper execution or results upon the work of the County or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Project Manager any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the County's or separate contractor's work as fit and proper to receive the Work, except as to defects that may subsequently become apparent in such work by others.
- 6.2.3 If, following the reporting of any discrepancy or defect as required in subparagraph 6.2.2 above, the Contractor suffers damage due to disruption or delay caused by the separate contractor, Contractor shall be entitled to compensation for any damage, disruption or delay incurred. Contractor shall not be entitled to any compensation if Contractor fails to report as required in subparagraph 6.2.2 or contributes to the damage or delay in anyway.
- 6.2.4 Any costs caused by defective or ill-timed work shall be borne by the contractor causing the defective or ill-timed work through its respective contract with the County.
- 6.2.5 Should the Contractor cause damage to the work or property of the County, or to other work or property on the site, the Contractor shall promptly remedy such damage as provided in Subparagraph 10.2.5.
- 6.2.6 Should the Contractor wrongfully delay or cause damage to the work or property of any separate contractor, the Contractor shall, upon due notice, promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues the County on account of any delay or damage alleged to have been caused by the Contractor, the County shall notify the Contractor who shall defend such proceedings, and if any judgment or award against the County arises, the Contractor shall pay or satisfy it and shall reimburse the County for all costs which the County has incurred.

6.3 COUNTY'S RIGHT TO CLEAN UP

- 6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Paragraph 4.15, the County may clean up and the contractor responsible therefore shall pay County such portions of the cost thereof as the Project Manager shall determine to be just.



ARTICLE 7
MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 The Contract shall be governed by the law of the State of California.

7.2 SUCCESSORS AND ASSIGNS

7.2.1 The County and the Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to the other party and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other

7.3 WRITTEN NOTICE

7.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the person and address shown in Article 7 of the Agreement.

7.4 CLAIMS AND DISPUTES RESOLUTION

7.4.1 A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, arising out of or relating to the Contract or a request for equitable adjustment or Change Order which cannot be resolved per provisions of Article 12. Any Claim shall be reduced to writing and filed with the CPM Division Manager, Solano County (or his/her designee), within twenty calendar days after the Contractor has notice of the condition giving rise to the Claim, and final action per Article 12 procedures has taken place or has been declared as such in writing, by either party. Such twenty-day notice of an asserted claim is in addition to the requirement for prompt notice required per Paragraph 12.3.

7.4.2 The Contractor shall not claim or recover any overhead cost administrative or otherwise, particularly 'Home Office' expenses, 'Extended site overhead', or any other overhead cost on the basis of any 'Home Office' damages formula, 'Eichleay' formula, 'Total Cost' recovery formula or any other such formula.

7.4.3 Contractor shall make any claims in writing within the time set forth above, for any unreasonable delay or hindrance caused by County, and specifying the cause thereof as required in **7.4.4 below**, and nothing herein shall preclude recovery for damages for delay under other provisions of the Contract.

7.4.4 **REQUIREMENTS FOR FILING A CLAIM:** Claims must be filed within the time specified in 7.4.1 above, but in no event later than the date of final payment. Claims shall be submitted to the CPM Division Manager, Solano County (or his/her designee). The claim shall be in writing and shall be sum certain if known. If unknown, Contractor shall specify the basis for establishing the sum certain. Claim shall include a statement of the reasons for the asserted entitlement and include the documents necessary to substantiate



the claim. Such documents may include but are not limited to payroll records, purchase orders, quotations, invoices, estimates, subcontracts, daily logs, supplier contracts, subcontract billings, bid takeoffs, equipment rental invoices, ledgers, journals, daily reports, job diaries, and any documentation related to the requirements of Article 12. In the case of a continuing delay, only one claim is necessary. If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the critical activities on the construction schedule. The Contractor shall certify, at the time of submission of a claim, as follows:

"I certify under penalty of perjury under the laws of the State of California, that the foregoing claim is made in good faith, that the supporting data are accurate, and in my opinion, justify the contract adjustments requested.

By: _____
(Contractor's signature)

Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.

For any claim subject to this Article 7.4, the following requirements apply:

- .1 For claims of less than fifty thousand dollars (\$50,000), the County's CPM Division Manager shall review the facts pertinent to the claim, obtain additional information deemed necessary for a decision (if any), review recommendations of the Project Manager, coordinate with the contract administrator (if any) and secure assistance from legal and other advisors, and render a written decision on the claim within 45 days of receipt of the claim. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the CPM Division Manager and claimant. The CPM Division Manager's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.
- .2 For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the CPM Division Manager shall review the facts pertinent to the claim, obtain additional information deemed necessary for a decision (if any), review recommendations of the Project Manager, coordinate with the contract administrator (if any) and secure assistance from legal and other advisors, and render a written decision on the claim within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the County may have against the claimant. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the County, Project Manager, and the claimant. The CPM Division Manager's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documents, or a period of time no greater than that taken by the claimant in



producing the additional information or requested documentation, whichever is greater.

- .3 If the claimant disputes the written response of the CPM Division Manager, or fails to respond within the time prescribed, the claimant may so notify the County Administrative Officer, in writing, either within 15 days of receipt of the CPM Division Manager's response or within 15 days of the CPM Division Manager's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the CPM Division Manager (or his/her designee) shall schedule a meet and confer conference within 30 days for settlement of the dispute.
- .4 Within 10 business days following the meet and confer conference, County shall provide a written statement identifying the portion of the claim that remains in dispute. Any payment due on the undisputed portion of the claim will be made within 60 days of the meet and confer conference.
- .5 Following the meet and confer conference, if a portion remains in dispute, the disputed portion, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the costs of the nonbinding mediation shared equally by Contractor and County. County and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.
- .6 If the mediation is unsuccessful and the claim or any portion remains in dispute, the claimant may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time the claim is denied, including any period of time utilized by the meet and confer conference.

7.4.5 CLAIMS AND DISPUTES EXEMPT FROM FILING REQUIREMENTS: The procedures and remedies provided in this Article 7.4 do not apply to:

- .1 Any claims by the County;
- .2 Any claim for or respecting personal injury or death or reimbursement or other compensation arising out of or resulting from liability for personal injury or death;
- .3 Any claim or dispute relating to stop payment requests or stop notices; and
- .4 Any claim related to the approval, refusal to approve, or substitution of subcontractors, regardless of tier, and suppliers.



- 7.4.6 PAYMENT OF UNDISPUTED PORTION OF CLAIM: County shall pay claimant such portion of a claim that is undisputed except as otherwise provided in the contract.
- 7.4.7 CONTINUE WORK DURING DISPUTE: In the event of any dispute between the County and the Contractor, the Contractor will not stop work but will prosecute the work diligently to completion in his manner directed by the County, and the dispute shall be resolved by a court of law after completion of the Work. However, Contractor must submit all disputes in accordance with the provisions of Article 7.4.
- 7.4.8 SUIT IN SOLANO COUNTY ONLY: Any litigation arising out of this Contract shall be brought in Solano County and Contractor waives the removal provisions of California Code of Civil Procedure section 394. All parties waive the right to a jury trial.
- 7.5 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND AND WARRANTY BOND
- 7.5.1 The Contractor shall furnish Performance Bond in the amount of 100% of the Contract amount, Payment Bond in the amount of 100% of the Contract amount and One Year Warranty Bond in the Amount of 10% of the final Contract Amount.
- 7.5.2 All bonds required, whether Bid bonds, Performance, Payment, Warranty or other bonds, shall be issued by an admitted surety insurer. **The Bid Bond, Performance Bond, Payment Bond, and Warranty Bond must be issued by the same admitted surety insurer.** The payment, performance and warranty bonds required by these specifications will neither be accepted nor approved by the County unless the bonds are underwritten by an admitted surety and the requirements of California Code of Civil Procedure section 995.630 are met. The County further reserves the right to satisfy itself as to the acceptability of the surety and the form of bond. Upon request of the County, the bidder must submit the following documents:
- .1 The original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws, or other instrument authorizing the person who executed the bond to do so.
 - .2 A certified copy of the certificate of authority of the insurer issued by the California Insurance Commissioner.
 - .3 A certificate from the county clerk that the certificate of authority has not been surrendered, revoked, canceled, annulled, or suspended, or in the event that it has, that renewed authority has been granted.
 - .4 A financial statement of the assets and liabilities of the insurer to the end of the quarter calendar year prior to 30 days next preceding the date of the execution of the bond, in the form of an officers' certificate as defined in Corporations Code § 173.
- 7.6 RIGHTS AND REMEDIES



- 7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available shall be in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.
- 7.6.2 No action or failure to act by the County, the Project Manager, the Architect/Engineer or the Contractor shall constitute a waiver of any right or duty afforded any of them under the contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach, except as may be specifically agreed in writing.

7.7 TESTS AND INSPECTION

- 7.7.1 Any public authority having jurisdiction over the Project or funds used for the Project shall at all times have access for the purpose of observation to all parts of the Work and to all shops wherein the work is in preparation. The Contractor shall cooperate and furnish such facilities and assistance as needed for the County and County's agents.
- 7.7.2 Where the Contract Documents, instructions by the County, laws, ordinances, or any public authority having jurisdiction, requires Work to be inspected, tested or approved before work proceeds, such Work shall not proceed, nor shall it be covered up without inspection.
- 7.7.3 The Contractor shall give notice to the Project Manager and County a minimum of two (2) working days in advance of the readiness for any Contract compliance inspection by the County Inspector of Record or any other inspector required by statute. The Contractor shall give notice as required by all other inspecting and testing agencies of jurisdiction for Code and regular compliance inspection. In all cases, the Contractor shall schedule inspections so as not to delay the Work.
- 7.7.4 If the Project Manager determines that any Work requires special inspection, testing or approval which Subparagraph 7.7.1 does not include, the Project Manager will, upon written authorization from the County, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in Subparagraph 7.7.3. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Project Manager's additional services, testing or inspections made necessary by such failure; otherwise the County shall bear such costs, and an appropriate Change Order shall be issued.
- 7.7.5 Required certificates of inspection, testing or approval shall be secured by the Contractor and the Contractor shall promptly deliver them to the Project Manager.
- 7.7.6 If the Project Manager wishes to observe the inspections, tests or approvals required by the Contract Documents, Project Manager will do so promptly and, where practicable, at the source of supply.

ARTICLE 8 **TIME**

8.1 DEFINITIONS



- 8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial Completion of the Work as defined in Subparagraph 8.1.3, including authorized adjustments to it.
- 8.1.2 The date of commencement of the Work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be such other date as may be established in the Owner-Contractor Agreement or elsewhere in the Contract Documents.
- 8.1.3 The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Project Manager when construction is sufficiently complete, in accordance with the Contract Documents, so that the County or separate contractors can occupy or utilize the Work or a designated portion thereof for the use for which it is intended.
- 8.1.4 The term “day” as used in the Contract Documents shall mean calendar day unless specifically designated otherwise.

8.2 PROGRESS AND COMPLETION

- 8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.
- 8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Subparagraph 8.1.2.
- 8.2.3 The Contractor shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion of the Work within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

The Contractor shall not be granted a Contract Time extension except on the issuance of a Change Order by the CPM Division Manager and County Administrative Officer, or the Board of Supervisors, upon a finding that the delay in completion was unavoidable.

Delays in prosecution of parts or classes of the Work that are not demonstrated to prevent or delay completion of the entire Project or specific milestones within the Contract Time are not "unavoidable delays" for purposes of this section.

In all cases, the time authorized for extension of the Contract Time shall be no greater than the number of days directly attributable to the unavoidable delay which cause delay in the completion of the Project. "Unavoidable delay" for this purpose shall be defined as follows:

- A. Unavailable Materials. That materials or articles called for in the Contract Documents are not obtainable within the time required for timely completion; provided that such materials or articles were listed by the Contractor in the schedule required by Section 4.10.2 and Division 1 - General Requirements Section 01 60 00/ Materials and Equipment hereinabove; that the Contractor demonstrates that the unavailability of the materials is in fact the cause for the delay, and could not have been procured by adjusting the Construction Schedule; and that the unavailability of such materials is due to circumstances beyond the Contractor's control. If good cause for delay is demonstrated pursuant to this subsection, the County, at its sole discretion, may grant a time extension.



- B. Force Majeure. That delays in construction have resulted from circumstances beyond the control of the Contractor and which the Contractor could not have provided against by the exercise of reasonable care, prudence, foresight, and diligence. Unavoidable delays within the meaning of this subparagraph shall be those caused by the acts of God, war, insurrection, civil disorder, fire, floods, epidemic, or strikes.
- C. Unseasonable Weather. An extension of time may be granted due to weather which is unsuitable for the Work currently in progress, upon the findings that the weather conditions in fact caused the delay in completion of the Project and that such weather conditions were not, and could not in the exercise of reasonable diligence, have been foreseen by the Contractor. Seasonable weather that, in the exercise of reasonable foresight and diligence, should be expected in the area at the time of year in question is not cause for an extension of time.
- D. Time Extensions Due to Change Orders or Work Authorizations. A time extension may be granted due to additional work that results in a delay in the Project caused by the approval by the County of a Change Order or Work Authorization. The Contractor shall be entitled to a time extension Change Order only when the extra Work is demonstrated by the Contractor to have impacted the critical path schedule of the Project.
- E. County Caused Delays. In the event that the Project is delayed by acts or omissions of the County or anyone for whom the County is responsible, not authorized by the Contract Documents, which the Contractor demonstrates will or has caused an unavoidable delay, the Contractor shall be entitled to a Contract Time Change Order to offset the extra time incurred by the Contractor. Extra time shall be limited to that which is directly identified as critical by the delay.

8.3.1 NOTICE OF DELAYS

Whenever the Contractor foresees any delay in the prosecution of the Work, and in any event immediately upon the occurrence of any delay which the Contractor regards as grounds for an extension, the Contractor shall notify the Project Manager in writing of the delay. Such notification shall specify with detail the cause asserted by the Contractor to constitute grounds for an extension. Failure of the Contractor to submit such a notice within five (5) working days after the initial occurrence of the event-giving rise to the delay shall constitute a waiver by the Contractor of any request for a time extension, **and no extension shall be granted as a consequence of such delay.**

With its request for time extension, the Contractor shall submit evidence to demonstrate that the delay in prosecution in the Work will result in an unavoidable delay in completion of the entire Project. Such evidence shall include a demonstration that the delayed portion of the Work will affect the Critical Path Scheduling of the entire Project. The Contractor shall also submit a proposed revised Project Schedule, which accounts for the delay in completion of the entire Project caused by the delay in progression of part of the Project, and includes a revised Critical Path demonstrating how the Project will be completed within the proposed revised Contract Time.

8.3.2 INVESTIGATION PROCEDURE

Upon receipt of a request for Contract Time extension, the Project Manager shall conduct an investigation of the facts asserted by the Contractor to constitute grounds for an extension. The results of this investigation shall be reported by the Project Manager to the Contractor and shall



indicate whether he/she will recommend for or against such extension to the County's representative. The performance of this investigation by the Project Manager shall not be construed in any way as direction or recommendation to the Contractor regarding scheduling of the work. Scheduling this work is the sole responsibility of the Contractor.

The Project Manager may, in his/her sole discretion, defer this recommendation to allow the accumulation of time extensions due to Work Authorizations into a periodic or final Change Order request.

Upon receiving the Project Manager's recommendation to the CPM Division Manager regarding the Contractor's request for a time extension, the Contractor may either withdraw its application for extension or request that it be scheduled for action by the Board of Supervisors, or the CPM Division Manager and County Administrative Officer. If the Board of Supervisors or CPM Division Manager and the County Administrative Officer disallow the request, there shall be no allowance made for the time during which the request was pending, and the Contractor shall remain obligated to complete the Work in the time specified.

If the Board of Supervisors or the CPM Division Manager and County Administrative Officer approves the time extension Change Order, the new Progress Schedule submitted by the Contractor and approved by the County shall be deemed to amend the original Progress Schedule approved by the County; thereafter, the amended Progress Schedule shall have the same force and effect as the originally approved Progress Schedule.

The revised progress schedule must be submitted within five (5) working days of when the Board of Supervisors or CPM Division Manager and the County Administrative Officer approves the change.

The Contractor agrees that the determination of the Board of Supervisors or the CPM Division Manager and the County Administrative Officer as to whether grounds for an extension exist, and if so, the duration of the extension shall be final and binding upon both County of Solano and Contractor, subject to other remedies available under the Contract.

8.3.3 DISCRETIONARY TIME EXTENSION FOR BEST INTEREST OF COUNTY

The County reserves the right to extend the Contract Time for completion of the Work if the Board of Supervisors determines that such extension is in the best interest of the County.

In the event that such discretionary extension is made at the request of the Contractor, the County shall have the right to charge to the Contractor all or any part, as the Board may deem proper, of the actual cost to the County for engineering, inspection, supervision, contract administration, incidental and other overhead expenses that accrue during period of such extension, and to deduct all or any portion of such amounts from the final payment for the Work.

In the event such extension is ordered over the objection of the Contractor, the Contractor shall be entitled to a Change Order adjusting the price paid to reflect the actual costs incurred by the Contractor as a direct and proximate result of the delay, upon his written application, accompanied by such verification of costs as the Project Manager requires. Only additional direct costs incurred at the site will be reimbursable by Change Order.

8.3.4 LIQUIDATED DAMAGES



If the Work is not completed by Contractor in the time specified in Article 3 of the Agreement for Construction 005200 or within any period of extension authorized pursuant to this Article, the Contractor acknowledges and admits that the County will suffer damage, and that it is impracticable and infeasible to fix the amount of actual damages. Therefore, it is agreed by and between the Contractor and the County that the Contractor shall pay to the County as fixed and liquidated damages, and not as a penalty, the sum specified in Section 00 73 00 Supplementary Conditions for each calendar day of delay until the Work is completed and accepted, and that both the Contractor and the Contractor's surety shall be liable for the total amount, and that the County may deduct said sums from any monies due or that may become due to the Contractor. Liquidated Damages shall be the County's exclusive remedy for delay in lieu of all other types of damages.

This liquidated damages provision shall apply to all delays of any nature whatsoever, save and except only unavoidable delays approved by the Board of Supervisors or the CPM Division Manager and the County Administrative Officer pursuant to Section 8.3, or discretionary time extensions approved by the Board of Supervisors or the CPM Division Manager and the County Administrative Officer pursuant to Section 8.3.3.

8.3.5 EXTENSION OF TIME NOT A WAIVER

Any extension of the Contract Time granted pursuant to this Article shall not constitute a waiver by the County, nor a release of the Contractor, from his obligations to perform this Contract in the Contract Time.

Granting of a time extension due to one circumstance on one request shall not constitute a granting by the County of an extension of time for any other circumstance or the same circumstance occurring at some other time and shall not be interpreted as a precedent for any other request for extension.

ARTICLE 9 **PAYMENTS AND COMPLETION**

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments to it, is the total amount payable by the County to the Contractor for the performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, and within fifteen working days of the Notice to Proceed, the Contractor shall submit to the Project Manager a Schedule of Values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Project Manager may require. This schedule, unless objected to by the Project Manager, shall be used only as a basis for the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT



- 9.3.1 At least fifteen (15) working days before the date for each progress payment established in the Owner-Contractor Agreement, the Contractor shall submit to the Project Manager an itemized Application for Payment, notarized, supported by such data substantiating the Contractor's right to payment as the County or the Project Manager may require, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. AIA Documents G702, Application and Certificate for Payment and G703/CMA, Continuation Sheet, or other substitute form supplied and required by the County shall be used. Payment is expressly conditioned upon submission by the Contractor of conditional waivers and release of lien rights upon progress payment as the County or the Project Manager may require. Waiver and Release forms must be submitted on forms provided or approved by the County of Solano. Copies of said forms shall comply with Civil Code § 8132 et seq.
- 9.3.2 Unless otherwise provided in the Contract Documents, payments may be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the County, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the County to establish the County's title to such materials or equipment or otherwise protect the County's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site.
- 9.3.3 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the County either by incorporation in the construction or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, stop notices, claims, security interest or encumbrances, hereinafter referred to in this Article 9 as "liens"; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest or an encumbrance is retained by the seller or otherwise imposed by the Contractor or such other person.
- 9.3.4 Progress Payments: The Contractor shall, on or before the first day of each month, make an estimate of the work performed during the preceding month and submit an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the County or the Project Manager may require, including appropriate updates to the CPM Construction Schedule, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. The Contractor will assemble the Application and forward it to the Project Manager within seven days for checking and approval. On or about the 20th day of the month following the month in which the work was performed, the County shall pay to the Contractor ninety-five (95%) percent of the value of said work in place, as checked and approved by the Project Manager. The balance of five (5%) percent of the estimate shall be retained by the County until the time of final acceptance of said work. In lieu of the five (5%) percent retainage, the Contractor may substitute securities as provided in Article 9.3.5 below. The Contractor may apply to reduce said rate of retainage as set forth in Article 5 of the Owner-Contractor Agreement.
- .1 If the County does not pay the Contractor within thirty days after receipt of an undisputed and properly submitted payment request for a progress payment, excluding that portion of the final payment designated by the contract as retention



earnings, then the County shall pay interest to the Contractor as provided by Public Contract Code § 20104.50. Said interest penalty is the sole recourse of Contractor and Contractor shall have no right to stop the Work until payment of the amount owing has been received, nor shall the Contract Time be extended, nor shall the Contract Sum be increased in any way, including by reason of any costs incurred by Contractor, except to the extent of said interest payment.

- .2 Pursuant to Public Contract Code § 7107, in the event of a dispute between the County and Contractor, the County may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. Except as so provided, the County shall release the retention withheld within 35 days after the date of completion of the work of improvement, as "completion" is defined in Public Contract Code § 7107. In the event that retention payments are not made within the time periods required by Public Contract Code § 7107, the County may be subject to the interest provisions of Public Contract Code § 7107.

- 9.3.5 Security Substitutions and Escrow for Moneys Withheld to Insure Contractor's Performance: Pursuant to Public Contract Code section 22300, the Contractor may deposit in an escrow, equivalent securities for any moneys withheld to insure performance and have said moneys paid directly to Contractor, or, in the alternative, have the County deposit such moneys directly into an escrow. Upon the closing of any such escrow, Contractor shall pay to each subcontractor, not later than 20 days after receipt of the closing payment, the respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to insure the performance of the Contractor. Any escrow established pursuant to this article shall be with a state or federally chartered bank, shall be at the sole expense of the Contractor, and shall be established using an escrow agreement in substantially the following form:



**ESCROW AGREEMENT FOR
SECURITY DEPOSITS IN LIEU OF RETENTION**

This Escrow Agreement is made and entered into by and between the County of Solano, (hereinafter called "County"), _____ (hereinafter called "Contractor"); and _____, a state or federally chartered bank in California, (hereinafter called "Escrow Agent").

For the consideration hereinafter set forth, the County, Contractor, and Escrow Agent agree as follows:

1. Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by County pursuant to the Construction Contract entered into between the County and Contractor for _____ in the amount of \$ _____, and dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the contractor, the County shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the County within ten (10) days of the deposit. The market value of the securities at the time of the substitution, as valued by the County, shall be at least equal to the cumulative total cash amount then required to be withheld as retention under the terms of the contract between County and Contractor. If the County determines that the securities are not adequate it will notify Contractor and Escrow Agent, and Contractor shall deposit additional security as further determined by the County. Securities shall be held in the name of the County and shall designate the Contractor as the beneficial owner.
2. Upon the deposit of adequate securities, County shall make progress payments to the Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.
3. When the County, at Contractor's written request, makes payment of retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for the benefit of the contractor until such time as the escrow created under this contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the County pays the Escrow Agent directly.
4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the County. The County, Contractor and Escrow Agent shall determine these expenses and payment terms.
5. The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the County.
6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from County to the Escrow Agent that County consents to the withdrawal of the amount sought to be withdrawn by Contractor.



7. The County shall have the right to draw upon the securities or any amount paid directly to Escrow Agent in the event of default by the Contractor. Upon seven (7) days written notice to the Escrow Agent from the County of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash, including any amounts paid directly to Escrow Agent, as instructed by the County.
8. Upon receipt of written notification from the County certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payment of fees and charges.
9. Escrow Agent shall rely on the written notifications from the County and Contractor pursuant to Sections (5) to (8), inclusive of this Agreement and the County and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.
10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the County and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of County:

Title: CPM Division Manager
Name: Mark A. Hummel
Signature: _____
Address: 675 Texas Street, Suite 2500
Fairfield, CA 94533

On behalf of Contractor:

Title: _____
Name: _____
Signature: _____
Address: _____

On behalf of Escrow Agent:

Title: _____
Name: _____
Signature: _____
Address: _____

At the time the Escrow Account is opened, the County and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

On behalf of County:

Title: CPM Division Manager
Name: Mark A. Hummel
Signature: _____
Address: 675 Texas Street, Suite 2500
Fairfield, CA 94533

On behalf of Contractor:

Title: _____
Name: _____
Signature: _____
Address: _____

On behalf of Escrow Agent:

Title: _____
Name: _____
Signature: _____
Address: _____



9.3.6 Itemized Breakdown: The Contractor shall submit a financial breakdown of the work, itemized by crafts or sections as designated by the Project Manager. The Contractor's payment shall be based upon the monthly percentage of completion of these items.

9.3.7 Lien Waivers: The County or Project Manager will require the Contractor to submit, along with the progress payment request, notarized lien waivers from each subcontractor, materials or equipment supplier. Lien waivers shall comply with Civil Code § 8132 et seq. The aggregate sum of which shall reflect previous progress payments.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Project Manager will, within seven days after the receipt of the Project Application for Payment, review the Project Application for Payment and either issue a Project Certificate for Payment to the County for such amounts as the Project Manager determines are properly due, or notify the Contractor in writing of the reasons for withholding a Certificate as provided in Subparagraph 9.6.1. The application for payment shall be made on AIA Documents G702 and G703 of the latest edition, in triplicate.

9.4.2 The issuance of a Project Certificate for Payment will constitute a representation by the Project Manager to the County that, based on the Project Manager's observations at the site as provided in Subparagraph 2.2.4 and the data comprising the Project Application for Payment, the Work has progressed to the point indicated; that, to the best of the Project Manager's knowledge, information and belief, the quality and timeliness of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion of the Work, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in the Certificate); and that the Contractor is entitled to payment in the amount certified. However, by issuing a Project Certificate for Payment, the Project Manager shall not thereby be deemed to represent that the Project Manager has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, has reviewed the construction means, methods, techniques, sequences or procedures, or has made any examination to ascertain how or for what purpose the Contractor has used the monies previously paid on account of the Contract Sum.

9.5 PROGRESS PAYMENTS

9.5.1 After the Project Manager has issued a Project Certificate for Payment; the County shall make payment in the manner and within the time provided in the Contract Documents.

9.5.2 The Contractor shall promptly pay each Subcontractor upon receipt of payment from the County, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contract on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to their Sub-subcontractors in similar manner.

The Project Manager may on request, at the Project Manager's discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the



amounts applied for by the Contractor and the action taken by the Project Manager on account of Work done by such Subcontractor.

- 9.5.4 Neither the County nor the Project Manager shall have any obligation to pay or to see to the payment of any monies to any Subcontractor or Material Suppliers except as may otherwise be required by law.
- 9.5.5 Neither certification of a progress payment, delivery of a progress payment, nor partial or entire use or occupancy of the Project by the County, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.6 PAYMENTS WITHHELD

- 9.6.1 The Project Manager may decline to certify payment and may withhold the Certificate in whole or in part to the extent necessary to reasonably protect the County, if, in the Project Manager's opinion, the Project Manager is unable to make representations to the County as provided in Subparagraph 9.4.2. If the Project Manager is unable to make representations to the County as provided in Subparagraph 9.4.2, and to certify payment in the amount of the Project Application, the Project Manager will notify the Contractor as provided in Subparagraph 9.4.1. If the Contractor and the Project Manager cannot agree on a revised amount, the Project Manager will promptly issue a Project Certificate for Payment for the amount for which the Project Manager is able to make such representations to the County. The Project Manager may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, the Project Manager may nullify the whole or any part of any Project Certificate for Payment previously issued to such extent as may be necessary, in the Project Manager's opinion, to protect the County from loss because of:
 - .1 defective Work not remedied;
 - .2 third party claims filed or reasonable evidence indicating probable filing of such claims, including claims by separate contractors;
 - .3 failure of the Contractor to make payments properly to Subcontractors, or for labor, materials or equipment;
 - .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
 - .5 damage to the County or another contractor;
 - .6 reasonable evidence that the Work will not be accomplished in compliance with the Contract Time;
 - .7 persistent failures to carry out the Work in accordance with the Contract Documents; or
 - .8 stop notice served upon the County.



- 9.6.2 When the grounds in Subparagraph 9.6.1 above are removed, payment shall be made for amounts withheld because of them.

9.7 SUBSTANTIAL COMPLETION

- 9.7.1 When the Contractor considers that the Work, or a designated portion of work, is substantially complete as defined in Subparagraph 8.1.3, the Contractor shall prepare for the Project Manager a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Project Manager, on the basis of inspection, determines that the Work or designated portion thereof is substantially complete, the Project Manager will then prepare a Certificate of Substantial Completion of the Work, said time to be within the Contract time unless extended pursuant to paragraph 8.3 of the Work, shall state the responsibilities of the County and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. AIA Document G704, Certificate of Substantial Completion, or other substitute form supplied and required by the County shall be used. The Certificate of Substantial Completion of the Work shall be submitted to the County and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.
- 9.7.2 Upon Substantial Completion of the work or designated portion thereof, and upon application by the Contractor and certification by the Project Manager, the County shall make payment, reflecting adjustments in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.
- 9.7.3 When the Project Manager, on the basis of inspections, determines that the Project or designated portion thereof is substantially complete, the Project Manager will then prepare a Certificate of Substantial Completion of the Project which shall establish the Date of Substantial Completion of the Project and fix the time within which the Contractor shall complete any uncompleted items of the Certificate of Substantial Completion of the Work.
- 9.7.4 Warranties required by the Contract Documents shall commence on the date of Beneficial Occupancy by the County if prior to Final Completion, otherwise Warranty commencement date shall be that of the recording of the Notice of Completion on the Project.

9.8 FINAL COMPLETION AND FINAL PAYMENT

- 9.8.1 Following the Project Manager's issuance of the Certificate of Substantial Completion of the Work or designated portion thereof, and the Contractor's completion of the Work, the Contractor shall forward to the Project Manager a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Project Manager a final Application for Payment. Upon receipt, the Project Manager will promptly make such inspection. When the Project Manager finds the Work acceptable under the Contract documents and the Contract fully performed, the Project Manager will issue a Project Certificate for Payment that will approve the final payment due the Contractor. This approval will constitute a representation that, to the best of the Project Manager's knowledge, information and belief, and on the basis of observations and inspections, the Work has been completed in accordance with the Terms and Conditions of the Contract



Documents and that the entire balance found to be due the Contractor, and noted in said Certificate, is due and payable. The Project Manager's approval of said Project Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.8.2 have been fulfilled.

- 9.8.2 Neither the final payment nor the remaining retainage shall become due until the Contractor submits to the Project Manager (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the County or the County's property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment, and (3) other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the County. AIA Documents G706, Contractor's Affidavit of Payment of Debts and Claims, and G706-a, Contractor's Affidavit Release of Liens, shall be used. If any Subcontractor refuses to furnish a release or waiver required by the County, the Contractor may furnish a bond satisfactory to the County to indemnify the County against any such lien. If any such lien remains unsatisfied, or no bond is in place, after all payments are made, the Contractor shall refund to the County all monies that the latter may be compelled to pay in discharging such lien.
- 9.8.3 If, after Substantial Completion of the Work, final completion is materially delayed through no fault of the Contractor or by the issuance of Change Orders affecting final completion, and the Project Manager so confirms, the County shall, upon application by the Contractor and certification by the Project Manager and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Paragraph 7.5, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Project Manager prior to certification of such payment. Such payment shall be made under the Terms and Conditions governing final payments, except that it shall not constitute a waiver of claims. AIA Documents G707, Consent of Surety Company to Final Payment or if appropriate G707-A, Consent of Surety to Reduction in or Partial Release of Retainage, shall be used.
- 9.8.4 The making of final payment shall not constitute a waiver of any claims by the County.
- 9.8.5 The acceptance of final payment shall, after the Date of Substantial Completion of the Project, constitute a waiver of all claims by the Contractor.
- 9.8.6 All provisions of this Agreement, including without limitation those establishing obligations and procedures, shall remain in full force and effect notwithstanding the making or acceptance of final payment.
- 9.8.7 Final payment will be released within 35 days after Notice of Completion is Filed with the County Recorder's Office.



ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

10.2 SAFETY OF PERSONS AND PROPERTY

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

- .1 all employees on the Work and all other persons who may be affected thereby;
- .2 all the work and all materials and equipment to be incorporated therein, whether in storage or off the site, under the care, custody or control of the Contractor or any of the Contractor's Subcontractors or Sub-subcontractors;
- .3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and
- .4 the work of the County or other separate contractors.

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

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and the progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying County's and users of adjacent facilities.

10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise reasonable care and shall carry on such activities under the supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy all damage or loss to any property referred to in Clauses 10.2.1.2. and 10.2.1.3 caused by the Contractor, any Subcontractor, any Sub-subcontractor, anyone directly or indirectly employed by any of them, or any one for whose acts any of them may be liable, and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to the acts or omissions of the County, the Project Manager, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 4.17.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the



Contractor's superintendent unless otherwise designated by the Contractor in writing to the County and the Project Manager.

10.2.7 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

10.3 EMERGENCIES

10.3.1 In any emergency affecting the safety of persons or property the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 12 for Changes in the Work.

ARTICLE 11 **INSURANCE**

11.1 CONTRACTOR'S INSURANCE

Bidders' attention is directed to the insurance requirements below. It is highly recommended that Bidders confer with their respective insurance carriers or brokers to determine in advance of bid submission the availability of the insurance certificates and endorsements required below. A bidder, who is awarded a contract and thereafter fails to comply strictly with the insurance requirements, will be deemed to be in default of its obligations.

Contractor shall procure and maintain, for the duration of the contract, insurance against claims for injuries to persons or damages to property that may arise from or in connection with the performance of the Work by the Contractor, his agents, representatives, employees or subcontractors. The cost of such insurance shall be included in the Contractor's bid.

No later than seven (7) calendar days following the Award of the Contract, and prior to execution of the Agreement for Construction by the County, the Contractor shall submit certificates of insurance, signed by an authorized agent of the insurer, attesting to insurance coverage of the Contractor as required by this Article.

11.1.1 Minimum Scope of Insurance: Coverage shall be at least as broad as:

- .1 Insurance Services Office Commercial General Liability coverage ("occurrence" form CG0001 1188) or Insurance Services Office form number GL 0002 (Ed. 1/73) covering Comprehensive General Liability and Insurance Services Office form number GL 0404 covering Broad Form Comprehensive General Liability.
- .2 Insurance Services Office Business Auto Coverage form number CA 0001 0187 covering Automobile Liability, code 1 "any auto".
- .3 Worker's Compensation insurance as required by the Labor Code of the State of California and Employers Liability insurance.



11.1.2 Minimum Limits of Insurance: Contractor shall maintain limits no less than:

- .1 General Liability: \$5,000,000 per occurrence for bodily injury, personal injury and property damage and \$10,000,000 general aggregate limit.
- .2 Automobile Liability: \$2,000,000 combined single limit per accident for bodily injury and property damage, including all owned, non-owned and hired automobiles, trucks, and trailers with combined single limit of not less than \$2,000,000 for bodily injury, \$2,000,000 for property damage, and with a \$2,000,000 policy limit.
- .3 Workers' Compensation and Employers Liability: Workers' compensation limits as required by Cal. Labor Code and Employers Liability limits of \$2,000,000 per accident.
- .4 Pollution Legal Liability: 1 Million per occurrence and \$2 Million aggregate limit.

If Contractor maintains higher limits than the minimums shown above, County is entitled to coverage for the higher limits maintained by Contractor. Any insurance proceeds in excess of the specified limits and coverage required, which are applicable to a given loss, shall be available to the County. No representation is made that the minimums shown above are sufficient to cover the indemnity or other obligations of the Contractor under this Contract.

11.1.3 Deductibles and Self-Insured Retentions: Any deductibles or self-insured retentions must be declared to and approved by the County. At the option of the County, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the County, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expense.

11.1.4 Other Insurance Provisions: The policies are to contain, or be endorsed to contain, the following provisions:

- .1 General Liability and Automobile Liability Coverage.
 - a. The County of Solano, its officers, officials, employees, agents, including Consulting Project Managers while performing contract administration services, and volunteers are to be covered as insured's as respects: liability arising out of activities performed by or on behalf of the Contractor, including the insured's general supervision of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobile owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the County, its officers, officials, employees or volunteers.
 - b. The Contractor's insurance coverage shall be primary insurance as respects the County, its officers, officials, employees, agents, Consulting Project Managers, and volunteers. Any insurance or self-insurance maintained by



the County, its officers, officials, employees, agents, Consulting Project Managers, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

- c. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the County, its officers, officials, employees, agents, Project Managers, Consulting Project Managers, or volunteers.
- d. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

.2 Worker's Compensation and Employers Liability Coverage.

The insurer shall agree to waive all rights of subrogation against the County, its officers, officials, employees and volunteers for losses arising from work performed by the Contractor for the County.

.3 All Coverage:

- a. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to the County.
- b. Insurance shall contain a provision requiring the insurance carriers to waive their rights of subrogation against County and all additional insured, as well as other insurance carriers for the Work.

.4 Builder's Risk (Course of Construction) Insurance:

Contractor may submit evidence of Builder's Risk insurance in the form of Course of Construction coverage. Such coverage shall name the County as a loss payee as their interest may appear. In the alternative, at the option of the County, an Installation Floater may be acceptable. In such case, a Property Installation Floater shall be obtained that provides for the improvement, remodel, modification, alteration, conversion or adjustment to existing buildings, structures, processes, machinery and equipment. The Property Installation Floater shall provide property damage coverage for any building, structure, machinery or equipment damaged, impaired, broken, or destroyed during the performance of the Work, including during transit, installation, and testing at the County's site."

11.1.5 Acceptability of Insurers: Insurance is to be paid with insurers with a Best's rating of no less than A: VI.

11.1.6 Verification of Coverage: Contractor shall furnish the County with certificates of effecting coverage required by this clause. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates are to be received and approved by the County before work commences. The County reserves the right to require complete, certified copies of all required insurance policies, at any time.



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

Minimum Limits of Insurance: Subcontractors shall maintain limits no less than:

1. General Liability: \$2,000,000
2. Automobile Liability: \$2,000,000
3. Worker's Compensation and Employer's Liability: As required by the State of California Labor Code and Employers Liability

ARTICLE 12

CHANGES IN THE WORK

12.1 CHANGE ORDERS

- 12.1.1 Definition: A Change Order is a written order to the Contractor signed to show the approval of the Project Manager and the authorization of the County, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the contract Sum or the Contract Time. The Contract Sum and the Contract Time shall be changed only by Change Order. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in the Contract Sum or the Contract Time, for full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.

- 12.1.2 The County, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletion or other revisions, the Contract Sum and Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order and shall be performed under the applicable conditions of the Contract Documents.

- 12.1.3 Costs mean an itemized breakdown of all labor (by crafts), materials, sales taxes, equipment rentals, etc., for each portion of the Work which comprises the change order including any subcontractors itemized breakdown, plus not more than 15 percent (refer to specification section 00 26 00 for exact percentage amounts) to cover all profits, overhead and administration. The cost or credit to the County resulting from a change in the Work shall be determined in one or more of the following ways:

- .1 by mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation.
- .2 by unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 by cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 by the method provided in Subparagraph 12.1.4.1 and 12.1.4.2.

- 12.1.4.1 If none of the methods set forth in Clauses 12.1.3.1, 12.1.3.2, or 12.1.3.3 is agreed upon, the Contractor, provided that a written order signed by the County is received, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Project Manager, on the basis of reasonable expenditures or savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such



case, and also under Clause 12.1.3.3 above, the Contractor shall keep and present, in such form as the County or the Project Manager may prescribe, an itemized accounting of actual cost together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: cost of materials, including sales tax and cost of delivery; cost of labor including social security, old age and unemployment insurance and fringe benefits required by agreement or custom; workers' or workmen's compensation insurance; bond premiums; rental value of equipment and machinery; and the additional costs of supervision and field personnel directly attributable to the change. Upon determination of cost by the Project Manager, payments to the Contractor may be made based on the Project Manager's approval of a Project Certificate for Payment. If the Contractor disputes the Project Manager's cost determination, the Contractor may initiate a claim in compliance with the claims and disputes resolution provisions of Paragraph 7.4.

12.1.4.2 The amount or credit to be allowed by the Contractor to the County, as confirmed by the Project Manager, for any deletion or change that results in a decrease in the Contract Sum will be the amount of the actual cost including reasonable overhead. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured in the basis of the new increase, if any, with respect to that change.

12.1.5 Variation in Estimated Quantities: If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated as so changed in a proposed Change Order, that application of the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the County or the Contractor, the applicable unit prices shall be equitably adjusted.

12.2 SITE CONDITIONS

12.2.1 If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and general recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect/Engineer before conditions are disturbed and in no event later than 10 days after first observance of the conditions. The Architect/Engineer will promptly investigate such conditions and, if the Architect/Engineer determines that the conditions differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect/Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect/Engineer shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect/Engineer's determination or recommendation, that party may proceed as provided in Article 7.

12.3 REQUEST FOR EQUITABLE ADJUSTMENT

12.3.1 If the Contractor considers a Request for Equitable Adjustment is justified for an increase in the Contract Time or Contract Sum, the Contractor shall promptly, upon first observance



of the condition giving rise to the request, provide the Project Manager and County written notice of such condition and circumstance. This notice shall be given by the Contractor before proceeding to execute the Work, except in emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 10.3. No such request shall be valid unless so made. Any change in the Contract Time or Contract Sum resulting from such request for equitable adjustment shall be authorized by Change Order.

- 12.3.2 If the Contractor requests that additional cost or time is involved because of, but not limited to, (1) any written interpretation pursuant to Subparagraph 2.2.8, (2) any order by the County to stop the Work pursuant to Paragraph 3.3 where the Contractor was not at fault, or any such order by the Project Manager as the County's agent, (3) any written order for a minor change in the Work issued pursuant to Paragraph 12.4, the Contractor shall make such request for equitable adjustment as provided in Subparagraph 12.3.1.

12.4 MINOR CHANGES IN THE WORK

- 12.4.1 The Project Manager will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be enacted by written order issued through the Project Manager and shall be binding on the County and the Contractor. AIA Document G710, Engineer's Supplemental Instructions, or other substitute form supplied and required by the County shall be used. The Contractor shall carry out such written orders promptly.

ARTICLE 13 **UNCOVERING AND CORRECTION OF WORK**

13.1 UNCOVERING WORK

- 13.1.1 If any portion of the Work should be covered contrary to the request of the Project Manager, County, public authority having jurisdiction, or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Project Manager, be uncovered for their observation and shall be replaced at the contractor's expense.
- 13.1.2 If any other portion of the Work has been covered which the Project Manager, County or public authority having jurisdiction has not specifically requested to observe prior to its being covered, the Project Manager may request to see such Work and it shall be uncovered by the contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charges to the County. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by the County or a separate contractor as provided in Article 6 in which event the County shall be responsible for the payment of such costs.

13.2 CORRECTION OF WORK

- 13.2.1 The Contractor shall promptly correct all Work rejected by the Project Manager as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion of the Work and whether or not fabricated, installed or



completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Project Manager's additional services made necessary thereby.

- 13.2.2 If, within one year after the recordation of the Notice of Completion of the Work or designated portion, or within one year after acceptance by the County of designated equipment, or within such longer period of time as may be prescribed by the terms of any applicable special warranty required by the Contract Documents, any of the Work to be found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the County to do so unless the County had notice of the defect and had previously given the Contractor a written acceptance of such defective condition. This obligation shall survive both final payment for the Work or designated portion thereof and termination of the Contract. The County shall give such notice promptly after discovery of the condition.
- 13.2.3 The Contractor shall, at his sole expense, remove from the site all portions of the Work that are defective or nonconforming and which have not been corrected under Subparagraphs 4.5.1, 13.2.1 and 13.2.2, unless removal is waived by the County.
- 13.2.4 If the Contractor fails to correct defective or nonconforming Work as provided in Subparagraphs 4.5.1, 13.2.1 and 13.2.2, the County may correct it in accordance with Paragraph 3.4.
- 13.2.5 If the Contractor does not proceed with the correction of such defective or nonconforming Work within a reasonable time fixed by written notice from the Project Manager, the County may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten days thereafter, the County may, upon ten additional days' written notice, sell such Work at auction or at private sale and shall account for the proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Project Manager, or other Professional's additional services made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County.
- 13.2.6 The Contractor shall bear the cost of making good all work of the County or separate contractors destroyed or damaged by such correction or removal.
- 13.2.7 Nothing contained in this Paragraph 13.2 shall be construed to establish a period of limitation with respect to any other obligation, which the Contractor might have under the Contract Documents, including Paragraph 4.5 hereof. The establishment of the time periods noted in Subparagraph 13.2.2, or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

13.3 ACCEPTANCE OF DEFECTIVE OR NONCONFORMING WORK



- 13.3.1 If the County prefers to accept defective or nonconforming Work, the County may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be affected whether or not final payment has been made.

ARTICLE 14

TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

- 14.1.1 If the Work is stopped for a period of thirty days under an order of any court or other public authority having jurisdiction, or as a result of an act of government such as a declaration of a national emergency making materials unavailable, through no act or fault of Contractor or a Subcontractor or any agents or employees or any other persons performing any of the Work under a contract with the Contractor, then the Contractor may, upon thirty additional days' written notice to the County and the Project Manager, terminate the Contract and recover from the County payment for all work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit.

14.2 TERMINATION BY THE COUNTY

- 14.2.1 If the Contractor is adjudged bankrupt, or makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of the Contractor's insolvency, or stop notices are served upon the County, or if the Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or fails to make prompt payment to Subcontractors or for materials or labor for which the Contractor has been paid by the County, or persistently disregards laws, ordinances, rules, regulations or orders of having any public authority having jurisdiction, or otherwise is guilty of a substantial violation of a provision of the Contract Documents, and fails after written notice to commence and continue correction of such default, neglect or violation with diligence and promptness, the County upon certification by the Project Manager that sufficient cause exists to justify such action, may, after an additional written notice and without prejudice to any other remedy the County may have, terminate the Contract and take possession of all materials and equipment owned by the Contractor and may finish the Work by whatever methods the County may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished.
- 14.2.2 If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Project Manager's and Engineer's additional services made necessary thereby, Contractor will only be paid for his actual unpaid costs from such excess. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the County. The amount to be paid to the Contractor or to the County, as the case may be, shall be certified by the Project Manager, upon application, in the manner provided in Paragraph 9.4 and this obligation for payment shall survive the termination of the Contract.
- 14.2.3 County may, at any time and for any reason, terminate this Contract in whole or in part for its convenience upon 30 days' written notice to Contractor. Upon such termination,



Contractor shall immediately cease work as directed by County and shall take all reasonable steps to minimize further costs. In the event of termination for convenience, Contractor shall be entitled only to payment for allowable, allocable, and reasonable costs incurred and work satisfactorily performed up to the effective date of termination, consistent with applicable federal, state, and local requirements. Contractor shall not be entitled to anticipated profits, unperformed work, or consequential damages.

ARTICLE 15

ADDITIONAL INSTRUCTIONS

15.1 SUBSTITUTION OF MATERIALS:

15.1.1 When a specific manufacturer, trade name or material is specified, or indicated, it is to establish a standard of quality and shall not be construed as limiting competition. If the Contractor desires to use material other than that specified, he shall request approval of such substitution, in writing, to the Project Manager. Requests for substitutions shall be in the hands of the Project Manager no later than fifteen (15) calendar days after the Notice to Proceed.

15.1.2 Submittals for approval of substitute materials shall contain sufficient information, descriptive brochures, drawings, samples or other data as is necessary to provide direct comparison to the specified materials. Each submittal shall be well marked and identified as to types and kind of the items being submitted for approval and will include the "Substitution Request" form exhibit attached to Section 01 25 13/ Product Substitution completely filled-out in accordance with the pertinent data found in Section 01 25 13. It is the sole responsibility of the Contractor to submit complete descriptive and technical information so the Project Manager can make proper appraisal. Lack of proper information will be sufficient cause for rejection. Reference to catalogs that the Architect/Engineer may or may not have will not be acceptable.

The Engineer's review for approval is for quality of visual appearance. It is the Contractor's responsibility to confirm and correlate all quantities and dimensions and coordinate with all trades whose work may be affected by the requested substitution.

Contractor is responsible for all costs incurred by County's agent(s) to perform any additional research to validate the proposed substitution's suitability for the Project and any additional construction costs and markups due to changes or additional impacts caused by said substitution on other elements or parts of Project.

15.2 REFERENCE TO STANDARDS:

15.2.1 Reference to known standards shall mean and intend the latest edition or amendment published prior to date of these Specifications, unless specifically indicated otherwise, and to such portions of it that relate and apply directly to the material or installation called for on the project.

15.2.2 Where material is specified solely by reference to standard specifications, the Contractor shall, if requested by the Project Manager, submit to the Project Manager for his approval, data on all such material proposed to be incorporated into the Work of the Contractor listing



the name and address of the vendor, the manufacturer or producer, and the trade or brand names of such materials.

15.3 SPECIFICATIONS:

- 15.3.1 The Specifications are organized into Divisions, Sections, and Trade headings based on the Construction Specifications Institute's Master Format – 2004 Edition, 48 - Division format/numbering system. This organization shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed by any trade. The Contractor shall be responsible for examining all sections of the Specifications for interrelated items of the Work, and for furnishing each item identified or specified.
- 15.3.2 No responsibility will be assumed by the County, Architect/Engineer or the Project Manager for omissions or duplications by the Contractor in the completion of the Contract due to any segregation of work and materials operate to make the Project Manager an arbiter in defining the limits to the agreements between the Contractor and his subcontractors or suppliers.
- 15.3.3 The misplacement, addition or omission of any letter, word or punctuation mark shall in no way damage the true spirit, intent or meaning of these Specifications.
- 15.3.4 The words "shown", "indicated", "noted", "scheduled" or words of that effect shall be understood to mean that reference is made to the Drawings accompanying these Specifications.
- 15.3.5 Where reference herein is made to colors or finishes "as selected", the reference is to the Project Manager with concurrence by the County.

15.4 APPROVED APPLICATORS:

- 15.4.1 Where specific instruction in these Specifications requires that a particular product and/or materials be installed and/or applied by an "approved applicator" of the manufacturer, it shall be the Contractor's responsibility to insure that any subcontractors used for such work be approved applicators.

15.5 DELIVERY AND STORAGE OF MATERIALS:

- 15.5.1 Contractor shall deliver all manufactured materials in the original packages, containers or bundles (with the seals intact) bearing the name or identification mark of all manufacturers.
- 15.5.2 Contractor shall deliver fabrications in as large assemblies as practicable and where specified to be shop-primed or shop-finished; they shall be packaged or crated as required to preserve such priming or finish intact and free from abrasion.
- 15.5.3 Contractor shall store all materials in such manner as necessary to properly protect it from damage, as materials or equipment damage by handling, weather, dirt or from any other cause will not be acceptable.



15.5.4 Contractor shall store materials so as to cause no obstructions which includes storing off sidewalks, roadways, and underground services. The Contractor shall be responsible for protecting all material and equipment furnished under the Contract.

15.6 WORKMANSHIP:

15.6.1 Where not more specifically described in any of the various Sections of these Specifications, workmanship shall conform to all of the methods and operations of industry standards and accepted practices of the trade or trades involved, and shall include all items of fabrication, construction, or installation regularly furnished or required for completion (including any finish), and for successful operation as intended.

15.6.2 All work shall be executed by mechanics skilled in their respective lines of work.

15.6.3 When completed, all parts shall have been durably and substantially built and shall present a neat, workmanlike appearance.

15.7 FINAL GUARANTEE:

15.7.1 The Contractor shall be held responsible for, and must make good any defects through faulty, improper, or inferior workmanship or materials, arising or discovered in any part of his work or structure, piping and appurtenances, within one (1) year after the filing of the Notice of Completion. The Warranty Bond, furnished by the Contractor, shall cover such defects and protect the County against them.

15.7.2 Contractor guarantees that all materials and workmanship shall conform to the Contract Documents and agrees to replace, at his sole cost and expense, and in conformity with the Contract Documents, any defective material and any and all work defectively or improperly performed or installed within a period of one (1) year after final acceptance in accordance with paragraph 9.8 of the General Conditions. The Contractor shall, within a reasonable time, but in no case longer than (10) calendar days after receipt of written notice thereof, commence to repair and/or replace any defect in materials or workmanship which may develop during said one-year period, and any damage to adjacent materials resulting from the repairing or replacing of such defects, at its own expense and without cost to County. In the event Contractor fails to remedy any such defect within a reasonable time, which shall not in any case be longer than thirty (30) days after receipt of such written notice (unless Contractor has commenced the repair and is diligently pursuing the repair to completion), County may proceed to have such defects remedied at Contractor's expense and Contractor shall pay the costs and charges incurred thereby. Neither acceptance nor payment nor any provision in these documents shall be deemed to be a waiver by County to relieve Contractor of any responsibility under this Contract.

15.8 HOURS OF WORK:

15.8.1 Eight (8) hours of labor shall constitute a legal day's work upon all work done hereunder, and it is expressly stipulated that no worker employed at any time by the Contractor, or by a subcontractor under this Contract, upon the work, shall be required or permitted to work thereon more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week, except as provided in Section 1810-1815 inclusive, of the Labor Code of the State of California, all the provisions whereof are deemed to be incorporated



herein as if fully set out; and it is further expressly stipulated that for each and every violation of said last named stipulation, said contractor shall forfeit, as a penalty to the County, twenty-five dollars (\$25.00) for each worker employed by the Contractor in the execution of this Contract, for each calendar day during which said worker is required or permitted to labor more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week in violation of the provisions of said section of the Labor Code.

15.8.2 The Contractor and each subcontractor shall also keep or cause to be kept, an accurate record showing the names and actual hours worked each calendar day and each calendar week by each worker employed by him in connection with the work contemplated by this Agreement, which record shall be open at all reasonable hours to the inspection of the County or its officer or agents, and to the Division of Labor Law Enforcement of the Department of Industrial Relations, its deputies and agents.

15.8.3 Notwithstanding the above stipulations, pursuant to Section 1815 of the Labor Code, work performed by employees of contractors in excess of eight (8) hours per day and forty (40) hours during any one week shall be permitted upon the project upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1 1/2) times the basic rate of pay.

15.9 WAGE RATES:

15.9.1 Pursuant to Section 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages and rates for legal holidays and overtime in the locality in which this work is to be performed, for each craft or type of worker or mechanic needed to execute this contract. Said wage rates pursuant to Section 1773.2.

15.9.2 It shall be mandatory upon the Contractor, and upon any subcontractor under him to pay not less than the said specified rates to all laborers, worker, and mechanics employed by them in the execution of the Contract, and to pay all laborers, workers and mechanics not less often than once weekly. Contractor shall post a copy of the determination of prevailing wages at the job site. The Contractor shall require all subcontractors to comply with Sections 1770-1780 of the Labor Code of the State of California and shall insert into every subcontract the requirements contained therein.

15.9.3 It is hereby further agreed that the Contractor shall forfeit to the County, as a penalty, twenty-five dollars (\$25.00) for each laborer, worker, or mechanic employed for each calendar day or portion thereof, who is paid less than the said stipulated rates for any work done under the Contract, by him or by any subcontractor under him. The difference between said stipulated rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than said stipulated rate shall be paid to each worker by the Contractor. The Contractor, and each subcontractor, shall keep or cause to be kept an accurate record showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed by him or her in connection with the public work. The records shall be open at all reasonable hours to the inspection of the County, to its officers and agents, and to the



Division of Labor Law Enforcement of the State Department of Industrial Relations, its deputies and agents.

- 15.9.4 In case it becomes necessary for the Contractor or any subcontractor to employ on the work under this Contract any person in a trade or occupation (except executive, supervisory, administrative, clerical or other non-manual workers as such) for which no minimum wage rate is specified, the Contractor shall immediately notify the County who will promptly thereafter determine the prevailing rate for such additional trade or occupation from the time of the initial employment of the person affected and during the continuance of such employment.

15.10 APPLICATION OF HIGHEST STANDARDS AND REQUIREMENTS:

- 15.10.1 Whenever two or more standards or requirements appear in these General Conditions or in any other part of the Contract Documents that form the Contract, the highest standard or requirement shall be applied and followed in the performance under this Contract.

15.11 NONDISCRIMINATION IN EMPLOYMENT:

- 15.11.1 Federal and State Laws prohibit discrimination in employment. The California Fair Employment Practices Act prohibits discrimination in employment on the basis of race, religion, color, sex, physical handicap, medical condition, marital status, age, national origin or ancestry, and applies to all employers, employment agencies and labor organizations.

- 15.11.2 Title VII of the Federal 1964 Civil Rights Act (42 U.S.C. Section 2000e - 2000e - 17) prohibits employment discrimination on the basis of race, color, sex, religion, or national origin, and applies to all employers that employ at least 15 workers during each working day in each of 20 or more calendars weeks in the current or preceding year.

- 15.11.3 In addition to these two laws of general application, there are other Federal and State laws that prohibit employment discrimination in particular cases.

- 15.11.4 The County of Solano is an Affirmative Action Employer and expects all of its contractors and suppliers to familiarize themselves with, and comply with, all applicable laws relating to employment discrimination.

- 15.11.5 To the extent required by law, the Contractor shall meet all requirements of law relating to the participation of minority, women, and disabled veteran business enterprise contracting goals, and shall comply with Public Contract Code § 10115 et seq. and all applicable regulations. Contractor further agrees that, when required, Contractor will ensure compliance by all subcontractors and will complete all forms required by all agencies exercising jurisdiction over the project.

15.12 APPRENTICES

- 15.12.1 Pursuant to Sections 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in the locality for each craft or type of worker needed to execute the work. Said wage rates pursuant to Section 1773.2 of the Labor Code.



15.12.2 Pursuant to Section 1775 of the Labor Code of the State of California, nothing in this chapter shall prevent the employment of properly registered apprentices upon public works.

15.12.3 Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he is employed and shall be employed only at the work of the craft or trade to which he/she is registered.

15.12.4 Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at Section 3070), Division 3, of the Labor Code, are eligible to be employed on public works. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

15.13 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

15.13.1 Every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted, and this contract shall be read and enforced as though it were included, and if through mistake or otherwise any provision is not inserted or is not correctly inserted, upon application of either party the contract shall be amended to make the insertion or correction.

15.14 DRUG FREE WORKPLACE CERTIFICATION

15.14.1 The Contractor shall comply with Government Code Section 8355 in matters relating to providing a drug-free workplace.

15.14.2 The Contractor shall publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of controlled substance is prohibited and specifying actions to be taken against employees for violations, as required by Government Code section 8355(a).

15.14.3 The Contractor shall establish a Drug-Free Awareness Program as required by Government Code section 8355(b), to inform employees about all of the following:

- a. The dangers of drug abuse in the workplace,
- b. The person's organization's policy in maintaining a drug-free workplace,
- c. Any available counseling, rehabilitation and employee assistance programs,
- d. Penalties that may be imposed upon employees for drug abuse violations.

15.14.4 Provide as required by Government Code 8355(a)(3), that everyone who works on the proposed contract:

- a. Will receive a copy of the company's drug-free policy statement, and



- b. Will agree to abide by the terms of the company's statement as a condition of employment on the contract.

END OF SECTION 00 72 00



SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

PART 1 – GENERAL

1.1 INSTRUCTIONS

- A. Requirements included herein supplement Document 00 72 00 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION.
- B. If any provision of this Section should conflict with any other provision of the Contract Documents, this section shall control.

1.2 ARTICLE 2 – ADMINISTRATION OF THE CONTRACT

PARAGRAPH - 2.2 THE PROJECT MANAGER

Add the following description to this paragraph to define the role of the Construction Manager and the interchangeable function and role with the Project Manager:

The term ‘Project Manager’ and ‘Construction Manager’ where used will mean the County’s Capital Project’s Management staff and Gilbane Project Management staff who coordinates and receives all communications from Contractors and assists in the administration of the Contract.

1.3 ARTICLE 8 – TIME

PARAGRAPH 8.1 – DEFINITIONS

Add the following to Subparagraph 8.1:

- 8.1.5 CONTRACT TIME: The Contractor shall substantially complete the Work of the Contract within 278 CALENDAR DAYS from the NOTICE TO PROCEED.
- 8.1.6 Contractor shall achieve Final Completion of the project within thirty (30) calendar days of project Substantial Completion.

1.4 ARTICLE 8 – TIME

PARAGRAPH 8.3.4 – LIQUIDATED DAMAGES

REVISE the following Clauses to Subparagraph 8.3.4:

- 8.3.4.1 The Contractor shall pay the County the sum of \$2,000 per calendar day for every calendar day delay in meeting the Final Completion and finishing the work under this Contract beyond the stipulated contract time.

1.5 ARTICLE 8 – TIME

PARAGRAPH 8.3 – DELAYS AND EXTENSIONS OF TIME



Add the following Clauses to Subparagraph 8.3, C – Unseasonable Weather:

8.3, C .1 Unseasonable Weather:

If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction.

8.3, C.2 A rain, windstorm, high water or other natural phenomenon of the specific locality of the work, which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as abnormal. It is hereby agreed that rainfall greater than the following cannot be reasonably anticipated.

1. Daily rainfall equal to, or greater than, 1/4 of an inch, only when the number of such days in any given month exceeds the number of calendar days the parties agree is normal for the area as listed below:

MONTH	Number of Calendar days (*)
January	5 days
February	6 days
March	8 days
April	1 day
May	4 day
June	2 days
July	0 days
August	0 days
September	0 days
October	3 days
November	4 days
December	8 days

* Information gathered from National Weather Service National Oceanic and Atmospheric Administration website from Travis Air Force Base, Fairfield, California.

2. Rainfall data shall be assumed to be the same as that measured at Travis Air Force Base. In the event the number of days lost to rain during any given month exceeds those anticipated above, it is agreed that the Contractor will only consider such days as a basis for a Claim for Additional Time if the Contractor can demonstrate that the rain impacted the Critical Path of the Approved project schedule. Delay claims due to rainfall of one quarter inch or more overnight will be reviewed on a case by case basis for comparison with the nature of work scheduled for the following day.
3. Unused anticipated rain-days shall be realized as Float to the Project and managed per specification Section 01 32 16 Construction Progress Schedules and Reports. If there are unused anticipated rain-days realized as Float, this would not reduce or modify the Substantial



Completion date.

4. Weather Allowance: The Preliminary Construction Schedule and the Master Construction Schedule will include in the overall contract duration an allowance for normal adverse weather. For this project, an allotment of thirteen (13) weather days for each winter weather period is to be indicated on the critical path as a single, separate activity. The winter weather period is defined as October 1st through March 31st, inclusive. County approved weather delays will be applied against the allotment. Once the allotment is exhausted the Contractor will be granted non-compensable time extensions for County approved weather delays.

1.6 ARTICLE 4.2 – REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS

Add the following Clauses to Article 4.2:

- 4.2.6 The County shall not be responsible for the repair or replacement of existing known or reasonably discoverable utilities.

1.7 ARTICLE 4 – CONTRACTOR

Add the following Subparagraph, 4.19 MAINTAINING EXISTING UTILITIES to Article 4:

- 4.19.1 If the Contractor needs to interrupt power, telephone/data, sewer, gas or other required utilities (for any reason) to the existing facilities. The Contractor must provide, at Contractor's expense, a means to provide temporary power, telephone/data, sewer, gas or other required utilities to the existing facility. The Contractor must notify the Project Manager (in writing) at least ten (10) working days before the utility interruption. Notification must include (by both diagram and written form) the plan for providing uninterrupted temporary power and the duration.

1.8 USE OF SITE

Contractor shall have use of a staging area at the Site to be designated when work is initiated. Contractor shall not interfere or encroach on adjacent County activities as well as its emergency exit-ways while work is ongoing. Contractor shall take all precautions necessary to preserve and maintain health and safety and to keep pedestrian and vehicular passageways clear at all times.

1.9 USE OF UTILITIES

The Contractor, at County's expense, may utilize the building's utility service (power, gas, water) for the performance of the Work. The Contractor will not abuse this privilege and will exercise appropriate conservation measures. Damaged receptacles, fixtures, equipment, etc. from use of existing utility service will be replaced or repaired at the expense of the Contractor. Power consumption shall not disrupt the County staff's need for continuous service. Ensure use of existing outlets does not interfere with use and function of the County services (telephone, data, computer, power, etc.).



1.10 TEMPORARY FENCING AND SITE SECURITY

The Contractor is responsible for providing temporary fencing around the perimeter of the staging area. The Contractor must maintain continuity of fencing at all times. Project Manager must review layout of fencing prior to installation. The Contractor is responsible for the security of all items within the temporary fencing perimeter.

1.11 OES/FEMA REQUIREMENTS

A. Compliance with Davis-Bacon Act

1. All transactions regarding this contract shall be done in compliance with the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable. The contractor shall comply with 40 U.S.C. 3141-3144, and 3146-3148 and the requirements of 29 C.F.R. pt. 5 as applicable.
2. Contractors are required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor.
3. Additionally, contractors are required to pay wages not less than once a week.

B. Compliance with Copeland Anti-Kickback Act

1. Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.
2. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as FEMA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
3. Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

C. Compliance with Contract Work Hours and Safety Standards Act under 40 U.S.C. 3701 et seq. and Department of Labor Regulations, 29 CFR, part 5.

1. *Overtime requirements.* No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.



2. *Violation; liability for unpaid wages; liquidated damages.* In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.
3. *Withholding for unpaid wages and liquidated damages.* The County shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
4. *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

D. Compliance with the Clean Air Act and the Federal Water Pollution Control Act

1. Clean Air Act
 - a. The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.
 - b. The contractor agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
 - c. The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FEMA.
2. Federal Water Pollution Control Act



- a. The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.
- b. The contractor agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- c. The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FEMA.

E. Debarment and Suspension

1. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).
2. The contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.
3. This certification is a material representation of fact relied upon by County. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to County, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.
4. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

F. Byrd Anti-Lobbying Disclosure Certification

Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.



G. Equal Employment Opportunity

During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
5. **Any and all references to Executive Order 11246 of September 24, 1965 are valid to the extent not revoked by Executive Order 14173 of January 21, 2025, as determined by a competent court of law.**
6. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.



7. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
8. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
9. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (9) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the



Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

H. Procurement of Recovered Materials

1. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired—
 - a. Competitively within a timeframe providing for compliance with the contract performance schedule;
 - b. Meeting contract performance requirements; or
 - c. At a reasonable price.
2. Information about this requirement, along with the list of EPA- designated items, is available at EPA’s Comprehensive Procurement Guidelines web site, <https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program>.
3. The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the “Solid Waste Disposal Act.”

I. Access to Records

1. The Contractor agrees to provide County, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.
2. The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.
3. The Contractor agrees to provide the FEMA Administrator or his authorized representatives access to construction or other work sites pertaining to the work being completed under the contract.
4. In compliance with the Disaster Recovery Act of 2018, the County and the Contractor acknowledge and agree that no language in this contract is intended to prohibit audits or internal reviews by the FEMA Administrator or the Comptroller General of the United States.



J. DHS Seal, Logo and Flags

The contractor shall not use the DHS seal(s), logos, crests or reproductions of flags or likenesses of DHS agency officials without specific FEMA pre-approval.

K. Compliance with Federal Law, Regulations and Executive Orders

This is an acknowledgement that FEMA financial assistance will be used to fund all or a portion of the contract. The contractor will comply with all applicable Federal law, regulations, executive orders, FEMA policies, procedures, and directives.

L. No Obligation by Federal Government

The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor or any other party pertaining to any matter resulting from the contract.

M. Program Fraud and False or Fraudulent Statements or Related Acts

The Contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the Contractor's actions pertaining to this contract.

1.12 CEQA REQUIREMENTS

A. Air Quality. During construction activities, the project applicant and construction contractor shall implement the following:

1. Exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered with non-potable water two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All roadways, driveways, and sidewalks shall be paved as soon as possible.
5. Idling times shall be minimized either by shutting equipment off when not in use or by reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure [ATCM] Title 13, Section 2485 of the California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
6. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.



7. A publicly visible sign shall be posted with the telephone number and person to contact at the City regarding dust complaints. This person shall respond and take corrective action within 48 hours of a complaint or issue notification. The Bay Area Air Quality Management District (BAAQMD) phone number shall also be visible to ensure compliance with applicable regulations.
- B. **Wildlife Exclusion Fencing.** Wildlife Exclusion Fencing (WEF) shall be constructed between all construction activities and the unnamed drainage to prevent wildlife (including dispersing western pond turtle) from entering the work area. A qualified Biologist shall be on-site to monitor the installation of WEF. WEF shall be in place and regularly maintained during project implementation. Fencing shall be removed within 72 hours of completion of work, and temporarily impacted areas shall be restored to pre-project conditions.
- C. **No work within Channel Banks or Bed.** No work (including vegetation removal) shall take place within this area. Contractor shall plan and perform the work in this Contract so that the channel banks and bed are not disturbed in any way.
- D. **Erosion Control.** At no time shall silt-laden runoff be allowed to enter the channel. Erosion control measures shall be utilized throughout all phases of operation where sediment runoff from the project may enter the channel. Best Management Practices (BMPs) to avoid erosion, uncontrolled stormwater runoff and bank deterioration shall be implemented, following the requirements of the project's stormwater control plan, and typically include silt fencing, coir rolls, and/or straw bale dikes.
- E. **Prevention of Toxic Substances/Pollution.** No substances toxic to fish and wildlife shall be discharged or allowed to leach into the channel. Reasonable precautions to protect aquatic habitats of the channel from pollution with harmful materials (e.g., fuels, oils, lubricants, and solvents) shall be implemented. Specifically, all potentially hazardous materials shall be controlled, cleaned up, and properly disposed of in accordance with the project's water quality control permits and plans. Materials deleterious or toxic to fish and wildlife including, but not limited to, asphalt, tires, concrete, construction materials, treated wood, and creosote containing materials shall not be stockpiled within 150 feet of the channel. Refueling and maintenance areas for equipment shall be limited to areas 150 feet from the channel.
- F. **Inadvertent Discovery of Cultural Resources.** In the event that significant archaeological resources are discovered during construction activities, operations shall stop within a 100-foot radius of the find and an Archaeologist who meets the Secretary of Interior's Professional Qualification Standards for archaeology shall be consulted to evaluate the potential resource, and determine whether it requires further study. The lead agency shall require the standard inadvertent discovery clause to be included on the grading plans to inform contractors of this requirement. Potentially significant archaeological resources consist of but are not limited to stone, bone, fossils, wood, or shell artifacts or features, including hearths, structural remains, or historic dumpsites. The qualified Archaeologist shall make recommendations to the lead agency concerning appropriate measures that shall be implemented to protect the discovered resources, including but not limited to excavation and evaluation of the finds in accordance with CEQA Guidelines, Section 15064.5. Any previously undiscovered resources found during construction within the project area should be recorded on appropriate Department of Parks and Recreation (DPR) forms and evaluated for significance in terms of CEQA Guidelines.



- G. Accidental Discovery of Human Remains. In the event of the accidental discovery or recognition of any human remains, CEQA Guidelines Section 15064.5; Health and Safety Code Section 7050.5; Public Resources Code Section 5097.94 and Section 5097.98 must be followed. During the course of project development, if there is accidental discovery or recognition of any human remains, the following steps shall be taken:
1. There shall be no further excavation or disturbance within 100 feet of the remains until the County Coroner is contacted to determine whether the remains are Native American and if an investigation of the cause of death is required. If the coroner determines the remains to be Native American, the coroner shall contact the Native American Heritage Commission (NAHC) within 24 hours, and the NAHC shall identify the person or persons it believes to be the Most Likely Descendant (MLD) of the deceased Native American. The MLD may make recommendations to the landowner or the person responsible for the excavation work within 48 hours, for appropriate treatment and disposition of, with appropriate dignity, the human remains, and any associated grave goods as provided in Public Resources Code Section 5097.98.
 2. Where the following conditions occur, the landowner or his or her authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity either in accordance with the recommendations of the MLD or on the project site in a location not subject to further subsurface disturbance:
 - a. The NAHC is unable to identify a MLD or the MLD failed to make a recommendation within 48 hours after being notified by the commission.
 - b. The descendant identified fails to make a recommendation.
 - c. The landowner or his authorized representative rejects the recommendation of the descendant, and mediation by the NAHC fails to provide measures acceptable to the landowner.
- H. Site Preparation.
1. After site preparation and before placement of compacted fills, the excavation bottom shall be observed and approved by the geotechnical engineer or their representative. After approval, the subgrade shall be scarified to a minimum depth of 8 inches, moisture conditioned to at least 3 percent of optimum moisture content, and compacted to between 88 and 92 percent of the maximum dry unit weight as measured by American Society of Testing and Materials (ASTM) D1557. Prepared soil subgrades shall be non-yielding when proof-rolled by a fully-loaded water truck or equipment of similar weight. Moisture conditioning of subgrade soils shall consist of adding water if the soils are too dry and allowing the soils to dry if the soils are too wet. If unstable, wet, or soft soil is encountered, the soil shall require processing before compaction can be achieved. When the construction schedule does not allow for air-drying, other means such as lime or cement treatment, over-excavation, and replacement, geotextile fabrics, etc. shall be employed to help



stabilize the subgrade. The method to be used shall be determined at the time of construction based on the actual site conditions.

2. If paragraph H.1 conflicts with the geotechnical report, the Drawings, or any Specification within Divisions 02 through 35, Contractor shall promptly issue a Request for Information to Project Manager, Project Engineer, and Geotechnical Engineer for guidance on how to proceed.

I. Engineered Fill Placement and Compaction.

1. All import fills shall be approved by the project geotechnical engineer, before delivery to the site, by providing representative samples of proposed import fills to the engineer for evaluation.
2. Engineered fill shall be placed in horizontal lifts each not exceeding 8 inches in thickness and mechanically compacted to appropriate moisture content. Relative compaction or compaction is defined as the in-place dry density of the compacted soil divided by the laboratory maximum dry density as determined by American Society of Testing and Materials (ASTM) Test Method D1557, latest edition, expressed as a percentage. Moisture conditioning of soils shall consist of adding water to the soils if they are too dry and allowing the soils to dry if they are too wet. Engineered fills consisting of on-site soils and imported soils shall be compacted to a minimum of 90 percent relative compaction with moisture content at least 2 percent above the laboratory optimum value. In pavement areas, the upper 12 inches of subgrade soil and the full section of aggregate base shall be compacted to a minimum of 95 percent relative compaction with moisture content slightly above the optimum value. Aggregate base in vehicle pavement areas shall be compacted at slightly above the optimum moisture content to a minimum of 95 percent relative compaction.
3. If paragraph I.1 and/or I.2 conflicts with the geotechnical report, the Drawings, or any Specification within Divisions 02 through 35, Contractor shall promptly issue a Request for Information to Project Manager, Project Engineer, and Geotechnical Engineer for guidance on how to proceed.

J. Pleistocene Layer. In the event that the Pleistocene layer is impacted, and significant paleontological resources are unearthed, construction activities shall be diverted at minimum of 15 feet away from the discovery until a professional Paleontologist has assessed the find for possible salvage. Recovered fossils shall be deposited in an appropriate repository, such as the University of California Museum of Paleontology (UCMP), as determined by a professional Paleontologist, for their curation and availability for future research.

K. Construction Noise Control. Implementation of the following multi-part mitigation measure is required to ensure reduction of potential construction noise impacts:

1. The Contractor shall limit construction activities on the project site to the hours of 7:00 a.m. to 10:00 p.m except with written permission of the Director of Public Works.



2. The Contractor shall ensure that all equipment driven by internal combustion engines shall be equipped with mufflers that are in good condition and appropriate for the equipment.
3. The Contractor shall ensure that unnecessary idling of internal combustion engines (i.e., idling in excess of 5 minutes) is prohibited.
4. The Contractor shall utilize “quiet” models of air compressors and other stationary noise sources where technology exists.
5. At all times during project grading and construction, the Contractor shall ensure that stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from adjacent residences.
6. The Contractor shall ensure that the construction staging areas shall be located to create the greatest feasible distance between the staging area and noise-sensitive receptors nearest the project site.
7. The Contractor shall control noise from construction workers’ radios to a point where they are not audible at existing residences in the project vicinity.

1.13 ADVANCED PLANNING AND SCHEDULING PROCEDURES

- A. Contractor will be required to actively participate with County, County’s Construction Manager, and other contractors in the collaborative development of a milestone schedule, phase/progression schedules, "make-ready" look ahead plans, weekly work plans, and methods for recording, measuring, and improving the reliability of the project planning.
- B. Within 10 calendar days of the Notice to Proceed, Contractor shall provide to County and County’s Construction Manager an Initial Project Schedule in Primavera P6 version 15 or higher in both PDF and native XER format.
- C. Contractor shall proactively consult and cooperate with all project team members to effectuate the timely completion of all project construction tasks carried out by the trade contractor and other members of the project team in accordance with the Contract Time and the Contract Price.
- D. Contractor shall identify and communicate issues in a timely manner in advance of planned work activities/sequences and meet with the County, County’s Construction Manager, designers, engineers, and other contractors to identify solutions to the issues and/or minimize impacts to the flow of work.
- E. Contractor shall be prepared to provide the latest information about the status of ongoing activities, near-term planned activities, long lead time activities, submittals and shop drawings, material and equipment deliveries, RFIs, change orders, safety training, labor, construction equipment availability, and contract issues to allow for proper incorporation of all necessary information into the project planning and production management system.
- F. Contractor must clearly and unambiguously express their planning needs to other project



team members and must provide reliable promises to other team members regarding their own performance. If Contractor discovers it will not achieve a commitment, it must immediately inform the project team of when it can perform and any impediments to its performance, as well as provide and execute a recovery schedule in accordance with the Contract Documents.

- G. Contractor shall report task start and completions as they occur to the County's Construction Manager daily or as agreed upon. Contractor shall provide actual resources working and quantities complete to the County's Construction Manager daily.
- H. Contractor shall participate and utilize any software solutions determined to benefit the project.
- I. Phase Scheduling. All Contractors shall attend continuous pull planning sessions for a collaborative approach to specify handoffs, project sequence, commitments, coordination, and workflow. These sessions will detail the milestone schedule.
- J. Look-ahead Planning / 6 Week Make Ready Schedules. At weekly Contractor meetings, Contractors shall identify constraints, confirm procurement, and continuity of commitments.
- K. Weekly Work Planning. Contractors shall submit their two-week look-ahead schedule to coordinate their work plan at the Trade Contractor meeting with the County's Construction Manager and other contractors. At the weekly trade meeting, the handoffs and sequence agreed upon at the pull plan sessions will be detailed into daily commitments.
- L. At the weekly Trade Contractor meeting, the planned percent complete (PPC) will be measured against the weekly work plan.
- M. Daily Planning & Commitment. Daily huddles are required for ALL foremen on the job site. These huddles will confirm that the daily tasks were completed (PPC/root cause). An alternate plan for the next day will be discussed if they are not completed.

END OF SECTION 00 73 00



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SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work required to be performed by the Contractor:

Asset Protection Project – General Site Labor at
550/600 Union Ave, Fairfield, Solano County, California.

In conformity with the Drawings and Specifications, the Agreement Between Owner and Contractor, including the General and Supplementary Conditions and other Division 1 Specification Sections, hereinafter identified as applied to this Project; including furnishing all material, labor, tools, equipment and services necessary therefore and incidental thereto, complete and available for intended use.

1.02 PROJECT DESCRIPTION and ADDITIONAL REQUIREMENT

- A. Project Description: The Project includes protection of properties at 500, 530, 550 and 600 Union Avenue, 500, 510, 512, 520, and 530 Clay Street, 501 and 509 Delaware Street, 501 Texas Street, and adjacent driveways and parking areas from stormwater damage. Included in this project are barrier walls, berms, landscaping, hardscape, flood gates, underground utility reconfiguration and pump systems, among other protection measures, to protect the County assets from seasonal flooding that occurs regularly.

- B. The Asset Protection Project documents include all work necessary for the overall project which is being procured by the County under a multi-prime manner of procurement. This bid only includes the following scope of work:

1. General Site Labor

- C. The scope of work of this General Site Labor bid package is further described as follows:

1. Provide on-site labor, to be directed by the Construction Manager (Gilbane):
 - a. (1) Carpenter Journeyman full-time, 40 hours per week, for 8 months of the Asset Protection project, August 2026 through March 2027.
 - b. (1) Laborer Journeyman for 200 hours total to assist with dewatering, temporary fencing, and temporary signage.
2. Furnish all labor and materials as required to provide the following services or assistance with the following services as they apply to necessities onsite including but not limited to:
 - a. Temporary fence maintenance and relocation.
 - b. Trash/dumpster disposal.



- c. Temporary walls, barriers, and structures. Assume \$30,000 for lumber and consumables. All other materials and equipment will be provided.
- d. SWPPP BMP maintenance
- e. Dewatering
- f. Jobsite office cleaning and temporary furniture relocation
- g. Safety inspection assistance
- h. Minor and occasional equipment operation
- i. Construction equipment refueling
- j. Temporary signage installation
- k. Restocking of temporary facilities
- l. Temporary fuel and power systems adjustments and/or fueling
- m. Jobsite photograph assistance
- n. Jobsite security maintenance

D. This bid package includes the following general inclusions:

- 1. Division 00 and 01 Specifications shall be the scope of this and all contractors.
- 2. Compliance with OSHA and Cal/OSHA as required.
- 3. All project documentation included but not limited to RFIs, submittals, Daily Reports, Record Drawings, and Specifications shall be managed and processed through Procore.
- 4. All daily reports shall be submitted to Solano County in Procore by no later than 12:00PM the following workday after the aforementioned work has been performed.
- 5. Contractor shall comply with all FEMA and CEQA requirements as they apply for their scopes of work.
- 6. Contractor will attend all coordination, safety, preinstallation, and foreman's meetings to coordinate all work with other trades in advance of installation.
- 7. Any and all overtime hours required to meet the project schedule.
- 8. Include all equipment as required to complete this scope of work, including but not limited to;



- a. Equipment required to receive and offload deliveries.
 - b. Temporary and/or task lighting.
 - c. Temporary power.
 - d. Construction water.
9. All excavations, trenches, incomplete construction etc. shall be delineated, protected, barricaded, or fenced off to prevent pedestrian or public access into the construction space.
 10. All permits, licenses, and fees as required to complete own scope of work.
 11. All surveying as necessary for own scope of work.
 12. Provide, install, maintain, and remove all SWPPP BMPs necessary due to disturbances caused by this scope of work that are not shown on the erosion and sediment control plans, DI bags, concrete washouts, etc.
 13. Dewatering of standing water as necessary to complete this scope of work.
 14. All groundwater encountered at depths noted in the geotechnical report shall be the responsibility of this contractor to mitigate, treat, pump, and discharge as required.
 15. Utilization of a qualified Qualified SWPPP Practitioner, costs associated, and coordination with the appropriate Authorities Having Jurisdiction will be the responsibility of this contractor.
 16. Debris bins, dumpsters, and offhaul of all trash and spoils.
 17. All temporary pedestrian, ADA compliant walkways as required to maintain Vehicular and/or Pedestrian Access.
 18. All traffic control and traffic control plans as required.
 19. Contractor shall at all times have a designated employee to provide continuous cleanup of work areas and disposal of trash.
 20. Work areas and adjacent public areas shall be free of debris and/or trash prior to every break or lunch, and at the end of each workday.
 21. Contractor is responsible for their own debris bins and shall comply with the appropriate Authority Having Jurisdiction for disposal.
 22. Protection and the cost for potential damages for any buildings, equipment, paving etc. shown to remain, or damaged finish work that is damaged shall be the responsibility of this contractor.

1.03 LOCATION OF SITE



- A. The site of the work is on County property located at 550/600 Union Ave, Fairfield, CA.

1.04 SPECIFICATIONS

- A. The Specifications are those documents bound in the Project Manual and enumerated in the Table of Contents. The General Conditions of the Contract for Construction, Supplementary Conditions, and Division 0 and 1 General Requirements of the Specifications apply to all Work under this Contract.
- B. For clarification: the documents released for bid are comprised of the drawings and specifications identified as “Issued for Construction” dated **September 29, 2025**. In addition, Divisions 00 and 01 are dated **June 22, 2026**.
- C. For additional clarification: notwithstanding paragraph 1.04.B, the documents released for bid also include the following revised specifications by Mead & Hunt:
1. SECTION 09 90 00 - PAINTING AND COATING, revision dated March 3, 2026.
 2. SECTION 31 00 00 - EMBANKMENT CONSTRUCTION, revision dated February 23, 2026.
 3. SECTION 31 23 16 - STRUCTURE EXCAVATION AND BACKFILL, revision dated February 23, 2026.

1.05 DRAWINGS

- A. All Contractors shall examine the full set of Asset Protection, which includes architectural, structural, mechanical, plumbing, electrical, and low voltage plans.
- B. For clarification: the documents released for bid are comprised of the drawings and specifications identified as “Issued for Construction” dated **September 29, 2025 (Volume 1 & 2)**. In addition, Divisions 00 and 01 are dated **June 22, 2026**. An exhibit labeled “Access Requirement” is included. A Geotechnical Design report dated September 3, 2021 by Cal Engineering & Geology is also included.
- C. For additional clarification: notwithstanding paragraph 1.05.B, the documents released for bid also include the following revised drawings by Mead & Hunt dated February 23, 2026:
1. Volume 1, Sheet G-002, “GENERAL NOTES AND SHEET INDEX.”
 2. Volume 1, Sheet C-152, “SITE PLAN - UTILITIES.”
 3. Volume 1, Sheet C-205, “PLAN AND PROFILE - STORM PROTECTION ALIGNMENT.”
 4. Volume 1, Sheet C-242, “ENLARGED PLAN – MEMORIAL AND MATERIALS USE AREAS.”
 5. Volume 1, Sheet M-141, “PLAN - PUMP STATION AND STORM DRAINAGE VAULTS.”



6. Volume 1, Sheet M-311, "SECTIONS - INTERIOR AND EXTERIOR STORM DRAINAGE VAULTS."
7. Volume 1, Sheet E-111, "POWER PLAN."
8. Volume 1, Sheet E-112, "ENLARGED POWER PLAN - PUMP STATION."
9. Volume 1, Sheet E-113, "ENLARGED POWER PLAN - CO-GEN INTERIOR."
10. Volume 1, Sheet E-114, "ENLARGED POWER PLAN - CO-GEN PUMP STATION."
11. Volume 1, Sheet E-211, "PLAZA LIGHTING PLAN."
12. Volume 1, Sheet E-213, "LIFT STATION LIGHTING PLAN."

1.06 SECURITY PROCEDURES

- A. Contractor shall cooperate to County authorities and shall observe and comply with all procedures presently in force at the CAC grounds.
- B. After award of Contract, there will be a project start meeting prior to or shortly after issuance of the Notice to Proceed, at which time, security regulations will be reviewed with Contractor, subcontractor, and other applicable parties who have an interest due to performing work on the Project. Refer to 01 35 53 Project Security Procedures.
- C. The Contractor will be required to follow all security procedures put forth by Solano County and Contractor will participate with the Project Manager to ensure that the security procedures are followed by all project personnel.
- D. The Project Manager and Contractor will participate in weekly status meeting to review and monitor the adherence to the security procedures, as well as, develop a plan for dealing with issues that require modification of change to the procedures. This meeting frequency may be adjusted depending on the level of compliance.

1.07 INTERRUPTION OF SERVICES

- A. Contractor shall make provisions to accomplish the work of this Contract without undue interference with the ongoing operations. Interruptions to services for the purpose of making or breaking connection shall be made only after consultation with the County a minimum of ten (10) working days in advance of connection break and shall be at such time and of such duration as may be directed. Contractor shall coordinate utility shutdowns for after-hours work.
- B. Work in other occupied spaces shall have minimal duration and to occur after hours to not interfere with operations.
- C. In addition, existing sewer, water, electrical, mechanical, and telephone/data lines disconnected for Work of this Contract shall not remain disconnected for more than 4 hours. If these utilities cannot be restored within the 4-hour period. Contractor shall



provide temporary utility service to restore required utility at Contractor's expense. Electrical and fire sprinkler disruption needs to occur on non-public hours.

1.08 SEQUENCE OF CONSTRUCTION OPERATIONS

- A. The Work will be conducted according to the Contractor's Construction Schedule accepted by the County.
- B. Before starting construction operations, Contractor shall confer with the County to review sequence of construction.
- C. The County desires to have the sequence of Work on-site in a manner to allow normal operations to continue and function for its intended purpose. The existing operations cannot be interrupted to cause impact on the day-to-day operations of the County and public. The County does not want to dictate the 'means and methods' of the Contractor however there are operational issues that will need to be addressed.
- D. Contractor shall prepare schedules as set forth in Section 01 32 16, Progress Schedules and Reports, and include the sequencing of the Work as described on the Drawings and Specifications.

1.09 HOURS OF WORK

- A. The Contractor shall perform Work of this Contract on normal workdays and within the work hours of 7:00 a.m. to 5:00 p.m. The Contractor will be required to do any utility shutdowns after normal work hours.
- B. Work after hours and on Saturdays, Sundays and holidays is permitted as long as approval is received from the County at least 2 working days in advance.

1.10 SITE CONDITIONS AND REQUIREMENTS

- A. Contractor shall keep drainage facilities, walks, and paved areas clean and free of mud and dirt, obstacles, etc. so that normal drainage and pedestrian and vehicular travel may be maintained.
- B. Contractor shall install temporary fencing around their laydown area(s). Contractor shall be responsible for restoring each area used back to the original condition.
- C. Do not use landscaped area(s) for work operations or storage unless area has been approved for use by the Project Manager. Contractor shall return area to original condition when work is completed.

1.11 WORK UNDER OTHER CONTRACTS

- A. Coordination with other contractors will be handled through the Project Manager. The Contractor will participate in all coordination meetings between contractors and will work cooperatively to accommodate the needs of other contractors without increasing the costs to the County. The Project Manager will set up said meetings and the amount of meetings will be at the discretion of the Project Manager.



- B. The County anticipates that there will be other contracts for installation of other aspects of the project with separate contractors. The Contractor shall coordinate their work with the work of the other contractors. There may be other contracts in addition to those listed. The scope and timing of this work is not finalized at this time.

1.12 CONTRACTOR USE OF PREMISES

- A. General: During the construction period the Contractor shall have full use of the designated Project area for construction operations, including use of the site. The Contractor's use of the premises is limited only by the County's right to perform construction operations with its own forces or to employ separate contractors on portions of the Project.
1. Confine operations to areas in within Contract limits indicated including staging area and parking zone. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 2. Keep driveways and entrances serving the premises clear and available to the County and the public at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
 3. Repair and replace damaged existing construction to remain such as curbs, parking lot paving, roadways, site vegetation and utilities.

1.13 COUNTY SERVICE PROVIDERS

- A. The County's vendor for the following building systems are:

Honeywell Building Solutions – Security System (Card Readers), (916) 343-1967
Sunbelt Controls – HVAC Controls (Tridium Niagara 3.8), (805) 459-1166

1.14 MISCELLANEOUS PROVISIONS

- A. Project Completion Requirements:

1. Before final acceptance, inspect, test and adjust performance of every system or facility of the Work to ensure that overall performance is in compliance with the contract documents.
2. No later than 11 months after the date of Final Acceptance, and after County occupancy and use of the Project, return and again inspect, test and adjust the work. Measure performance relative to terms of the acceptance test performed at the end of the job and demonstrate and record compliance. See Document 00 72 00, General Conditions of the Contract for Construction, for details and more information.
3. Submit a report of results to the County and Project Manager.



4. Instruct the County's operating personnel on operational requirements needed to maintain compliance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 11 00



SECTION 01 25 13 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. The Contractor's Construction Schedule is specified in Section 01 32 16, "Construction Progress Schedules and Reports"; and the Schedule of Submittals is included under Section 01 33 00, "Submittals Procedures."
- C. Standards: Refer to Section 01 42 00 "Definitions and Standards" for applicability of industry standards to products specified.
- D. Procedural requirements governing the Contractor's selection of products and product options are included under Section 01 60 00 "Materials and Equipment."

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:
 - 1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - 2. Revisions to Contract Documents requested by the County or Engineer.
 - 3. Specified options of products and construction methods included in Contract Documents.
 - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBSTITUTION PROCEDURE

- A. Substitute Products: When the naming of one or more products is followed by "or accepted equal," a substitute product may be offered for consideration. A substitute product is a



product other than those specified.

- B. Product substitution requests shall be submitted for approval to the Project Manager within 15 calendar days from the date of Notice to Proceed. Any substitution requests submitted after the allocated time may not be accepted.
- C. If a substitution is being proposed, submit drawings, specifications, tests, performance data, and other pertinent information required to substantiate the equality of each substitute product.
- D. After the designated substitution period other products may be proposed only if a product indicated or specified can be proved to have subsequently become unavailable.
- E. Whenever a product is identified in the Contract Documents by reference to manufacturer's name, trade name, catalog number, or the like, it is so identified for the purpose of establishing a standard, and products of other manufacturers may be equally acceptable, provided the proposed products are, in the opinion of the Engineer, of equal quality, utility, and appearance.
- F. In requesting acceptance of a product other than that identified in the Contract Documents, the Contractor represents that he/she:
 - 1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.
 - 2. Will furnish the same guarantees/warranties or bonds for the proposed product as for the product indicated or specified.
 - 3. Will coordinate the installation of the proposed product into the Work, and make such other changes as required to make the Work complete and in compliance with the Contract Documents and applicable regulatory requirements at no additional cost to the County.
 - 4. Waives claims for additional costs and time associated with the proposed product that may subsequently become apparent.
 - 5. Agrees to pay the Architect/Engineer for costs of reviewing the proposed substitute product, as specified hereinafter.
- G. Request for acceptance of a product other than that indicated or specified in the Contract Documents shall be submitted to the Architect/Engineer on a "Substitution Request Form", provided at the end of this section, and accompanied by sufficient information to enable proper evaluation to be made. Only one product may be proposed for a product identified in the Contract Documents. Submit with request:
 - 1. Complete technical data, including drawings, performance specifications, cost data, samples, and test reports of the product proposed. Submit additional information, if required by the Engineer.
 - 2. A detailed comparison of significant qualities of the proposed substitution with



those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

3. Data similar to that specified for the item for which the product is proposed.
 4. Complete breakdown of costs indicating the amount to be deducted from the Contract Sum if the proposed product is accepted.
 5. Signed statement that the proposed product is in full compliance with the Contract Documents and applicable regulatory requirements.
 6. List of other Work, if any, which may be affected by the proposed product. Be responsible for the effect of a proposed product upon related Work in the Project and pay the additional costs generated by the product if it is accepted, including the cost of the Engineer's additional services associated therewith.
 7. Information on availability of maintenance service, and source of replacement materials.
 8. Sample of manufacturer's standard form of guarantee or warranty for proposed product.
 9. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 10. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include 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.
- H. The Project Manager/Architect will review requests for proposed products with reasonable promptness and notify the Contractor, in writing, of his decision to accept or reject such products.
- I. The Project Manager/Architect at his/her sole discretion will determine the acceptability of proposed products, and his determination shall be final.
- J. Project Manager/Architect's Action: No consideration will be given to a substitute product unless, in the Engineer's judgment, it complies with the following conditions:
1. It is equal in quality and serviceability.
 2. Its use does not entail changes in details or related construction.
 3. It is acceptable in regards to design and artistic effect.
 4. There is cost, time, or both, advantage to County.
 5. The cost of reviewing such proposed products by the Project Manager/Architect



or his consultants, or the County's consultants, and any Project Manager/Architect or consultant fees necessary to accommodate the substitution into the Work, shall be processed as a deductive Change Order in accordance with the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

- K. Notification: Written notification of decision will be given within a reasonable time after receiving the required technical data. Acceptable substitutions will be processed as Change Orders.
- L. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.
- M. If a proposed product is not accepted, use the product originally specified or indicated.
- N. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Project Manager/Architect's prior written acceptance.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 25 13

SUBSTITUTION REQUEST FORM FOLLOWS



SUBSTITUTION REQUEST FORM

TO _____

PROJECT: Asset Protection Project

We hereby submit for your consideration the following product instead of the specified item for the above Project:

Proposed Substitution _____

Section _____ Paragraph _____ Specified Item _____

Attach complete technical data, including laboratory tests, if applicable.

Include complete information on changes to Drawings and Specifications which proposed substitution will require for its proper installation.

Fill in Blanks Below:

A. Does the substitution affect dimensions shown on Drawings? Yes ___ No ___. If yes, clearly indicate changes.

B. What effect does substitution have on other trades? _____

C. What effect does substitution have on construction schedule? _____

D. Differences between proposed substitution and specified item? _____

E. Manufacturer's warranty/guarantees of the proposed and specified items are: _____

_____ Same _____ Different (explain on attachment)

The undersigned certifies that the function, appearance and quality are equivalent or superior to the specified item. The undersigned also certifies that all costs caused by or resulting from the requested substitution including, but not limited to, additional design work, construction changes and review time will be paid by the firm requesting the substitution.



Submitted by:

For Use by Design Consultant

Signature_____

____Accepted ____Accepted as Noted

Firm_____

____Not Accepted ____Received Too Late

Address_____

By_____

By_____

By_____

Remarks_____

Telephone_____



SECTION 01 26 00 - CONTRACT MODIFICATIONS PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Document 00 72 00/ General Conditions of the Contract for Construction and Document 00 73 00/ Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Refer to General Conditions, Article 12 for additional provisions regarding changes in the work. If any provision in this Section 01 26 00 should conflict with any provision in General Conditions Article 12, this Section shall control.

1.02 NO CHANGES WITHOUT CONSENT; PERFORMING WORK ORDERED

- A. No extra Work shall be performed, and no change shall be made, except pursuant to a written Change Order, Work Authorization, or Field Order from the County stating that the extra Work or change is authorized, and no claim for any addition to the Contract Price or Time for Completion shall be valid unless ordered. However, nothing in this Section shall excuse the Contractor from diligently proceeding and fully completing the Project.

1.03 CHANGE ORDERS AUTHORIZED; PROCEDURE

A. Authorization

- 1. Change Orders Authorized. Subject to legal requirements relating to competitive bidding, the County may require changes in, additions to, or deletions from the scope of the Work to be performed or the materials to be furnished pursuant to the Contract Documents.

The County may, at any time, without notice to the sureties, by written order designated or indicated to be a Change Order, make any change or modification in the Work, or add to the Work within the general scope of the Contract, including, but not limited to changes:

- a. In the Specifications or Drawings;
- b. In the sequence, method or manner of performance of the Work;
- c. In the County-furnished facilities, equipment, materials, service, or site.

- 2. County Directed Changes Requiring an Increase in Contract Sum. If the Change in or addition to the work will result in an increase in the Contract Sum, the County shall have the right to require the performance thereof on a Lump Sum basis or a Time and Material basis, all as hereinafter more particularly described. The right of the County as aforesaid shall apply with respect to each Change in the Work.

- B. Methods of Calculation. Adjustments, if any, to the Contract Price by reason of any such change, addition or deletion, shall be determined by one or more of the following methods,



at the County's sole discretion. The Contractor shall provide sufficient substantiating data to allow the County to evaluate the Contractor's request for a Change Order.

1. By a lump sum proposal by the Contractor accepted or amended by formal action by the County; and/or
 2. By time and materials charges, limited to the "Actual. Cost" to perform the Work, as defined by Paragraph D of this Article, plus overhead and profit as allowed by Paragraph C of this Section.
- C. Overhead/Profit and Allowable Time Limitations on Change Orders. If the County elects to have the Change in the Work performed on a Lump Sum basis, its election shall be based on a lump sum proposal, which shall be submitted by the Contractor to the Project Manager within ten (10) working days of the Contractor's receipt of a request. The County reserves the right to request the Contractor to adjust the price of the change order if the County disagrees with the Contractor's quoted price. The County's request for a lump sum proposal shall not be deemed an election by the County to have the change in the Work performed on a lump sum basis. The Contractor's and the Contractor's subcontractor's' proposal shall be itemized and segregated by labor and materials for the various components of the change in, or addition to, the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed proposals of any subcontractors who will perform any portion of the change in, or addition to, the Work and of any persons who will furnish materials or equipment for incorporation therein. The proposal shall also include the Contractor's estimate of the time required to perform said changes or additional work

The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its subcontractors, may include reasonable anticipated costs of job site labor, including foremen, who will be directly involved in the change in the Work, for such time as they will be so involved. The Contractor's cost for Project Managers, Project Engineers, Superintendents, Clerical, and like personnel are considered as contained in overhead.

1. The Contractor's proposal for additional Work shall include by itemized breakdown for Work done by Contractor's own forces and including subcontractors with sub-subcontractors' itemized breakdowns:
 - a. Cost of labor, including: hourly base wage's, Social Security taxes, Federal or State unemployment taxes, worker's compensation insurance, and fringe benefits required by collective bargaining agreements effective for the Contractor or subcontractor.
 - b. Cost of materials and equipment or furnishings which will be incorporated into the permanent Work, including manufacturers or supplier's cost, sales taxes, and cost of delivery.
 - c. Construction equipment costs (not small tools) for time of use required at Contractor's or Subcontractor's unit rates or at discounted local published rates, whichever is less.



- d. General Conditions, General Requirements, supervision, overhead (excluding small tools) and profit applied to items number a, b, and c above for:
 - (1) Work done by Contractor's own forces; not including bond and insurance premiums, 10% of the cost of that portion of additional work.
 - (2) Work done by subcontractors, all tiers, including bond and insurance premiums, if any, shall not exceed 10% of the cost of that portion of the work plus 5% for the General Contractor. Total combined General Contractor and Sub-Contractor fee shall not exceed 15%.
 - (3) Under no circumstance will the total allowable mark up for General Conditions, General Requirements, supervision, overhead (excluding, small tools) and profit, exceed a cumulative total fifteen percent (15%), including markups for all parties involved in a change.
 - e. Contractor's Performance and Payment Bond premiums, one percent (1 %).
- 2. In the event that the Contractor fails to submit his proposal within the designated period, the County may order the Contractor to proceed with the Change or Addition to the Work and the Contractor shall so proceed. The County shall unilaterally determine the reasonable cost and time to perform the Work in question, which determination shall be final and binding upon the Contractor. In no event shall the Contractor allow an unresolved change order to hamper the progress of the work.
 - 3. In the event that the parties are unable to agree as to the reasonable cost and time to perform the change in, or addition to, the work based upon the Contractor's Proposal, and the County does not elect to have the Change in the Work performed on a Time and Materials basis, the County shall make a unilateral determination of the reasonable cost and time to perform the change in the Work, based on their own estimates, the Contractor's submission, or a combination thereof. A Change Order shall be issued for the amounts of cost and time determined by the County and shall become binding upon the Contractor unless the Contractor submits his protest in writing to the County within ten (10) working days of the issuance of the Change Order. County has the right to direct in writing the Contractor to perform the change in the Work, which is the subject of such Change Order. Failure of the parties to reach agreement regarding the cost and time of performing the change in the Work and/or any pending protest shall not relieve the Contractor from performing the change in the Work promptly and expeditiously.
 - 4. If the County elects to have the change in the Work performed on a Time and Materials basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its subcontractor or sub-subcontractors, at actual cost to entity performing the change in Work, without any charge for administration, clerical expense, supervision, or superintendence of any nature whatsoever, or the



cost, use or rental of tools or plant. The cost of a Change Order on a Time and Materials basis shall be evaluated according to Paragraph 1.03.C. The Contractor shall submit to the County daily Time and Material tickets, to include the identification number assigned to the change in Work, the location and description of the change in the Work, the classification of labor employed with names and Social Security numbers, the materials used, the equipment rented (not tools) and such other evidence of cost as the County may require. The County may require authentication of all Time and Material tickets and invoices by persons designated by the County for such purpose. The failure of the Contractor to secure any required authentication shall, if the County elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the County shall not constitute an acknowledgment by the County that the items were reasonably required for the change in the Work.

5. No costs for General Conditions, General Requirements, supervision, overhead, and profit will be paid by the County on account of a change in the work" except as specifically provided in Paragraph 1,03. C. and shall be deemed to include all costs and expenses which the Contractor or any of its subcontractors may incur in the performance of a change in the Work and which are not otherwise specifically recoverable by them pursuant to Paragraph 1.03.
- D. "Actual Costs" Defined. The actual cost to perform the Work for purposes of this Section is limited to the applicable labor rates, including Contractor's contributions directly attributable to the Work authorized; and the material man's or supplier's invoice amount for all material and equipment actually used to accomplish the work authorized. All other direct and indirect costs, all costs attributable to the time needed to perform the Work ordered by such Change Orders, and all profit associated with such Work shall be included in the maximum overhead and profit amounts stated hereinabove.
- E. Audit and Verification. With respect to any change in the Work resulting in a change in the Contract Sum, the Contractor shall afford and shall require its subcontractors to afford access to the County at all reasonable times to any books, correspondence, instructions, receipts, vouchers, memoranda, and records of any kind relating thereto, all of which shall be maintained by the appropriate parties for a period of at least three (3) years from and after the date the County makes payment on account of such change in work. The Contractor authorizes the County and shall require its subcontractors to authorize the County to check directly with any suppliers of labor and material with respect to, and to obtain, sworn statements and waivers of lien, if the County so elects.
- F. Changes Requiring a Decrease in Contract Sum. If the change in the Work will result in a decrease in the Contract Sum, the County shall require a quotation by the Contractor of the amount of such decrease for use in preparing a Change Order. The Contractor's quotation shall be forwarded to the County within ten (10) working days of the Project Manager's request and, if acceptable to the Project Manager, shall be incorporated in the Change Order. Contractor's quotation shall include all direct costs associated with the decreased scope of work, plus five percent (5%) for overhead. If not acceptable, the parties shall make every reasonable effort to agree as to the amount of such decrease, which may be based on a Lump Sum, properly itemized basis in accordance with Subparagraph 1.03.C.



If the Project Manager and the Contractor are unable to agree on the amount of such decrease, the decrease shall be the total estimated reduction in actual cost of the Work, as determined by the Project Manager in his/her reasonable judgment and the Contractor shall be bound to credit this amount to the County.

- G. Periodic Change Orders. The Project Manager is authorized to cumulate Work Authorizations and process periodic Change Orders including additions and deletions, and to develop procedures providing the methods for such processing in addition to and consistent with those set forth in herein.

1.04 WORK AUTHORIZATIONS; PROCEDURE

- A. Work Authorizations Authorized. The County or designee is authorized to issue Work Authorizations instructing the Contractor to proceed with extra Work.
- B. Quotation by Contractor. Other than in extraordinary circumstances, as described below, before a Work Authorization is issued, the Contractor shall submit a quotation setting forth an estimated cost of the Work to be performed with sufficient substantiating data to allow the County to evaluate the quotation, and an estimate of the time necessary to perform the Work. If requested by the Project Manager, the Contractor shall provide additional data to support the quotation. The Contractor shall acknowledge the quotation as binding.
- C. Request for Price Adjustment. After the extra Work specified on the Work Authorization is completed, the Contractor may submit a request for a Contract Price Change Order due to the Work Authorization. The request shall be supported with substantiating data to show the actual costs to perform the Work and the overhead and profit being requested, as defined in Sections 1.03.C. and 1.03.0. The maximum price adjustment claimed shall not exceed ONE HUNDRED AND TEN PERCENT (110%) of the approved quotation.
- D. Request for Time Adjustment. If the Contractor claims that the Work Authorization has delayed the construction completion time, he shall verify' the claimed delay by demonstrating with reference to the approved Project Progress Schedule that the Work Authorization in fact caused a delay in the overall completion date of the Project. Upon such demonstration; the' Project Manager shall process a request for a Contract Time extension Change Order pursuant to Specification Section 00 72 00, Article 8.
- E. Accumulation of Work Authorizations. At the Project Manager's sole discretion, the Contractor's claims for Change Orders arising from several Work Authorizations may be accumulated into periodic Change Orders adjusting Contract Price, Time, or both, separately or in one Change Order. Such periodic Change Orders shall include deductions for changes which constitute Deductive Change Orders as defined in Section 1.03.F., during the time period being considered in the periodic Change Order.
- F. Immediate Work Authorizations. In the event extraordinary circumstances arise which require extra Work to be authorized before the Contractor, the County or designee prepares a quotation may issue an immediate Work Authorization without such quotation. Such Work Authorization shall include a maximum authorized sum over which no price adjustment will be authorized. The determination as to whether circumstances as described



above exist is discretionary with the County. Such Work Authorizations otherwise shall be processed as specified in this Section.

1.05 FIELD ORDERS; PROCEDURES

- A. Field Orders Authorized. The Project Manager may issue Field Orders instructing the Contractor to proceed with Work differing from that shown in the Contract Documents, and which changes the Scope of the Work, by adding or deleting Work, by instructing Work to be located differently than shown on the Contract Drawings or making other minor changes which the Project Manager determines are in the County's best interests.
- B. No Price or Time Adjustment Authorized. Field Orders are not authorized to change the Contract Price or Time, or to bind the County to the payment of any sum to the Contractor.
- C. No Cost Adjustments Required. If the change ordered in the Field Order will neither delete nor add costs to the Project, the Field Order shall so note. If the Contractor contends that extra work is required, Section 1.03 shall apply.
- D. Cost Adjustments Required: If the change ordered in the Field Order will either delete or add costs to the Project, the Field Order shall instruct the Contractor to submit its quotation. Thereafter, Section 1.02 or Section 1.03, as specified by the Project Manager, shall apply.
- E. Proceeding Before Decision. If the Contractor proceeds with Work noted on a Field Order without notifying the Project Manager of its claims that the Work is extra work, the Contractor shall have waived its right to request an adjustment to the Contract Price and/or Time. Such notification must be made prior to commencing any of the work noted on the Field Order.

1.06 EXTRA WORK REQUESTS; PROCEDURE

If the Contractor claims that any Clarification, Field Order, or other instruction issued by the County requires Work beyond the Scope of the Agreement for Construction, the following provisions shall apply:

- A. Notice to Project Manager. Within ten (10) calendar days, the Contractor shall notify the Project Manager of its request, and submit a quotation for the requested costs, pursuant to Section 1.03.C. The Contractor shall submit additional information requested by the Project Manager to decide the request.
- B. Action by Project Manager. The Project Manager shall review the Contractor's submittals and either recommend for approval or deny Contractor's request. If the request is approved, the Project Manager may process either a Change Order or Work authorization, pursuant to this Section. If the request is denied, the Project Manager shall so advise the Contractor. Thereafter, the Contractor shall proceed with the Work in issue. The Project Manager shall issue his/her decision within twenty-one (21) calendar days of receipt of a complete submittal from the Contractor. The Project Manager shall recommend final action to the County and the County's decision shall be binding on the Contractor.
- C. Time. If the request is approved, the time during which the request was being considered shall be included in the time allocation for the Work Authorization adjusting the request,



and Article 1.03 shall apply thereto; if the request is adjusted by Change Order, any Time extension authorized thereby shall include the Time during which the request was pending. If the request is denied, no Time adjustment shall be authorized.

- D. Effect of Proceeding. If the Contractor proceeds with the Work without notifying the Project Manager pursuant to Paragraph A, or before a decision pursuant to Paragraph B, any claim for a Contract Price and/or Time adjustment shall be waived.
- E. Scheduling. The Contractor is responsible to schedule the Work and submit extra-work requests so the time required for decision, as specified in Paragraph B, does not delay the Work in general.
- F. Contractor Notice of Change. If the Contractor asserts that any event or occurrence has caused a change in, or addition to, the Work which change causes an increase or decrease in the Contractor's cost or the time required for the performance of any part of the Work under the contract, the Contractor shall, within ten (10) working days of such event, give the County written notice as herein required. Said notice shall include the instructions or circumstances that are the basis of the change and the Contractor's best estimate of the cost and time involved.
 - 1. If the Contractor intends to assert a claim under this Section, he/she must, within Ten (10) working days after receipt of a written Change Order above or the furnishing of a written notice under Paragraph 1.06.F. Submit to the Project Manager a written statement setting forth the specific nature and cost of such claim, unless this period is extended by the Project Manager. The statement of claim may be included in the notice under Paragraph 1.06.F above. Failure to submit such written notice within the specified time frame shall be deemed a waiver of the claim. The statement of claim shall include all direct, indirect and impact costs associated with the change, as well as the Contractor's estimate of the schedule impact of the change, if any.
 - 2. If the parties are unable to agree to the reasonable cost and' time to perform the Change or are unable to agree as to whether a change occurred, the County shall make unilateral determination as described in Sub subparagraph 1.03. C.2. The Contractor shall proceed pursuant to the provisions of that Section.

1.07 CHANGE ORDERS REGARDING TIME FOR COMPLETION

Any time extension authorized by the County pursuant to Specification Section 00 72 00 Article 8, herein shall be set forth in a Change Order issued by the Project Coordinator and County Administrative Officer or the Board of Supervisors.

1.08 CHANGE ORDERS DUE TO UNAVAILABLE MATERIALS

In the event that the Contractor demonstrates good cause for a delay in the Contract Time due to the unavailability of materials, the County; in its sole discretion, may either grant a Contract time extension, or utilize this Section.

In the event that the Project is unable to be completed due to unavailable materials, and if the Project is completed otherwise, the Contractor may request to delete the portion of the Project not



yet completed from the Agreement for Construction, thereby allowing a Notice of Completion to be filed on the remainder of the Project. The County shall approve no such Change Order unless the Contractor accompanies his request with an offer to perform the Work so deleted for a price not to exceed the value of the Work deleted by such Change Order, such Work to be commenced upon delivery of the materials, and diligently prosecuted to completion.

In the event the County elects to accept the Contractor's offer, Work done pursuant thereto shall not be construed as Work done on the Project, nor shall such Work be construed as affecting, in any way, the legal significance of the Notice of Completion filed on the Project. The application of this Section is limited as follows:

- A. No Change Order shall be issued pursuant to this Section until the Contractor has submitted all documents required for final payment.
- B. This Section shall apply only to Work, the completion of which is precluded due to unavailable materials.
- C. Utilization of this Section lies solely within the discretion of the County, and such discretion hereby is delegated to the Project Manager.

1.09 EFFECT OF CONTRACTOR'S ACCEPTANCE OF CHANGE ORDER

By accepting a Change Order, Contractor agrees to the changes, if any, in the Contract Price specified for each item and to the specified Extension of time allowed, if any, for completion of the entire Work on account of such Change Order, and agrees to furnish all labor and materials and perform all Work necessary to complete all additional Work for the price adjustment and within the time specified. Contractor shall make no additional claim for adjustment to the Contract Price or time, nor, for additional costs or damages, on account of the work referenced in such Change Order. A Change Order duly issued by the County and accepted by the Contractor shall constitute a complete accord and satisfaction as to the work, Contract Price, and Contract Time changed thereby. Contractor shall defend and indemnify the County, its officers, employees, agents and consultants, if any Subcontractor asserts any claim against the County due to a duly issued and accepted Change Order.

1.10 EFFECT ON SURETIES

All changes authorized by the Contract Documents may be made without notice to, or consent of, the sureties on the Performance and Payment bonds, and shall not reduce their liability on the bonds.

The County reserves the right to require additional Performance or Payment bonds to secure a Change Order. In this event, the Change Order shall be increased by the actual cost of the bond premium for the additional bond amounts if any.

1.11 GENERAL PROVISIONS RELATED TO CHANGES

The Contractor shall not be entitled to any amount for indirect costs, damages, or expenses of any nature, including, but not limited to, so-called "impact" or "cumulative" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the proposal is based and to which the parties have agreed, and which the Contractor, its subcontractors or sub-subcontractors or any other person may incur as a result of delay, interferences, suspensions, changes in sequence or the



like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all changes in the Work performed. It is understood and agreed that the Contractor's sole and exclusive remedy in such event shall be recovery of his direct costs as compensable hereunder and an extension of the contract Time, but solely in accordance with the provisions of the Contract Documents.

No claim by the Contractor hereunder shall be allowed if asserted after final payment under this Contract. No claim relating to or flowing from a particular Change shall be allowed after execution of the Change Order relating to that change.

If any disputes should arise between the parties with respect to an increase or decrease in the Contract Sum or an expansion or contraction in the Contract Time as a result of a change in the Work, the Contractor shall not suspend performance of a change in the Work or the Work itself unless otherwise so ordered by the County in writing. The County shall, however, pay to the Contractor up to the County's reasonable estimated value of the change in the Work, regardless of the dispute, if said change in the Work results in an increase in the Contract Sum; and the County shall have the right to decrease the Contract Sum up to the County's reasonable estimated value of the change in the work, regardless of the dispute, if said change in the Work results in a decrease in the Contract Sum, and the Contractor shall be bound by the County's decision as to amount of payment or credit.

1.12 MINOR CHANGES IN THE WORK

The County and/or Project Manager shall have authority to order minor changes in the Work not involving an adjustment in the Contract sum or an extension of the Contract Time, and not inconsistent with the Contract Documents. Such changes shall be affected by written order and shall be binding on the County and the Contractor. The Contractor shall carry out such written orders promptly.

END OF SECTION 01 26 00



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SECTION 01 29 00 - APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
 - 1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.
- B. The Contractor's Construction Schedule requirements are included in Section 01 32 16, "Construction Progress Schedules and Reports"; and Submittal Schedule requirements are included in Section 01 33 00, "Submittals Procedures".

1.03 SCHEDULE OF VALUES

- A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule. See Section 01 32 16 "Construction Schedules and Reports" for additional information.
 - 1. Within fifteen (15) working days of the Notice to Proceed, the Contractor shall submit Schedule of Values for review by County's Project Manager, allocating a dollar value for each activity on the Construction Schedule.
- B. Format and Content: Use the Construction Schedule as a guide to establish the format for the Schedule of Values.
 - 1. Identification: Include the following identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of the County.
 - c. Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
 - a. Generic name.



- b. Related Specification Section.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that have affected value.
 - g. Dollar value.
 - h. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items; amounts and line items subject to Project Manager's approval.
 - a. Dollar value for each activity will be cost including labor and materials.
 - b. Make sum of activity costs equal to total of each Subcontract that will then equal total of Contract Sum.
 - c. Separate line items for General Conditions and overhead/profit will be required.
4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
5. All material storage will be the responsibility of the contractor and stored material will not be reimbursed until said material is installed.
6. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Work Authorizations result in a change in the Contract Sum. List each Change Order or Work Authorization as a new line item.
7. Provide separate category for “grant-related work efforts” in schedule of values for product materials and installation for the following items:
 - a. Casework; doors, frames and hardware; glazing; window film; window treatment; flooring (carpet tile, resilient sheet, and wall base); acoustic wall panels; painting; signage; vinyl graphics; fire extinguisher and cabinets; TV monitors, associated audio-visual system and media/technology equipment; power for all modular systems furniture and demountable partitions; low voltage/data cabling for all modular systems furniture and demountable partitions; security cameras; and card reader system.



1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the County. See Article 9 of General Conditions for additional information regarding progress payments and final payment.
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- B. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702/CMA and Continuation Sheets G703 as the form for Application for Payment.
- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the County. Incomplete applications will be returned without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - 2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.
- E. Transmittal: Submit 3 executed copies of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.
 - 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.
- F. Waivers of Mechanics Lien and Stop Notice: With each Application for Payment, submit waivers of mechanics' lien and stop notices from every entity that may lawfully be entitled to file a mechanics lien or stop notice arising out of the Contract, and related to the Work covered by the payment.
 - 1. Submit partial waivers on each item for the amount requested on each item.
 - a. When an application shows completion of an item, submit final or full waivers.
 - b. The County reserves the right to designate which entities involved in the Work must submit waivers.



- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Schedule of Values.
 4. Contractor's Construction Schedule (preliminary if not final).
 5. Submittal Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of authorizations and licenses from governing authorities for performance of the Work.
 9. Initial survey and damage report.
- H. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment Application for Payment include the following:
1. All pertinent permits and similar approvals such as fire department sign-off.
 2. Warranties (guarantees) and maintenance agreements.
 3. Test/adjust/balance records.
 4. Maintenance instructions.
 5. Meter readings.
 6. Start-up performance reports.
 7. Change-over information related to County's occupancy, use, operation and maintenance.
 8. Final cleaning.
 9. Application for reduction of retainage, and consent of surety.
 10. Completion of Project closeout requirements.
 11. Completion of items specified for completion after Substantial Completion.
 12. Assurance that unsettled claims will be settled.



13. Transmittal of required Project construction records to County.
14. Proof that taxes, fees and similar obligations have been paid.
15. Removal of temporary facilities and services.
16. Removal of surplus materials, rubbish and similar elements.
17. Change of door locks to County's access.
18. Sign off sheets for waste water treatment tracking conducted by contractor.
19. Post Warranty Bond in the amount of 10% of Final Contract Amount.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 29 00



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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.01 COUNTY PROJECT PERSONNEL

- A. This section specifies the County Project Personnel assigned to this Project.
- B. Related requirements that describe the titles and roles of the County Project Personnel are specified in other Sections include:
 - 1. General Conditions: Section 00 72 00; Article 2, Administration of the Contract.
- C. County Project Personnel:
 - 1. Project Coordinator:
Tim Reynolds
Solano County General Services Department,
Capital Projects Management Division
675 Texas Street, Suite 2500, Fairfield, CA 94533
(707) 784-6421 Phone
tsreynolds@solanocounty.gov
 - 2. Project Manager:
Gilbane Building Company
Chris Chandler
2535 Capitol Oaks Drive, Suite 400, Sacramento, CA 95833
(408) 839-7262 Phone
cchandler@gilbaneco.com
 - 3. Project Engineer:
Mead & Hunt, Inc.
Chris Hirschmann
180 Promenade Circle, Suite 240, Sacramento, CA 95834
(916) 993-4615 Phone
chris.hirschmann@meadhunt.com

1.02 PROJECT CONTROL

- A. The County's Project Manager will outline and detail communication, correspondence and coordination procedures at Project start (pre-construction conference) meeting.
- B. Examination of Site: Contractor and subcontractors shall visit the site prior to bidding and prosecution of the Work and shall familiarize themselves with existing conditions and be prepared to carry out the Work within existing limitations.
- C. Condition of Work in Place: Inspect and take responsibility for previously prepared or installed work of other contractors before applying subsequent materials or finishes. If work is in unsatisfactory condition, notify the County's Project Manager. Do not proceed until defective work has been corrected.



D. General Coordination:

1. Subletting and Subcontracting Responsibilities: Refer to Document 00 72 00, General Conditions of the Contract for Construction, Article 5, Subcontractors and Section 01 31 13, Contractor Coordination.
2. Contractor shall coordinate the Work with related work being done by other contractors operating in the area and the County. This coordination shall include reasonable adjustments of schedule in order to allow other contractors or County to do their work.
3. Contractor shall coordinate electrical, mechanical, plumbing, and security electronics work, particularly between general trades and electrical, mechanical, plumbing, and security electronics trades so that sleeves, hangers, chases, openings, etc., required for pipe, conduit, and other installations of like character are duly and properly provided for and installed as work progresses.
4. Contractor shall carefully examine Drawings relating to entire work with actual conditions so that Work will be accommodated in spaces provided. General arrangement and location of elements of various systems is shown on the Drawings or specified. Final locations, levels, etc., shall be governed by actual material size used, by building conditions encountered, and by work of all trades. Space conflicts and interferences shall be resolved before work is installed.
5. Contractor shall utilize the Contract Documents, submittals, and layout drawings of the various trades to check and coordinate the Work so that no interferences or conflicts between trades will occur. This checking and coordination shall be performed and completed before construction is commenced in each affected area.
6. Coordinate work to assure efficient and orderly sequence of installation of construction elements. Make provisions for accommodating items installed by the County or under separate contracts.
7. Verify characteristics of interrelated operating equipment are compatible; coordinate work having interdependent responsibilities for installing, connection to, and placing such equipment in service.

1.03 COORDINATION

A. Description

1. Coordinate the Work; do not delegate the responsibility for coordination to any Subcontractor.
2. Resolve differences or disputes concerning coordination, interference, or extent of Work of the various SECTIONS.

B. Specific Coordination



1. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
 - a. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - b. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - c. Make adequate provisions to accommodate items scheduled for later installation.
2. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - a. Prepare similar memoranda for the County and separate Contractors where coordination of their Work is required.
 - b. Prior written notice of ten (10) working days is required before interruption of any existing system. After written notice the contractor is required to set up a coordination meeting with the Project Manager and County personnel. The Project Manager will assist with retrieving the key personnel. The Contractor will submit a plan for interrupting said system that shall include a schedule of events for this operation.

C. Requests for Information (RFI)

1. Comply with requirements of Document 00 72 00, General Conditions, Article 4, Contractor.
2. Submit on form that will be distributed by the Project Manager during the pre-construction meeting.
3. Number RFI's sequentially; include date submitted.
4. Identify Project, Contractor, subcontractor, major supplier, pertinent Drawing sheet and detail number, and Specification Section.
5. Specifically identify time response information is required to avoid impact on Construction Schedule and cost. The time for response should be reasonable to allow for processing and Architect review, research and response.



6. RFI's are requests for information only. If a reply to an RFI requires additional services by Architect, or will change scope of Work or Contract Time, submit Change Order Request Work Authorization.
7. Allow five (5) working days for a response after delivery to the Project Manager.
8. Request for Information shall include written and graphic solutions proposed by Contractor. Architect will determine if proposal is in accord with Contract Documents and design intent of Project.
9. Contractor's failure to make reasonable effort to propose realistic solution may result in Request for Information returned with no action.
10. Maintain current and accurate Request for Information Log as follows:
 - a. Sequentially number each RFI. Indicate current status of RFI's at all times; submit log weekly, and as requested by Architect.
 - b. Maintain for duration of Contract.
 - c. For RFI's submitted in form of drawings follow submittal procedures specified in Section 01 33 00 Submittals.
11. Requests for Information shall be issued only for information not clearly defined in the contract documents. For those RFI's that are issued that request information that is clearly shown in the contract documents, the Architect shall be entitled to back charge the Contractor for the actual time spent responding to the RFI. The back charge shall be deducted from the Contractor's next payment application and those funds forwarded to the Architect as compensation.
 - a. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1) Preparation of schedules
 - 2) Installation or removal of temporary facilities
 - 3) Delivery and processing of submittals
 - 4) Progress meetings
 - 5) Project Closeout activities

1.05 LOCATIONS, ELEVATIONS, AND LAYOUT OF WORK

- A. Contractor shall layout the Work and furnish surveys required for alignment and elevations of the Work and shall pay all costs. Contractor shall furnish necessary lines, levels, locations, measurements and markers for all on the Work and be responsible for their accuracy.
- B. On building structures, Contractor shall layout on forms, walls, floors, and columns, the exact location of partitions as guide to all trades.



- C. Engineer of Record to verify layout.

1.06 SCHEDULES AND MEETINGS

- A. Planning and Scheduling: Refer to Section 01 32 16/ Construction Progress Schedules and Reports.
- B. Project and Pre-Installation Meetings: Contractor or his duly appointed representative shall attend project meetings at regular intervals as set by the County's Project Manager and shall attend pre-installation meetings as required by pertinent Specification Sections. Attendance shall be limited to the Contractor and his immediate subordinates, subcontractors where so specified, the County's Project Manager, and representatives of the Architect and Consultants, as requested. County's Project Manager, or duly appointed representative, will keep minutes of meetings; with copies sent to all who attend. Meetings shall be held at job site at the County trailer or other designated location.

1.07 ALLOWABLE ENTRANCE

- A. Contractor, subcontractors, their employees, suppliers and delivery persons shall enter and exit property via County designated entrance.

END OF SECTION 01 31 00



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SECTION 01 31 13 – CONTRACTOR COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Coordinate the Work; do not delegate the responsibility for coordination to any Subcontractor.
- B. Resolve differences or disputes concerning coordination, interference, or extent of Work of the various SECTIONS and all sub-trades.
- C. Contractor will be required to coordinate all construction activities with the Project Manager daily. Coordination shall include, but not limited to, deliveries, any noisy activities such as hammer drilling or powder actuated fasteners, etc. and what area the contractor will be working in the next day. Coordination can be via email, conference/phone call and/or in person.

1.2 GENERAL COORDINATION

- A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
 - 1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the County and separate Contractors where coordination of their Work is required.
 - 2. Prior written notice of ten (10) working days is required before interruption of any existing system. After written notice the contractor is required to set up a coordination meeting with the Project Manager and County personnel. The Project Manager will assist with retrieving the key County personnel. The Contractor will submit a plan for interrupting said system that shall include a schedule of events for this operation.



1.3 REQUESTS FOR INFORMATION (RFI)

A. General:

1. Comply with requirements of Article 4 of General Conditions.
2. The Project Manager will conduct a weekly RFI status meeting with the Project Architect, Contractor, County personnel and others as deemed necessary to update the progress of reviewing RFI's.
3. Submit on form that will be distributed by the Project Manager during the preconstruction meeting.
4. Number RFI's sequentially; include date submitted.
5. Identify Project, Contractor, subcontractor, major supplier, pertinent Drawing Sheet and Detail Number, and Specification Section.
6. Specifically identify time response information is required to avoid impact on Construction Schedule and cost. The time for response should be reasonable to allow for processing and Architect review, research and response.
7. RFI's are requests for information only. If a reply to an RFI requires additional services by Architect, or will change scope of Work or Contract Time, Architect will submit Change Order Request Work Authorization.
8. Allow five (5) working days for a response after delivery to the Project Manager.
9. Request for Information shall include written and graphic solutions proposed by Contractor. The Project Manager and Architect will determine if proposal is in accord with Contract Documents and design intent of Project.
10. Contractor's failure to make reasonable effort to propose realistic solution may result in Request for Information returned with no action.
11. Maintain current and accurate Request for Information Log as follows:
 - a. Sequentially number each RFI. Indicate current status of RFI's at all times; submit log weekly, and as requested by Project Manager.
 - b. Maintain for duration of Contract.
 - c. For RFIs submitted in form of drawings follow submittal procedures specified in Section 01 33 00 Submittal Procedures.
12. Requests for Information shall be issued only for information not clearly defined in the contract documents. For those RFIs that are issued that request information that is clearly shown in the contract documents, the Architect shall be entitled to back charge the Contractor for the actual time spent responding to the RFI. The



back charge shall be deducted from the Contractor's next payment application and those funds forwarded to the Architect as compensation.

- a. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of schedules
 2. Installation or removal of temporary facilities
 3. Delivery and processing of submittals
 4. Weekly progress meetings, RFI status meetings and other project meetings as called by Project Manager
 5. Project Closeout activities

1.4 CONSERVATION

- A. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
- B. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as County's property.

1.5 STAFF NAMES

- A. Within five (5) calendar days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Project Manager, Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses, telephone and cell numbers and emergency contact numbers.

1.6 COORDINATION OF LAYOUTS

- A. Provide basic layouts of grid lines and station points on sub-floors as necessary to facilitate coordination and layout of partitions and Work at and above ceilings.

1.7 COORDINATION DRAWINGS

- A. Prepare coordination drawings before beginning fabrication or delivery of materials to the Project site. Such drawings should include, but not be limited to piping, ducts, conduit, fixtures and equipment for all utilities, and should demonstrate that such items will fit in the space available within the structure.
- B. Keep copies of the coordination drawings at the jobsite.



- C. The Project Manager and/or the Architect will verify that coordination drawings have been made but will not review the coordination drawings.

1.8 ELECTRICAL AND MECHANICAL COORDINATION

- A. Use large-scale layout drawings of the electrical, mechanical, and security electronics, together with Shop Drawings or layout drawings of other affected Work, to check, coordinate, and integrate the Work to prevent interferences.
- B. Perform and complete checking and coordination before commencing construction in the affected areas.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Verify characteristics of interrelated assemblies and equipment for compatibility. Coordinate Work having independent responsibilities for installation connection, or servicing access.
- C. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- D. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject and do not install any damaged and defective items.
- E. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- F. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Project Manager and/or the Architect for final decision.
- G. Recheck measurements and dimensions, before starting each installation.
- H. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- I. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.



- J. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Project Manager and/or the Architect for final decision.

3.2 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration prior to Final Acceptance.
- B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- D. Execute daily/weekly cleaning to keep Work, Site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- E. Provide on-site containers for collection of waste materials, debris and rubbish.
- F. Remove waste materials, debris and rubbish from site periodically and dispose of at legal disposal areas away from site.
- G. Do not allow trash containers to overflow.
- H. Clean interior spaces prior to start of finish painting and continue cleaning on as-needed basis until painting is finished.
- I. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.
- J. Each Sub Contractor:
 - 1. Clean up daily all waste materials, rubbish, and debris resulting from own operations.
 - 2. Place waste materials, rubbish, and debris from ground floor operations outside of building in an area designated by Project Manager and General Contractor.
 - 3. Place waste materials, rubbish and debris from above ground floor operations in chute provided by General Contractor.
 - 4. Oversee cleaning and ensure that building and grounds are maintained free from accumulations of debris.



5. Sprinkle dusty debris with water.
6. At reasonable intervals, minimum once a week, clean-up site and access and dispose of debris off-site.
7. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces of fixtures, hardware and equipment.
8. Repair, patch, and touch-up marred surfaces to match adjacent finishes damaged by his own operations.
9. Vacuum interior areas when ready for painting.
10. Schedule cleaning operations so that contaminants resulting from cleaning do not fall on wet painted or finished surfaces.

K. Contractor:

1. Oversee cleaning and insure that building and grounds are maintained free from accumulations of waste materials, rubbish, and debris on a daily/weekly schedule.
2. Provide and maintain a rubbish chute from upper floors to ground level.
3. Clean up all un-definable debris.
4. Remove all debris and dispose of offsite.
5. Clean all glass and aluminum surfaces.
6. Leave the work "broom clean".

END OF SECTION 01 31 13



SECTION 01 31 19 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCES

- A. Prior to commencement of Work, a pre-construction conference will be held to discuss procedures to be followed during the progress of the Work. The meeting will be scheduled after execution of the agreement and prior to commencement of work.
- B. Location: On-site.
- C. Attending shall be:
 - 1. County's Representative/Project Manager/Architect
 - 2. Contractor
 - 3. Contractor's Superintendent
 - 4. Major Subcontractors
 - 5. County's Facilities Operations' Manager
 - 6. Other's as appropriate
- D. Agenda: Following is suggested agenda. Actual agenda will be prepared and distributed by Project Manager prior to meeting:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers
 - b. Projected Construction Schedules
 - c. Critical work sequencing and reiteration of contract obligation toward meeting milestones
 - d. Major equipment deliveries and priorities
 - e. Project Coordination
 - f. Daily Reports
 - g. Designation of responsible personnel
 - h. Procedures and processing of:
 - 1. Submittals



2. Field Orders and Clarifications
3. Proposal requests and quotations
4. Change Orders and Work Authorizations
5. Applications for Payment
6. Requests for Information
- i. Procedures for maintaining Record Documents
- j. Use of premises:
 1. Office, work and storage areas
 2. County requirements
- k. Construction facilities
- l. Temporary utilities
- m. Security considerations
- n. Housekeeping procedures
- o. Insurance requirements
- p. Wage and hour compliance
- q. Conducting work in operating facility
- r. Noise control
- s. Other Subjects as appropriate

1.2 PROGRESS MEETINGS

- A. The Project Manager will schedule and hold meetings weekly. The Project Manager will prepare the Agenda for such meetings and distribute to the County representatives, the Architect, the Contractor, and other interested parties at the next successive meeting.
 1. Location: Project site or other acceptable location.
 2. Attending shall be:
 - a. County's Representative/Project Manager
 - b. Contractor



- c. Contractor's Superintendent
 - d. Subcontractors, as appropriate to the Agenda
 - e. Suppliers, as appropriate to the Agenda
 - f. Others, as appropriate to the Agenda
 - g. Architect and his professional consultants, as needed
3. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.
4. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.
 - a. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
5. Review the present and future needs of each entity present, including such items as:
 - a. Interface requirements
 - b. Time
 - c. Sequences
 - d. Deliveries
 - e. Off-site fabrication problems
 - f. Access
 - g. Site utilization
 - h. Temporary facilities and services
 - i. Hours of Work
 - j. Hazards and risks (Contractor's Responsibility)
 - k. Housekeeping
 - l. Quality and Work standards.



- m. Change Orders
 - n. Daily Reports
 - o. Documentation of information for payment requests
6. Reporting: No later than each successive meeting, the Project Manager will distribute copies of minutes of the meeting to each party present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
7. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.3 PROGRESS PAYMENT MEETINGS

- A. Schedule and hold a billing meeting each month prior to submittal of Application for Payment. Billing meetings shall coincide with last of month progress meeting, whenever possible.
- 1. Location: Project site or other acceptable location.
 - 2. Attending shall be:
 - a. County's Representative/Project Manager
 - b. Contractor
 - 3. Prepare an itemized draft of the month's proposed billing for review with the Project Manager and Architect/Engineer at the billing meeting. Refer to SECTION 01 29 00, APPLICATION FOR PAYMENT, for further requirements.
 - 4. Following review of the proposed billing, revise as required, prepare Application for Payment, and submit to the Project Manager. The Project Manager will certify and forward it to the Contract Administrator, who will authorize payment upon receipt of partial waivers of lien from the Contractor and all Subcontractors for previous payment.

1.4 PRE-PUNCH LIST MEETING

- A. After notification is provided to the Project Manager that the contractor is ready for a punch list to be generated, the Project Manager shall hold a meeting to review the expectations of the punch list.
- B. Attending shall be:
- 1. County's Representative
 - 2. Facilities Operations Representative



3. Project Manager
4. Architect
5. County's and Architect's Consultants, as appropriate
6. Contractor

1.5 FINAL CLOSEOUT MEETING

- A. Refer to the General Conditions.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01 31 19



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SECTION 01 32 16 – PROGRESS SCHEDULES AND REPORTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for the critical path method (CPM) of scheduling and reporting progress of the Work.
- B. Work under this Section shall consist of furnishing computerized Time Scaled Critical Path Method (CPM) Progress Schedule showing in detail how Contractor plans to execute and coordinate the Work; and submitting schedules, logs, updates and reports.
- C. Contractor shall have sufficient professional schedulers on staff or as sub-consultant to expand and detail the CPM Progress Schedule for all construction operations. The assigned scheduler shall be trained and experienced [minimum of five (5) years' experience with comparable size/types of construction] in compiling construction scheduling data, in analyzing schedule data by use of CPM, and in preparation and issuance of periodic reports as required. Contractor to provide resume of experience for individual or firm assigned as Project Scheduler for approval by County to County Project Manager, prior to preparing any scheduling work.
- D. The scheduler shall provide input to develop and update Project Schedules, including realistic activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, and samples/purchase/delivery of products requiring long lead-time procurement. The schedule is to be broken down into activities of three (3) weeks maximum duration, with the exception of procurement. Construction manpower shall be projected for each activity. Each activity shall be explicit in definition and location of Work. The schedule is to be updated 1) once per month, 2) whenever Work is behind schedule to an extent greater than five (5) working days, and/or 3) to add approved change order Work.
- E. Contractor shall use Primavera SureTrak Project Manager 3.0 or, Primavera Project Planner V.6 software.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions of the Contract for Construction; Article 4/ Contractor, Paragraph 4.10/ Contractor's Construction Schedule, Article 8/ Time, Article 9/ Payments and Completion and Article 12/ Changes in the Work.
- B. Document 00 73 00: Supplementary Conditions; Contract Time and Liquidated Damages.
- C. Section 01 29 00: Application for Payment
- D. Section 01 31 00: Project Management and Coordination.
- E. Section 01 33 00: Submittal Procedures.
- F. Section 01 77 00: Closeout Procedures



1.03 SCHEDULE DESCRIPTION

- A. Requirements for CPM scheduling are included to insure adequate planning and execution of the Work and to assist the County in evaluating progress of the Work economically and chronologically, and so the County can coordinate Work by others.
- B. The Contractor shall be solely responsible for establishing the schedule for the Work and shall be responsible for such schedule to be consistent with meeting the contract milestone and completion dates as established by the County.
 - 1. The Contractor shall develop a Critical Path Method Schedule demonstrating fulfillment of all contract requirements. The project schedule shall be kept current to be utilized for scheduling, coordinating, monitoring work progress, and for preparation of the monthly payment application for payment under this Contract including all Work of Subcontractors and equipment and material suppliers.
- C. Schedule shall be based on and incorporate Contract Milestone and Completion Dates specified in the Contract Documents. Schedule shall furnish or comply with the following requirements:
 - 1. Time scaled- manpower loaded CPM type schedule.
 - 2. No activity on schedule shall have duration longer than 21 calendar days, with exception of fabrication, concrete curing and procurement activities, unless otherwise approved by the County. Activity durations shall be total number of actual days required to perform that activity including consideration of weather impact on completion of that activity.
 - 3. Procurement of major equipment, through receipt and inspection at job site, identified as separate activity.
 - 4. County-furnished materials and equipment, if any, shall be identified as separate activities.
 - 5. Dependencies (or relationships) between activities.
 - 6. Processing/approval of submittals and shop drawings for major equipment. Activities dependent on submittal acceptance and/or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.
 - 7. Responsibility code for each activity corresponding to subcontractor responsibility for performing the work. Since the CPM Construction Progress Schedule is one of the Contractor's most important tools, the Contractor shall develop and provide a complete, efficient and understandable Work Breakdown Structure (WBS) code to submit to the Owner for review and approval. Suggested character fields for the code structure are:



<u>Name</u>	<u>Length</u>	<u>Description</u>
PHAS	1	Phase or stage
TYPE	4	Type of activity
FLOR	1	Floor
AREA	4	Area and/or room
RESP	7	Responsible party
SPEC	5	CSI section number
OF/CI	4	Owner Furnished/Contractor Installed Equipment

8. Allow 30 calendar days for developing punch list(s), completion of punch list items, and final inspection of Work, or designated portion thereof, by the County. No other activities shall be scheduled during this period.
9. Interface with work of other contractors (or entities).
 - a. Separate buildings and other independent project elements shall be individually identified in network.
 - b. No 'negative' lags shall be allowed in schedules.
- D. Overall time of completion and time of completion for each milestone shown on the Schedule shall adhere to the specified Contract time, unless an earlier (advanced) time of completion is requested by Contractor, agreed to by the County, and formalized by Change Order.
- E. Schedule shall be the basis for evaluating job progress, progress payments, and time extension requests. Contractor shall develop Schedule and monitor actual progress as compared to Schedule.

1.04 SUBMITTALS

- A. Interim First 90-Days Schedule: Within ten (10) calendar days after receiving Notice to Proceed, and prior to proceeding with any work on site, submit electronic copies (PDF format) and 2 prints of detailed Schedule presenting orderly and realistic plan for completion of the Work for the first 90 days, in conformance with requirements of this Section.
 1. The Interim Schedule shall reflect the following information:
 - a. Procurement, submittals, construction drawings, shop drawings, approvals, fabrication and delivery of all major and long lead equipment and material items.
 - b. Work expected to occur within the first ninety (90) calendar days of the project, consistent with meeting all established milestone and completion dates.
 - c. The Interim Schedule shall be descriptive of the work to be performed so that the Contractor, and the County can easily monitor progress of the



work. All work activities shall be manpower and will be the basis for payment during the beginning months of the project.

2. (not used)
 3. Within fifteen (15) working days after receipt of the Interim Schedule, the County will notify the Contractor of the approval or disapproval of the Interim Schedule. In the event of disapproval, the Contractor shall resubmit the schedule within seven (7) calendar days. No progress payments will be made for work in progress or completed until the Interim Schedule is approved.
 4. Acceptance of 90-Day Schedule by County, failure of 90-Day Schedule to include an element of work, or inaccuracy in 90-Day Schedule will not relieve Contractor from responsibility for accomplishing Work in accordance with the Contract.
- B. Procurement Log: Submit 2 copies of a Procurement log, cross-referenced to Schedule, including the following information for each type of material or equipment to be provided:
1. Material or equipment description.
 2. Technical specification reference.
 3. Duration in calendar days required for preparation and review of submittals.
 4. Duration in calendar days required for fabrication and delivery.
 5. Cross reference to activities which will be affected by delivery date of material or equipment item.
 6. Scheduled delivery dates.
- C. Official Contract Construction Schedule: The Critical Path Method Schedule to be prepared by the Contractor pursuant to this section will be a part of a total system for scheduling, reporting work progress, and preparing the monthly payment applications.
1. Within ten (10) calendar days after the Notice to Proceed, the Contractor shall submit to the County's Project Manager one (1) electronic copy of schedule files (in PDF format) of the complete project schedule for approval or disapproval. In the event the complete project schedule is disapproved, the Contractor shall resubmit a corrected schedule within five (5) calendar days after the Contractor receives the notice of disapproval.
 2. Should the Contract Schedule not be accepted within sixty (60) calendar days after Notice to Proceed, the Contractor may be due provisional progress payments(s) on work performed, based on the 90-Day Interim Schedule. It is the responsibility of the Contractor to reconcile such cost information and payments with the Contract Schedule. However, no payment shall be approved after the sixty (60) calendar day period, until the County has accepted the Contract Schedule.



3. The County will review submitted Schedule for conformance with requirements. Within fifteen (15) working days after receipt, the County will accept Schedule or will return it with comments. If proposed Schedule is not accepted, Contractor shall revise Schedule to incorporate comments and resubmit Schedule for acceptance within seven (7) calendar days after receiving it. Accepted Schedule shall become the Official Contract Construction Schedule and Progress Schedule.
4. Acceptance of Schedule by County, failure of Schedule to include an element of work, or inaccuracy in Schedule will not relieve Contractor from responsibility for accomplishing Work in accordance with the Contract.
5. The approved Interim 90-Day Schedule shall be incorporated into the final Contract Schedule and shall represent the initial ninety (90) calendar days of the Contract Schedule.
6. The initial submittal of the Contract Construction Schedule shall not reflect contract changes or delays. These changes shall be added within the first schedule revision.
7. The initial submittal of the official Contract Construction Schedule shall include, in addition to construction activities, the following:
 - a. The submittal and approval of construction drawings, shop drawings and materials, the procurement and fabrication of major materials and equipment, and their installation and testing.
 - b. Contract requirements dates of all or parts of the Work will be shown including all activities of the County that affect the progress of the work.
 - c. Activities of completed work ready for use by next trade, etc.
 - d. Activities relating to different areas of responsibility, such as sub-contracted Work that is distinctly separate from that being done by Contractor directly.
 - e. Different categories of Work as distinguished by craft or crew requirements.
 - f. Different categories of Work as distinguished by materials.
 - g. Distinct and identifiable subdivisions of Work such as structural slabs, beams, masonry walls or columns.
 - h. Location of Work within the project that necessitates different times or crew to perform.
 - i. Outage schedules of limiting times that existing utility services may be interrupted to construct the Project.
 - j. Items listed separately in Schedule of Values for payment purposes.



- k. Acquisition and installation of equipment and materials supplied and/or installed by County or separate Contractors.
 - l. Material stored on site.
 - m. The Contractor will be responsible for dividing the work within the Project to accommodate no durations in excess of twenty-one (21) calendar days.
8. Major Equipment/Materials: For all major equipment and materials fabricated or supplied for Project, Construction Schedule shall show a sequence of activities including:
- a. Preparation of shop drawings and sample submissions.
 - b. Review of shop drawings and samples.
 - c. Shop fabrication, delivery, and storage.
 - d. Erection or installation.
 - e. Test of equipment and materials.
 - f. Required dates of completion.
9. Construction activities are to be delineated separately for off-site sewer, site development, earthwork, utilities, roads, parking lots, fences and like Work and each building, separately.
10. The network diagrams shall clearly indicate any work that is planned to be accomplished on a work schedule other than eight (8) hours per day and forty (40) hours per week.
11. The basic concept of CPM network diagramming will be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities. The diagrams shall show a continuous flow from left to right with no right to left sequences.
12. The following information will be provided in a report for each network activity:
- a. Activity description.
 - b. Activity duration in workdays.
 - c. Working activities and General Conditions activities shall be identified separately.
 - d. Estimated man-hours for each activity.
 - e. Activity predecessors.



- f. Activity successors.
 - g. Activity logic ties.
- 13. The Contractor shall provide to the County's Project Manager his schedule data. Schedule information provided by the Contractor shall support completion dates of the contract.
- 14. Approval of schedule should not be construed as direction from the County to Contractor on how to schedule the work.
- 15. Subsequent to approval of the contract schedule, the Contractor will provide one (1) electronic copy of the network diagrams and three (3) printed copies, plus three (3) copies of all supporting documents (Contract Price, Schedule of Values, breakdown, etc.) Monthly update data will be submitted in the same form and numbers. Size of network diagrams for each sheet shall be no larger than 30 inches by 42 inches or as approved by the County.
- 16. After Completion and Acceptance of the Official Contract Schedule: The Contractor will provide initial computer reports and weekly and monthly reports thereafter, as follows:
 - a. Schedule Reports: Initial and subsequent Schedule Reports will contain the following minimum information for each activity and shall be produced at a minimum of once a month:
 - i. Activity Number;
 - ii. Activity Description;
 - iii. Estimated duration in days;
 - iv. Early and late finish dates;
 - v. Percentage of each activity completed as of each report;
 - vi. Remaining float/days behind schedule;
 - vii. Responsibility for activity;
 - viii. Current status of activity as compared to baseline schedule.
 - b. Short Interval Schedule
 - i. Short Interval Scheduling (SIS) shall be used throughout onsite construction activity.
 - ii. Interval shall be a 3-week projection and shall include week submitted and two weeks thereafter.



- iii. It shall contain sufficient detail to evaluate daily milestones and manpower/equipment loading and shall identify/tie into monthly updated Schedule.
 - iv. Short Interval Schedule shall be submitted weekly.
 - v. At weekly meeting scheduled with County, Contractor to submit Short Interval Schedules for review and discussion of upcoming construction activities.
- c. Payment Progress Reporting: Project Manager and Contractor shall select a specified time for updating the Project Schedule at the jobsite each month.
- i. The Project Manager and Contractor and his/her designated scheduling representatives will attend the meeting to review the project progress.
 - ii. The schedule shall be the basis for monthly pay requests derived from the joint review of the cost loaded schedule.
 - iii. All progress and status information provided by the Contractor shall clearly define the reporting period for which the status is provided.
- d. At the monthly progress review meeting, the Contractor will provide "actual start" and "actual completion" dates for activities that were started or completed during the reporting period. The Contractor and the County will agree upon and assign percent complete values to activities in progress. In the event of a disagreement, the County, or its designated representative, shall make the final decision as to percent completion of each activity.
- e. After joint review, County will process the Contractor's pay request based on progress from the schedule.
- i. Payment to the Contractor shall be made from the progress reflected by the Interim or the Contract Schedule.
 - ii. Receipt of an acceptable monthly update is a condition precedent to receiving monthly payment request.
- f. Time is of the Essence: Whenever it becomes apparent from the current monthly progress review that phases of Work or the Contract Completion Date will not be met, through no fault of the County, the Contractor will take the following actions with no change in the contract amount:
- i. Increase construction manpower to eliminate an adverse backlog of work.



- ii. Increase the number of working hours per shift, shifts per day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the adverse backlog of Work in coordination with all applicable Labor Codes.
17. The Official Contract Schedule as approved by the County will be an integral part of the Contract and will establish interim Contract Completion Dates or milestone dates for the various activities.
18. It is expressly understood and agreed that the failure by the County to either order the Contractor to expedite an activity or to expedite the activity by other means, pursuant to the two preceding paragraphs, shall not be considered precedent setting with respect to any other activities which may fall behind the Official Contract Schedule approved by the County; nor will it relieve the Contractor from completion of the Project Work in accordance with the Official Contract Schedule and the Contract Completion Date.
19. County's acceptance of, or its review of, comments about any schedule or scheduling data shall not relieve the Contractor from its sole responsibility to plan for, perform, and complete the Work within the Contract Time. Acceptance of or review of comments about any schedule shall not transfer responsibility for any schedule to County nor imply their agreement with (1) any assumption upon which such schedule is based, or (2) any matter underlying or contained in such schedule.
20. Failure of County to discover errors or omissions in schedules that it has reviewed, or to inform Contractor that Contractor, Subcontractors, or others are behind schedule, or to direct or enforce procedures for complying with the Contract Schedule shall not relieve Contractor from its sole responsibility to perform and complete the Work within the Contract Time and shall not be a cause for an adjustment of the Contract Time or the Contract Sum.

D. Schedule Revisions:

1. General: Revisions to the approved Construction Schedule must be approved in writing by the Project Manager and Contractor.
2. Contractor: Submit requests for revision to schedule to the Project Manager together with written rationale for revisions and description of logic for researching Work and maintaining Specific Contractual Milestone Dates listed in Contract Documents.
3. Proposed revisions acceptable to Project Manager and County will be incorporated into next update of Construction Schedule.
4. When proposed Change Order is issued which has potential to impact specified completion dates, a Time Impact Evaluation (TIE) shall be prepared by Contractor to reflect impact of such changes. After TIE has been accepted and Contractor ordered to proceed with proposed Change Order, it shall be incorporated into Schedule. No additional cost beyond that provided in the General Conditions will be allowed for incorporation of approved proposed Change Orders into Schedule.



5. Should Contractor, after acceptance of Schedule, intend to change their plan of construction, they shall submit their requested revisions to the County, along with written commentary of revision, including description of logic for rescheduling the Work, methods of maintaining adherence to intermediate milestones and other specific dates and reasons for revisions. If requested changes are acceptable to the County, they will be incorporated into Schedule in next reporting period.
- E. Acceptance: Acceptance of revised schedule by Project Manager and/or County does not relieve Contractor of meeting contractual milestone and completion dates.

1.05 RECOVERY SCHEDULE

- A. General: Should updated Construction Schedule show Contractor to be five (5) or more working days behind schedule at any time during construction, Contractor will prepare Recovery Schedule displayed on CPM schedule, at no additional costs to County. Prepare Recovery Schedule to show plan for returning to original schedule as expeditiously as possible.
- B. Schedule Preparation: Within three (3) calendar days after notice from Project Manager, prepare and submit to Project Manager a Recovery Schedule, incorporating best available information from Subcontractors and others that will permit return to Construction Schedule at earliest possible time. Prepare Recovery Schedule to same level of detail as Construction Schedule.
- C. Schedule Review: Within five (5) days after notice from Project Manager, participate in conference with Project Manager and County to review and evaluate Recovery Schedule. Submit revisions necessitated by review for Project Manager and County's approval within two (2) days of conference. Use approved Recovery Schedule for its planned duration as basis for return to Construction Schedule.
- D. Schedule Assessment: Five (5) days prior to expiration of Recovery Schedule, confer with Project Manager and County to assess effectiveness of Recovery Schedule. As a result of this conference, Project Manager will direct Contractor as follows:
- E. Behind Schedule: If Project Manager determines Contractor is still behind schedule, Project Manager will direct Contractor to prepare another Recovery Schedule for subsequent pay period.
- F. On Schedule: If Project Manager determines Contractor has successfully complied with provisions of Recovery Schedule, Project Manager will direct Contractor to return to use of Construction Schedule.

1.06 OWNERSHIP OF FLOAT

- A. Float is defined as amount of time between early start date and late start date or between the early finish date and late finish date for such activities, as depicted on Construction Schedule. Float is not for exclusive use or benefit of either County or Contractor and shall be apportioned according to project need and with the approval of the County.



1.07 TIME EXTENSIONS

- A. Contractor shall submit network window for claimed time extension requests, showing impact of claimed delay on Schedule.
- B. Float or Slack Time is the amount of time between earliest start date and late start date or between earliest finish date and latest finish date of activities of Schedule. No time extensions or delay costs will be allowed for delays caused by the County, on paths or activities containing float time, providing such delay does not exceed float time in latest updated version of Schedule.
- C. The County shall have no obligation to consider time extension request unless requirements of Contract Documents are complied with; the County shall not be responsible or liable to Contractor for constructive acceleration due to failure of the County to grant time extensions under the Contract Documents, should Contractor fail to comply with submission requirements and justification requirements of this Contract for time extension requests. Contractor's failure to perform in accordance with Schedule shall not be excused because Contractor has submitted time extension requests, until and unless such requests are approved by the County.

1.08 DAILY REPORTS

- A. Contractor shall submit Daily Activity Report to the County for each workday, including weekends and holidays, when worked.
- B. Contractor may use Contractor's own report form, provided it contains same information included in standard form furnished by the County.

1.09 PAYMENTS WITHHELD

- A. Progress Payments may be withheld in whole or in part should Contractor fail to comply with requirements of this Section.
- B. Refer to Document 00 72 00, General Conditions of the Contract for Construction.

1.10 CONTEMPORARY PERIOD ANALYSIS

- A. It is the County's desire and intent to resolve all issues affecting the Substantial Completion date in a timely, efficient, and effective manner. To achieve this goal, the County and Contractor shall participate in contemporaneous analyses of all delays and advances of the schedule by application of the Contemporaneous Period Analysis method. The Contemporaneous Period Analysis shall coincide with the monthly schedule update meetings.
- B. The logic and planning elements of the CPM schedule are the Contractor's however, assessment of impacts due to changes or other events, in accordance with the Contemporaneous Period Analysis method described herein, must be performed on the most recent accepted update of the schedule. Further, impacts due to changes or other events shall be assessed utilizing the accepted schedule update that represents the data date closest to, and just prior to, the date of the impacting event. An alternative method can be



to progress the schedule to a data date that represents the date of the impacting event. Subsequent to the assessment of schedule sequences representing the impacting events, the schedule may be updated to the next data date with appropriate logic or duration changes resulting from the impacting events. All data shall be provided to the Owner's Project Manager.

- C. While the County or Contractor might not agree in all instances as to the proper assessment of liability of delay, it is essential that both parties determine and accept the monthly update. Agreement is essential as the update becomes the baseline Progress Schedule for the upcoming period and is the schedule to be updated for the next monthly schedule update meeting.
- D. Submission of a valid monthly update and the completion of the Contemporaneous Period Analysis are conditions precedent to the review and approval of any request for an extension in the Contract Time. Failure to complete monthly updates and to participate in Contemporaneous Period Analysis will defer consideration of any time extensions by the County until the Work is completed and all as-built progress can be analyzed by the County. Further, the County will assess liquidated damages, if any, regardless of the status of any requests for time extensions pending, until any such requests are resolved.
- E. The Contractor shall obtain training by a qualified consultant in the application of the Contemporaneous Period Analysis method. The training shall be provided to appropriate Contractor field personnel, appropriate major Subcontractor personnel, and appropriate Owner personnel. The training should not exceed one day. The requirement for training may be waived by the Owner provided the Contractor can demonstrate sufficient working knowledge of the Contemporaneous Period Analysis method. The Contractor shall bear all costs for training specified herein.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 32 16



SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Timing:

1. Make submittals within the times specified herein and not all at one time. Submit in accordance with the sequence of procurement, fabrication and construction, and according to Submittal Schedule submitted to Project Manager. All submittals shall be submitted within ten (10) calendar days from Notice to Proceed, per Article 4 of the General Conditions.
2. Make submittals far enough in advance of scheduled dates of installation to allow the time required for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.

B. Related Documents:

1. Drawings and general provisions of Contract, including Document 00 72 00/ General Conditions of the Contract for Construction and Document 00 73 00/ Supplementary Conditions and other Division - 1 Specification Sections, apply to this Section.
2. Section 01 60 00/ Materials and Equipment for Product Options and Substitutions.

C. Identification:

1. Identify each submittal and re-submittal with the following information:
 - a. Project name and address as they appear on the Contract Documents
 - b. Contract name and number
 - c. Contractor's name and address
 - d. Date of submission
 - e. Numbering System: Submittals shall be identified by specification section (i.e., 02810001, 07210-001, 11191-001, etc.). Any re-submittals shall be numbered sequentially according to the original submittal section, followed by the subscript ". 1, .2, .3 submittal number (i.e., 001.1, 001.2, etc.). Submittals and re-submittals shall be kept intact with the original number. Do not add new drawing or information outside the scope of the original Submittal, unless specifically requested. Do not assign a new number for a resubmittal.
 - f. Reference: List Specification Section number and product reference as a cross reference for each submittal.



2. Identify each submittal with the following additional identification:
 - a. Contractor's stamp with initials or signature, certifying to review of submittal, compliance with Contract Documents, and coordination with other impacted work, and verification of field measurements. The Architect/Engineer will return any submittal not bearing this stamp without being reviewed.
 - b. Drawing and Specification SECTION numbers to which the submittal applies.
 - c. Subcontractor's or supplier's name and address.
 - d. Name and telephone number of the individual to contact for additional information regarding the submittal.
 - e. Whether it is an original or a re-submittal.

D. Summary:

1. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
 - a. Submittal schedule
 - b. Submittal procedures
 - c. Daily construction reports
 - d. Shop Drawings
 - e. Product Data
 - f. Samples
 - g. Manufacturer's' instructions
 - h. Manufacturers' certificates
2. Administrative Submittals: Refer to other Division - 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - a. Permits
 - b. Applications for payment
 - c. Performance and payment bond



- d. Insurance certificates
 - e. List of Subcontractors
 - i. The Schedule of Values submittal is included in Section 01 29 00 Applications for Payment.
 - ii. CPM Schedule: As specified in Section 01 32 16, Construction Progress Schedules and Reports.
 - iii. Inspection and test reports are included in Section 01 40 00 Quality Control and Section 01 45 29 Testing Laboratory Services.
- E. Coordination of Submittals:
- 1. General: Prior to submittal for the Engineer's or consultant's review, as applicable, fully coordinate material as follows:
 - a. Determine and verify field dimensions and conditions, materials, catalog numbers, and similar data.
 - b. Coordinate shop drawing submittals with previously issued Addenda and Information Bulletins.
 - c. Coordinate with the various types of Work and public agencies involved.
 - d. Secure necessary approvals from public agencies and others and signify by stamp, or other means, that approvals have been secured.
 - e. Unless otherwise specifically permitted by the Engineer, make submittals in groups containing all associated items.
 - 2. Completeness: Submittals shall be complete; partial submittals will be rejected for not complying with the Contract Documents.

1.02 SCHEDULES

- A. Submittal Schedule: Include submittal date and date required for return for each submittal required by the Contract Documents. No action will be taken on such submittals without prior receipt, review, and acceptance of Submittal Schedule.
- 1. Prepare a complete schedule of submittals. See Article 4.12 of the General Conditions for additional information. The schedule is to identify every item on which the contractor intends to provide a submittal whether or not it is required specifically in the contract documents.

NOTE: Some submittals maybe required within the first ten calendar days of the Notice to Proceed due to the sequence of Work. Contractor to review statutes and contract documents.



2. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
3. Prepare the schedule in chronological order. Provide the following information:
 - a. Scheduled date for the first submittal
 - b. Related Section number
 - c. Event Number associated with CPM Construction Schedule
 - d. Submittal category
 - e. Name of subcontractor
 - f. Description of the part of the Work covered
 - g. Scheduled date for re-submittal
 - h. Scheduled date the Engineer's final release or approval
- B. Distribution: Following response to initial submittal schedule, print and distribute 3 copies and an electronic file (pdf) to the Project Manager. Contractor is responsible to coordinate their subcontractors in accordance with schedule provided to Owner. Post copies in the Project meeting room and field office.
 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting. Instruct recipients to report promptly any problems anticipated by dates or sequences shown in schedule.

1.03 SUBMITTALS PROCEDURES

- A. Coordinate preparation and processing submittals with performance of construction activities.
 1. Make submittals in groups containing associate items to ensure that information is available for checking each item when received.
 - a. Partial submittals may be rejected as not complying with requirements of Contract documents and Contractor shall be liable for any resulting delays.
 2. Requests for deviation from Contract Documents shall be submitted for consideration before submittal of affected items. Only deviations, which have been previously accepted in writing, shall be included in submittals.



- B. Place permanent label or title block on each submittal for identification. Indicate name or entity preparing each submittal in label or title block. See Paragraph 1.01.C herein for further information requirements on each submittal label or title block.
1. Provide space on label or beside title block to record Contractor's and Engineer's review markings and action taken.
- C. Contractor's Review:
1. Review submittals for accuracy, completeness, and conformity with Contract Documents.
 - a. Submittal shall be construed as stipulating Contractor has thoroughly and completely reviewed and coordinated data.
 - b. Submittals that indicate less than Contractor's full compliance will be returned without action.
 - c. Delays caused by failure to comply will not be acceptable basis for extension of Completion Time.
 2. Certify submittals have been reviewed and coordinated by adding following affidavit to each submittal:
"The undersigned certifies this submittal has been reviewed, approved, and coordinated in compliance with requirements of Section 01 33 00 of the Project Manual."
Signature _ Date__
Name Printed _ Title__
 - a. Submittals not certified by being stamped and signed by Contractor will be returned without action, as will submittals which, in the Project Manager or Architect's opinion, have not been adequately reviewed and coordinated by the Contractor.
- D. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
- E. Package each submittal appropriately for transmittal and handling.
- F. Project Manager / Architect's Review:
1. Submittals are reviewed for general conformance with design concept and general compliance with information given in Contract Documents only.
 2. Review of separate item shall not indicate acceptance of assembly of which item is part.
- G. Review shall not relieve Contractor from responsibility for errors or deviations from requirements of Contract Documents.



- H. Submittal Log: Maintain accurate submittal log for duration of Contract. Indicate current status of all submittals at all times. Make submittal log available for the Project Manager's review upon request.
- I. Re-submittals:
 - 1. Subject to same terms and conditions as original submittal.
 - 2. Project Architect will accept not more than one re-submittal.
 - a. Should additional re-submittals be required; Contractor shall reimburse County for Project Manager/Architect's account for time spent in processing additional re-submittals at rate of 2.5 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Project Manager/Architect's personnel engaged on Project and portion of costs of mandatory and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.
 - 3. Claims will not be considered for Contractor's additional time or expense associated with re-submittals.
- J. Revisions:
 - 1. Make only those revisions required or accepted by Project Manager/Architect.

1.04 DAILY CONSTRUCTION REPORTS

- A. Prepare daily construction reports to record: manpower of the general contractor and each onsite subcontractor, a summary of progress, high & low temperature, precipitation, contract days expended, CPM activities performed and percent complete for each activity, and other pertinent information. Prepare one report for each workday. Submit the report of the previous day no later than 8:00 am the following workday.

1.05 SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND OTHER SUBMITTALS

- A. General:
 - 1. Submit only as required by the various Specification SECTIONS. Do not submit shop drawings, product data, samples or other submittals, unless specifically required.
 - 2. Submit in accordance with the accepted submittal schedule. Send copies of transmittals to the County.
 - 3. Submit in the manner and quantities specified hereinafter.



4. Allow a minimum of 10 working days for processing by the Project Manager/Architect and his consultants, as applicable. Some submittals may require more processing time based upon consultant's input and the complexity of the submittal. If certain submittals are critical, they should be so identified at time of submission. If a specific submittal cannot be reviewed and returned within 10 working days, the Architect will develop with the Project Manager and Contractor a timely "turn-around" that will not impact the construction schedule.

B. Shop Drawings:

1. Submit PDF electronic files of shop drawings.
2. The Project Manager/Architect or his consultants, as applicable, will review the Shop Drawings; mark the PDF drawings with required revisions; stamp the drawings and indicate "No Exceptions Noted," "Make Corrections Noted," "Revise and Resubmit," or "Rejected," and return the drawings. "Revise and Resubmit" or "Rejected" stamps shall not be construed by the Contractor as a valid reason for an extension of time.
3. Contractor shall review the returned drawings and take appropriate action as indicated.
 - a. If drawings are marked "Revise and Resubmit," make revisions and indicate them with a "cloud," stamp and date, and resubmit in the same manner and number as for the original submittal. Contractor may not proceed with work represented in submittal. Resubmit until "No Exceptions Noted," or "Make Corrections Noted" status is given.
 - b. If drawings are marked "Rejected," make a new submittal and submit in the same manner and number as for the original submittal.
 - c. If drawings are marked "No Exceptions Noted" or "Make Corrections Noted", print and distribute copies for County and Inspector, as well as those required for Contractor and Subcontractors. Contractor may proceed with work represented in submittal. Project Manager/Architect's review is not conducted for the purpose of determining the accuracy or completeness of other details, such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment and systems, all of which remain the responsibility of the Contractor.
4. The Project Manager/Architect or his consultants, or the County's consultants, as applicable, may review at their discretion up to one re-submittal and take action, as appropriate, in the same manner as for the original submittal. If more than one re-submittal is required, any associated costs as a result of additional reviews shall be an extra service of the Project Manager/Architect, or his consultants or the County's consultants, as applicable, and will be processed as a deductive Change Order in accordance with the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.



5. As with the original submittal, review the returned drawings and take appropriate action as indicated. As specified hereinabove, resubmit and revise until final action by the Architect/Engineer or his consultants, or the County's consultants, as applicable. Final action is signified by the markings "No Exceptions Noted," or "Make Corrections Noted," on the returned drawings.
6. Following final action by the Project Manager/Architect or his consultants, or the County's consultants, as applicable, the Contractor shall make copies and distribute as required for accomplishment and inspection of the indicated Work. Provide electronic PDF copies of approved shop drawings for the County's records.
7. Only those Shop Drawings that bear stamps showing final review of the Contractor, Project Manager/Architect, or its consultants, or the County's consultants, as applicable, shall be used.
8. Reproduction and Mailing Costs: The Contractor shall pay the reproduction and mailing costs of all prints relating to submittals required by contract documents.
9. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
 - a. Preparation of coordination Drawings is specified in Section 01 31 13 Contractor Coordination and may include components previously shown in detail on Shop Drawings or Product Data.
 - b. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

C. Product Data:

1. Submit in electronic format (pdf) brochures, catalog cuts, and similar material as required by contract document.
2. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
 - a. Mark electronic copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - i. Manufacturer's printed recommendations



- ii. Compliance with recognized trade association standards
 - iii. Compliance with recognized testing agency standards
 - iv. Application of testing agency labels and seals
 - v. Notation of dimensions verified by field measurement
 - vi. Notation of coordination requirements
 - c. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. Review and processing of Product Data shall be the same as that for Shop Drawings.

D. Samples:

1. Submit in the size specified in the individual Specification Sections, with 3 samples to be returned to the Contractor, together with three additional Samples, which will be retained by the Project Manager/Architect or his consultants, or the County's consultants, as applicable.
2. Ship samples to the Project Manager's on-site office, carriage prepaid. Samples to be returned to the Contractor will be shipped, carriage collect.
3. Submit samples to illustrate functional and aesthetic characteristics of Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
4. Preliminary Submittals:
 - a. Unless precise color, pattern, and texture or similar characteristics are specifically described, submit full set of choices for material or product.
 - b. Preliminary submittals will be reviewed and returned with Project Manager/Architect's mark indicating selection and other action.
 - c. Project Manager/Architect reserves right not to make individual determination or selections until all samples of all materials are submitted.
 - d. Submit samples of all selected colors, patterns, textures or other similar characteristics as selected by Project Manager/Architect.
5. Submit number of samples required by Contractor plus three that will be retained.
 - a. Where variation in color, pattern, texture or other characteristics are inherent in material or product, submit multiple units (not less than 3), that show approximate limits of variations.



- b. Accepted samples will form standard of comparison for finished Work.
 - c. Defects, and deviations in excess of those in accepted samples, are unacceptable and are subject to rejection of completed Work.
 - 6. Include identification on each sample, with full Project information, including:
 - a. Project name and location
 - b. Manufacturer and supplier
 - c. Name, finish, and composition of material
 - d. Location where material is to be used
 - e. Specification Section number.
 - 7. Reviewed samples which may be used in the Work are indicated in individual specification sections.
 - 8. Field Samples: Provide field samples as required by individual sections. Install samples in locations as directed, completed and finished.
- E. Other Submittals: Submit as specified in the individual Specification Sections.

1.06 MANUFACTURERS INSTRUCTIONS

- A. When specified in individual Sections, submit PDF's of manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.07 PATTERNS AND COLORS

- A. Unless the exact pattern and color of a product are indicated in the Contract Documents, whenever a choice of pattern or color is available for a product, submit 3 hard copies, not PDF's of accurate color charts and pattern charts to the Project Manager/Architect for his review and selection.

1.08 CERTIFICATES OF COMPLIANCE

- A. Submit certificates of compliance with the associated Shop Drawings, Product Data, Samples, and other submittals required for the product.
- B. Submit on 8-1/2-inch-x-11-inch white paper and electronic file (pdf).
- C. Submit three copies.
- D. Submit in form of letter or company standard forms, signed by officer of manufacturer.



- E. Each certification shall include the following:
 - 1. Project name and location
 - 2. Contractor's name and address
 - 3. Quantity and date or dates of shipment or delivery to which certificate applies
 - 4. Manufacturer's name
- F. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- G. Certificates may be recent or previous test results on material or product but must be acceptable to Project Manager/Architect.
- H. The Project Manager and Architect will retain the certificates of compliance; no review reply is intended.

1.09 DEFERRED APPROVAL

- A. See sheet G002, for applicable items that require Deferred Approval.
- B. Submit a minimum of five (5) sets of full-size drawings, calculations, product data, samples, etc. for review by the County Building Department or 'deferred' Agency. All drawings and calculations must be "wet stamped" and signed.
- C. Allow a minimum of three (3) weeks for County Building Department or 'deferred' Agency to review.
- D. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 33 00



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SECTION 01 35 53 - PROJECT SECURITY PROCEDURES

PART 1 - GENERAL

1.01 GENERAL

- A. The following special requirements are applicable to this project; hereinafter referred to as “Institutions”. Security regulations include, but are not limited to, the given provisions in this Section.
- B. All contractors are required to have assigned County badge and worn at all times. Contractor to provide names for all Contractor’s Employees anticipated to be working on this project. Badge process takes approximately 3-5 working days.
- C. Background checks will be required for certain contractors that will access the Justic Center Detention Facility. Contractor is required to provide separate list of Names, Dates of Birth, Social Security Numbers, and Driver’s License Numbers for all of the Contractor’s Employees anticipated to be working in these secured spaces for verification against the Department of Justice and Department Database no later than five calendar days from Notice to Proceed. Background checks take approximately 3-4 weeks.
- D. The Contractor shall meet with the Project Manager prior to beginning any work on-site to review the applicable security procedures and develop a Security Requirements Plan that can be used to communicate the Project Security Procedures to all personnel that will be on-site or who will visit site during the construction of this Project. The Contractor will be required to designate one of their on-site personnel to represent the Contractor, monitor and implement the Security Requirements Plan.

1.02 USE OF PROPERTY

- A. Contractor shall confine work operations to the areas of work indicated on the Drawings. Material storage, fabrication facilities, and the like, shall be located as near to the working areas as custodial regulation permit.
- B. The Project Manager will designate an appropriate material storage, tool storage or shop facility area, and the like – refer to Section 01 11 00/ Summary of Work for the Contractor’s laydown/staging area.

1.03 CONTRACTOR'S WORKERS CLEARANCES AND IDENTIFICATION

- A. The verification process to get personnel 'cleared' through background checks can take up to approximately 3-4 weeks; Contractor shall work to provide this information to the Project Manager as quickly as possible to ensure that assigned personnel can access and work on site.
- B. Workers will be required to wear identification at all times in the CAC campus. They will be allowed to park their private vehicles in designated construction parking areas, as directed by the Project Manager. Refer to Section 01 11 00/ Summary of Work.



- C. No firearms, ammunition, narcotics, pepper sprays, chemical agents, knives, drugs, intoxicants, handcuffs, handcuff keys, alarm keys, cameras, audio recording devices or explosives will be allowed on the premises. All persons shall remove ignition keys from their vehicles and lock the vehicle when it is not in use.
- E. Construction personnel will not be permitted into areas beyond the scope of the project without being escorted at all times by a County staff.
- F. Workers may be in the same vicinity of public at times.
- G. Within 5 calendar days from Notice to Proceed, Contractor shall provide a 'priority' list of personnel who will be working on Project site upon commencement of work. Lists of other personnel will follow based on the Project Schedule. Contractor shall provide one-week notice of changes or additions in personnel as such changes or additions occur.
 - 1. Listing shall include the following information (for “standard” County badge):
Name
 - 2. Listing shall include the following information (for “security clearance” County badge – which requires background check):
Name
Driver's License Number
Social Security Number
Date of Birth
- 2. Prior arrest/conviction record may or may not affect the eligibility of a worker. The Institution (District Attorney) will be the approval authority in each individual case. The Institution stresses that Contractor's personnel should be as truthful and divulging as possible to assist in these decisions. Information about work arrest/conviction records will be kept confidential.
- 3. Allow 3-4 weeks for security clearance, prior to new employee being permitted on Project site. Workers are subject to eviction from Institution at any time when a question of security clearance arises. Eviction for this reason is not a statement as to the character of the employee being evicted. Allow 5-10 days to verify security clearance where a question has arisen. Workers may be removed from clearance status at any time at the discretion of the Institution.

1.04 WORK HOURS

- A. Refer to Section 01 11 00/ Summary of Work, Part 1.02D for work hours. However, the County shall reserve the right to adjust start/quit times in the best interest of the Project.
- B. Contractor shall make special arrangements for overtime work with the Project Manager at least 48 hours in advance. No overtime will be allowed unless prior approval has been obtained.

1.05 SECURITY



- A. If County deem it necessary to declare a "State of Emergency", work may be curtailed or terminated for the duration of said emergency. Contractor shall be aware that events of this nature are considered potentially everyday occurrences on project sites of this nature. Requests for additional compensation for occurrences of the aforementioned type will not be considered.
- B. All persons shall remove ignition keys from their vehicles when they are out of the vehicle. Contractor's equipment shall be rendered temporarily inoperative when not in use; by locking or other means.
- C. In order to maintain CAC grounds security, inspection searches on the project site may become necessary; therefore, keys shall be furnished to provide access to all locked areas or places on the project site and for periodic fire prevention inspection. The County will not be responsible for Contractor's loss due to fire and/or theft.
- D. Personal search is not normally required. However, the County reserves the right to search workers when there is probable cause, as determined by the County.

1.06 HOSTAGES

- A. The Solano County has a no hostage policy and hostages will not be recognized for bargaining purposes. The Contractor is to communicate this to all personnel that will come on site.
- B. Responsible subcontractor personnel and other designated personnel shall attend security briefing at Pre-construction Meeting.

1.07 REMOVAL OF DEBRIS

- A. Debris, waste materials, and other trash resulting from work of this project, shall be disposed of regularly per Section 01 74 19, Construction Waste Management. Disposal shall be off of County property and Contractor shall pay fees required for use of public dumps. Burning on County property is prohibited. Arrangements for outside waste companies to enter CAC grounds to pick-up/drop-off dumpsters shall be made with the Project Manager.

1.08 CAMERAS AND AUDIO OR VISUAL RECORDING DEVICES

- A. Cameras and other Audio or Visual Recording Devices may be allowed with written approval and arrangements with Project Manager. Protocol will be discussed with Contractor at Pre-construction meeting. Contractor shall obtain approval from Project Manager prior to use of such devices within CAC grounds.

END OF SECTION 01 35 53



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SECTION 01 40 00 - QUALITY CONTROL AND QUALITY ASSURANCE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control and quality assurance.
- B. Quality assurance includes the planned and systematic activities implemented in a quality system so that quality requirements for a product or service will be fulfilled.
- C. Quality control includes inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Project Manager, County Inspector or the Architect/Engineer.
- D. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- E. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover-production of standard products as well as customized-fabrication and installation procedures.
 - 2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
- F. Requirements for the Contractor to provide quality control services required by the Project Manager, Architect/Engineer, County, or authorities having jurisdiction are not limited by provisions of this Section.

1.03 QUALITY CONTROL RESPONSIBILITIES

- A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the County's responsibility, or are provided by another identified entity. Costs for these services shall be included in the Contract Sum.



1. The Contractor shall employ and pay an independent agency, to perform specified quality control services, and quality control services required by laws, rules, regulations, and regulatory authorities.
 2. The County will engage and pay for the services of an independent agency to perform inspections and tests specified as the County's responsibility.
 - a. Where the County has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the County, unless otherwise agreed in writing with the County.
 3. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
 - a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.
 4. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
 - a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 - b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
 - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 - d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 - e. Security and protection of samples and test equipment at the Project site.
- B. Duties of Testing Agency: The independent testing agency engaged by the Contractor to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections and by applicable laws, rules, and regulations; shall cooperate with the Project Manager, County, Inspector and the Architect/Engineer and Contractor in performance of its duties and shall provide qualified personnel to perform required inspections and tests.



1. The agency shall notify the Project Manager, Architect/Engineer, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve of or accept any portion of the Work.
 3. The agency shall not perform any duties of the Contractor.
- C. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.04 QUALITY CONTROL SUBMITTALS

- A. The County's and Contractor's independent testing agencies shall submit a certified written report of each inspection, test or similar service, to the Project Manager, the Architect/Engineer and the Contractor, in duplicate.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 2. Report Data: Written reports of each inspection, test or similar Service shall include, but not limited to:
 - a. Date of issuance
 - b. Project and title number
 - c. Name, address and telephone number of testing agency
 - d. Dates and locations of samples and tests or inspections
 - e. Names of individuals making the inspection or test
 - f. Designation of the Work and test method
 - g. Identification of product and Specification Section
 - h. Complete inspection or test data
 - i. Test results and interpretation of test results
 - j. Ambient conditions at the time of sample-taking and testing



- k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
- l. Name and signature of laboratory inspector
- m. Recommendations on retesting

1.05 TESTING AGENCY QUALIFICATIONS

- A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.
- B. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

1.06 TEST SELECTION

- A. The Contractor shall be responsible for, and shall pay for, all off-site and on-site tests except tests on the following materials/installations:
 - 1. Concrete
 - 2. Grout
 - 3. High-strength bolting
 - 4. Structural welding (shop and field)
 - 5. Reinforcing steel
 - 6. Bolts installed in concrete.
 - 7. Expansion and epoxy anchors
- B. The Contractor shall notify the Project Manager in writing (3) three working days in advance of time for the above-named tests.

1.07 FIELD MOCK-UPS

- A. Specific requirements for field mock-ups are specified in the individual specifications Sections.
- B. Submit field mock-ups a minimum of fourteen (14) days prior to installation of work.
- C. No installation or application until the field mock-up is approved.



- D. Submit schedule for field mock-up construction, show date and relationship to County accepted contract schedule.
- E. Construct field mock-ups in location as approved by the County representative.
- F. County and Architect/Engineer representatives will review the field mock-ups for conformance with the requirements of the contract documents.
- G. Modify or replace field mock-up until mock-up is approved.
- H. Approved field mock-ups:
 - 1. Must remain until the remainder of the Work of the Section requiring field mock-up is complete
 - 2. Will be used as the standard of acceptable quality for the remainder of the Project.
 - 3. May be incorporated into the work at the discretion of the County Representative.
 - 4. Must be removed at the completion of the Work of that Section when required by Section or when not incorporated into the work.

1.08 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. Observer's Qualifications:
 - 1. Submit qualifications of observer to the County thirty (30) days in advance of required observations.
 - 2. Observer subject to approval of the County.
- B. Observer to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

1.09 INSPECTIONS

- A. Contractor shall participate in and make work available for First-Delivery Inspections, First Equipment in Place inspections, Benchmark Inspections, Closure inspections, Start-up and Turnover Inspections.

1.10 QUALITY ASSURANCE RESPONSIBILITIES

- A. Contractor Responsibilities: Appoint a Responsible Party to participate in the QA and QC activities identified, including providing immediate response and correction of deficiencies. Participate in QA/QC meetings including kick-off and pre-installation meetings.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION



1.01 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements per "Cutting and Patching."
- B. Protect construction exposed by or for quality control service activities and protect repaired construction.
- C. Repair and protection are the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01 40 00



SECTION 01 42 00 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the General Conditions.
 - 1. Indicated refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.
 - 2. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Project Manager/Architect", "requested by the Project Manager/Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Project Manager/Architect's responsibility into the Contractor's area of construction supervision.
 - 3. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
 - 4. Regulation: The term "Regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.
 - 5. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
 - 6. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
 - 7. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."
 - 8. Installer: An "Installer" is the Contractor, or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.



9. Unless otherwise indicated, the term "experienced," when used with the term "Installer" means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.
10. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other construction activities as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.
11. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 17-Division format and MASTER FORMAT numbering system.
- B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and where the full context of the Contract Documents so indicates.
 2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
 - a. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.
- C. Assignment of Specialists: The Specification requires that certain specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
 1. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.



2. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

1.4 DRAWING SYMBOLS

- A. Graphic symbols: Where not otherwise noted, symbols are defined by "Architectural Graphic Standards," published by John Wiley & Sons, Inc., eighth edition.
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical Drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, they are supplemented by more specific symbols recommended by technical associations including ASME, ASPE, IEEE, and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

1.5 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.
- B. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of these specifications.
- C. Updated Standards: At the request of the Architect/Engineer, Contractor, or authority having jurisdiction, submit a Change Order Request where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected. The Architect/Engineer will decide whether to issue a Proposal Request to proceed with the updated standard.
- D. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect/Engineer for a decision before proceeding.
- E. Minimum Quantity or Quality Levels: In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to the Architect/Engineer for a decision before proceeding.



F. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

G. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.6 GOVERNING REGULATIONS/AUTHORITIES

A. The Architect/Engineer has contacted authorities having jurisdiction where necessary to obtain information necessary for the preparation of Contract Documents; that information may or may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

Copies of Regulations: Obtain copies of applicable regulations and retain at the Project Site, available for reference by parties who have a reasonable need for such reference.

1.7 SUBMITTALS

A. Permits, Licenses, and Certificates: For the County's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 00



SECTION 01 51 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Contractor shall use a separate mailing address from the Project for all USPS/UPS/FedEx or other delivery services for mail and package deliveries. No deliveries will be accepted at the existing facility under any circumstances.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00/ General Conditions of the Contract for Construction.
- B. Section 01 31 00/ Project Management and Coordination
- C. Section 01 33 00/ Submittal Procedures
- D. Section 01 35 53/ Project Security Procedures
- E. Section 01 74 19/ Construction Waste Management
- F. Section 01 77 00/ Closeout Procedures.

1.03 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Project Manager, Architect, County representatives, testing agencies, and authorities having jurisdiction.
- B. Water Service: Water from County's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service: Electric power from County's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.04 CONSTRUCTION EQUIPMENT

- A. Erect, equip, operate, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, rules, and regulations of authorities having jurisdiction.
- B. Provide and maintain scaffolding, staging, runways, and similar equipment, as needed.



- C. Provide and maintain hoists and related lift equipment, including equipment for hoisting workmen; complete with operators, power and signals, as required (per Safety Orders of State of California, Division of Industrial Safety) until completion of the Work under this Contract or until no longer required on jobsite.

1.05 SAFETY PRECAUTIONS

- A. Provide and maintain barricades, fencing, shoring, pedestrian walkways, including attached lights, other lights, and other safety precautions to properly guard against personal injury and property damage as prescribed by authority having jurisdiction. (See also 00 72 00/ General Conditions of the Contract for Construction, Article 10.).
- B. In addition, Contractor for Work under this Contract shall provide such additional safety precautions as may be prescribed by the County of Solano. Fully inform each subcontractor and material supplier as to requirements of applicable Safety Orders. (See document 00 72 00/ General Conditions of the Contract for Construction, Article 10, Protection of Persons and Property).
- C. Attention is directed to Safety Orders issued by the State of California, Division of Industrial Safety. Contractor shall obtain and post copies of Safety Orders applicable to type of work to be performed and shall be governed by requirements thereof in construction operations.

1.06 ROADS AND ACCESSWAYS

- A. Entrance to Work Site: There is very limited access for the site. Contractor and Contractor's employees and subcontractors shall use certain access roads or entranceways as indicated on Plans or as directed by County. Contractor will be required to maintain all existing access to the existing facility to ensure complete, uninterrupted operations.
- B. Maintain these roads in satisfactory condition during Contract time, and repair damages attributable to Work of this Project at intervals as needed. Contractor shall inspect roads after each rainfall measuring more the 0.10" and resurface as necessary. At completion of Contract, roads and entrance ways shall be left in condition at least equal to that existing at start of Contract, except as may be otherwise required by Contract documents.
- C. Permanent Improvements: Where Contract calls for permanent sidewalk, road, and other ground improvements, and when such permanent improvements are completed, or essentially completed within construction period, Contractor does not have vested right to use such improvements as temporary facilities.
- D. Contractor shall retain responsibility pursuant to 00 72 00/ General Conditions of the Contract for Construction. Use of permanent improvements by Contractor shall be subject to approval by County.

1.07 USE OF COUNTY PROPERTY

- A. On Site Storage and Work Areas: The County will allocate available on-site storage and work areas to Contractor, subject to change as may be necessary by job progress, such as site development or other intervening work.



- B. County Property: Except as otherwise shown or specified, Work operations shall be confined to County property and shall not encroach on areas other than those designated or approved for such use by County. (See 00 72 00/ General Conditions of the Contract for Construction, Paragraph 3.14.).
- C. Ascertain, observe, and comply with rules and regulations in effect at occupied County facilities, including, but not restricted to, parking and traffic regulations, security restrictions, hours of allowable ingress and egress as to main arteries, occupied buildings, and the like.
- D. Use of Sidewalks and Streets: Contractor shall not make use of sidewalks and streets adjacent to the entrance to the Project site.
- E. Parking and Traffic Regulations: All parking for this Project shall be confined to the Project site and within the 'Limits of Work' area. Contractor, subcontractors, material delivers, visitors, County personnel and consultants, and other parties shall not park on the existing facility site.
- F. Existing Improvements in sidewalks and Streets: Existing street signs, electroliers, traffic signage, fire hydrants, underground valves and meter boxes, manholes, trees and other items occurring in sidewalk areas or in streets adjacent to the Project shall be left undisturbed, unobstructed, and easily accessible at all times during construction, except as otherwise indicated or agreed to between Contractor and County.
- G. Covering, moving, trimming, or altering which may become necessary to complete construction operations shall be done only with consent of and in cooperation with County and others having jurisdiction. Contractor shall pay all costs, which may be incurred.
- H. Contractor shall make detailed examination of such adjacent property at start of work and conditional shall be noted by Contractor and confirmed by the County.
 - 1. Contractor, if damaged by this work, shall repair public and private streets, sidewalks and curbs, and other existing improvements therein adjacent to the site, at intervals as required to keep improvements functional. At completion of Project, all such items not include in Contract shall be left in condition equal to that at start of construction.
 - 2. Repair work shall conform to requirements of public authorities having jurisdiction. This includes, but not limited to, temporary walks for pedestrians, cleaning of mud and debris, air pollution control, and traffic control.
- I. Protection of County-Owned Trees and Shrubs: Existing County-owned trees and shrubs to remain shall not be injured during the course of this Work.
 - 1. Irrigate trees and shrubs, which are to remain within 'Limits of Work' area, as directed by County.



2. It is agreed that the Contractor shall replace each damaged tree or shrub with like species and size should any tree or shrub be injured or damaged as a result of construction operations of the Project.

J. Protection of Existing Utilities: Utility service lines found entering site and not indicated to remain or to be incorporated in the facility/site, shall be plugged, capped, or otherwise abandoned by Contractor in a manner satisfactory to Utility Companies whose services are involved, except as otherwise required. See Section 00 72 00/ General Conditions of the Contract for Construction, Article 10, Protection of Persons and Property.

K. Protection of Existing Utilities: Protect from damage, existing utility lines not specified to be altered by Work of this Contract; any such features damaged shall be repaired or replaced to condition equal to that existing prior to commencing work of this Contract. See Section 00 72 00/ General Conditions of the Contract for Construction, Article 10, Protection of Persons and Property.

1.08 PROJECT IDENTIFICATION AND SIGNS

(not used)

1.09 CLEAN UP AND DISPOSAL OF TRASH

- A. Contractor is directed to Section 00 72 00/ General Conditions of the Contract for Construction, Article 4.15, Cleaning Up. Keep work and storage areas clean and free of rubbish and perform protective and clean-up work within one day of being notified by County.
- B. Dispose of trash resulting from work, off County property, as it accumulates. Pay fees required for trash disposal. No burning on County property is allowed.
- C. Refer to Section 01 74 19/ Construction Waste Management for related requirements that apply.

1.10 NOISE AND DUST ABATEMENT

- A. Perform any noisy operations outside of regular working hours; include 'extra' cost in Bid Price. Such work shall be done at times convenient to County and shall be approved by County at least 72 hours in advance.
- B. Control dust resulting from all construction operations by localizing it to the greatest practicable extent using temporary fencing, partitions, curtains, or other means which will prevent spread of dust beyond immediate work areas. Duct openings and other openings communicating with other portions of building or systems shall have effective temporary closures.
- C. Use water wagons or spray from hoses to control dust created by outdoor work operations in areas on County property and within the 'Limits of Work' during the entire period of this Contract as directed by the County; also, satisfactory control dust created by construction operations on property used, other than County property, to satisfaction of County and other responsible parties.



D. (Not used)

1.11 TEMPORARY UTILITIES SERVICES PURCHASED FROM UTILITY COMPANIES

(Not used)

1.12 SANITARY FACILITIES FOR WORKERS

(Not used)

1.13 TEMPORARY WATER

(Not used)

1.14 TEMPORARY ELECTRICAL FACILITIES

- A. Provide such temporary electrical facilities as are necessary to supply temporary lighting for all work operations (inside and outside of building) and temporary power for portable power-driven tools and other Contractor equipment.
- B. Construction Requirements: Construct and maintain temporary electrical facilities in accordance with CCR, Title 24, Part 3, Basic Electrical Regulations, all local codes and PG&E rules and regulations. Materials, devices, and equipment used for these facilities shall be in good and safe condition.
- C. Temporary electrical materials and equipment furnished and installed by Contractor for required facilities.

1.15 TEMPORARY HEAT

- A. Provide and pay all costs for temporary heat, including equipment, fuel, and operators, which may be required during Contract time to provide adequate temperatures for storage, installation, application, and drying of installed materials.
- B. Provide temporary closures for windows and doors, and temporary general building ventilation, for proper storage and drying of materials and safe working conditions.
- C. Areas in which wood finishes, gypsum wallboard or other temperature sensitive materials will be stored or installed shall be properly ventilated and, if necessary, heated until ambient temperature is maintained, day and night/ 24 hours, between 60 and 70 degrees F for at least 10 days immediately prior to start of installation and continuing thereafter until final acceptance of Project.
- D. Use of permanent heating for temporary heating: Permanent heating system shall not be used for temporary heat until it has undergone operational testing, commissioning and is approved by the County. No demand shall be made by the Contractor for use of permanent heating for temporary heating, except with consent of County and by agreement in writing for use mutually acceptable to County and Contractor.



- E. Operation and maintenance: Provide operator, maintain permanent heating system, and continue to do so during entire time temporary heat is required, and until entire Work of this Contract is accepted by County. Maintenance shall include replacement of filters and other dispensable items. Refer to technical specifications for requirements relating to the replacement of filters and other items used during temporary heating operations.
- F. Payment for use, including cost of fuel, operators, and maintenance for permanent heating system shall be borne by Contractor until acceptance of Project by County.

1.16 SECURITY

- A. Contractor is responsible for security of buildings and grounds within the 'Limits of Work' involved in this Project, including other subcontractors and County facilities, during entire time of Contract. Make good all damages to work and loss of materials due to vandalism or theft, within this responsibility.

1.17 DEWATERING FACILITIES

- A. Provide and maintain dewatering and pumping facilities to keep site reasonably dry, and to protect materials and installed work from water damage until dewatering is no longer required.

1.18 MITIGATION MONITORING PROGRAM

(Not Used)

1.19 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel in areas designated by the County.

1.20 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.21 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.01 MATERIALS



- A. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Provide galvanized steel bases for supporting posts.

2.02 TEMPORARY FACILITIES

- A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.03 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with the public and performance of County staff. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in 01 11 00/ Summary Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. (Not used)
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.



- D. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
 - 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- E. (Not used)
- F. Heating and Cooling: Provide temporary heating and cooling required by construction activities in order to maintain ventilation and temperature in the human comfort zone at public and staff areas. Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- H. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
- I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead, unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- K. Telephone Service: Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- L. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail.

3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:



1. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. (Not used)
- C. (Not used)
- D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- G. (Not used).
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with 01 74 19/ Construction Waste Management for progress cleaning requirements.
 1. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
- I. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- C. (Not used)
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at



Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
 - 1. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- I. Where heating or cooling is needed, and permanent enclosure is not complete, insulate temporary enclosures.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention, protection, and detection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed during installation of new fire alarm system to ensure fire detection system is maintained at all times. Instruct personnel in methods and procedures. Post warnings and information.

3.05 OPERATION, TERMINATION, AND REMOVAL

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



- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in 01 77 00/ Contract Closeout Procedures.

END OF SECTION 01 51 00



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SECTION 01 60 00 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. The Contractor's Construction Schedule is included in Section 01 32 16, "Progress Schedules and Reports"; and the Schedule of Submittals is included under Section 01 33 00, "Submittals."
- C. Standards: Refer to Section 01 42 00, "Definitions and Standards" for applicability of industry standards to products specified.
- D. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01 25 13, "Product Substitutions."

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.
 - 1. "Products" are 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.
 - a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - 2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.04 DESCRIPTION

- A. Material and equipment incorporated in the Work shall be:



1. New, unless otherwise specified.
 2. In a condition acceptable to the County and the Architect/Engineer.
 3. Suitable for the use intended.
 4. In conformance with EPA codes and regulations and applicable air quality control district.
- B. No material or equipment shall be used for any purpose other than that for which it is designed or specified.
- C. No material shall contain asbestos.
- D. No materials or products shall contain formaldehyde in excess of the amount recommended by the State of California Department of Health Services (DOHS).

1.05 TRANSPORTATION AND HANDLING

- A. Deliver manufactured products in the manufacturer's original, unbroken containers or packaging, with identifying labels intact and legible.
- B. Immediately on delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and reviewed submittals, and to verify that products are properly protected and undamaged.
- C. Handle products in a manner to avoid soiling and damaging the products and their packaging.
- D. Promptly remove damaged and defective products from the site, and replace at no increase in Contract Sum.

1.06 STORAGE

- A. Store manufactured products in accordance with the manufacturers' printed instructions, with seals and labels intact and legible.
1. Store products subject to damage by the elements in weather tight enclosures.
 2. Maintain temperature and humidity within the ranges specified by the manufacturers.
- B. Exterior Storage:
1. Store fabricated products above the ground, on blocking or skids, to prevent soiling and staining.
 2. Cover products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.



3. Store loose granular material in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. Arrange storage to facilitate inspection.
- D. Periodically inspect stored products to assure that products are maintained under specified conditions and free from damage and deterioration.
- E. Protection After Installation:
 1. Provide substantial coverings as necessary to protect installed products from damage from traffic and construction operations. Remove coverings when no longer needed.
 2. Maintain temperature and humidity conditions for interior equipment and finish products in accordance with the manufacturers' printed instructions.

1.07 PRODUCT OPTIONS

- A. For products indicated or specified only by reference standard, select any product meeting such standard.
- B. For products indicated or specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the specified requirements.
- C. For products indicated or specified by naming only one product and manufacturer, there is no option.
- D. Products not meeting the criteria hereinabove, shall be considered Substitutions, and shall be submitted as specified under "Substitution Procedure" Section 01 25 13.
- E. "Or accepted equal" means a product accepted by the Architect/Engineer for use in the Work as being equivalent in essential attributes to the product indicated or specified in the Contract Documents. Reference the product substitution procedures Section 01 25 13.

1.08 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 two 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.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.



1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface, which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer
 - b. Model and serial number
 - c. Capacity
 - d. Speed
 - e. Ratings

1.09 SUBSTITUTION PROCEDURE

- A. Substitute Products: When the naming of one or more products is followed by "or accepted equal," a substitute product may be offered for consideration. A substitute product is a product other than those specified.
 1. Submit offer of substitute product with Bid as an Alternate to Base Bid. List on an Alternate Proposal Sheet; show amount Base Bid will be decreased or increased if alternate is accepted.
 2. If informed that a substitution is being considered, drawings, specifications, tests, performance data, and other pertinent information required to substantiate the equality of each substitute product.

OR

3. For a period of 5 calendar days after the execution of the Agreement, other products may be proposed in lieu of products identified in the Contract Documents.
4. After such time other products may be proposed only if a product indicated or specified can be proved to have subsequently become unavailable.
5. Whenever a product is identified in the Contract Documents by reference to manufacturer's name, trade name, catalog number, or the like, it is so identified for the purpose of establishing a standard, and products of other manufacturers may be equally acceptable, provided the proposed products are, in the opinion of the Architect/Engineer, of equal quality, utility, and appearance.
6. In requesting acceptance of a product other than that identified in the Contract Documents, the Contractor represents that he:



- a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.
 - b. Will furnish the same guarantees/warranties or bonds for the proposed product as for the product indicated or specified.
 - c. Will coordinate the installation of the proposed product into the Work, and make such other changes as required to make the Work complete and in compliance with the Contract Documents and applicable regulatory requirements.
 - d. Waives claims for additional costs associated with the proposed product that may subsequently become apparent.
- B. Request for acceptance of a product other than that indicated or specified in the Contract Documents shall be submitted (to the County and) the Architect/Engineer in written form and accompanied by sufficient information to enable proper evaluation to be made. Only one product may be proposed for a product identified in the Contract Documents. Submit with request:
1. Complete technical data, including drawings, performance specifications, cost data, samples, and test reports of the product proposed. Submit additional information, if required by the Architect/Engineer.
 2. Data similar to that specified for the item for which the product is proposed.
 3. Effect on the construction schedule.
 4. Complete breakdown of costs indicating the amount to be deducted from the Contract Sum if the proposed product is accepted.
 5. Signed statement that the proposed product is in full compliance with the Contract Documents and applicable regulatory requirements.
 6. List of other Work, if any, which may be affected by the proposed product. Be responsible for the effect of a proposed product upon related Work in the Project and pay the additional costs generated by the product if it is accepted, including the cost of the Architect/Engineer's additional services associated therewith.
 7. Information on availability of maintenance service, and source of replacement materials.
 8. Sample of manufacturer's standard form of guarantee or warranty for proposed product.
- C. The Architect/Engineer will review requests for proposed products with reasonable promptness and notify the Contractor, in writing, of his decision to accept or reject such products.



- D. The Architect/Engineer at his sole discretion will determine the acceptability of proposed products, and his determination shall be final.
- E. Architect/Engineer's Action: No consideration will be given to a substitute product unless, in the Architect/Engineer's judgment, it complies with the following conditions.
 - 1. It is equal in quality and serviceability.
 - 2. Its use does not entail changes in details or related construction.
 - 3. It is acceptable in regards to design and artistic effect.
 - 4. There is cost, time, or both, advantage to County.
- F. Notification: Written notification of decision will be given within a reasonable time after receiving the required technical data. Acceptable substitutions will be processed as Change Orders.
- G. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.
- H. If a proposed product is not accepted, use the product originally specified or indicated.
- I. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Architect/Engineer's prior written acceptance.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and unused at the time of installation.
 - 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 - 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience.
 - 1. Visual Matching: Where Specifications require matching an established Sample, the Architect/Engineer's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply



with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

2. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect/Engineer will select the color, pattern and texture from the product line selected.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 60 00



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SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This SECTION describes the requirements for performing cutting and patching; patching includes the insertion or projection of other products in or from a surface.

1.2 QUALITY ASSURANCE

- A. Design Criteria:

1. Patching shall achieve security, strength, and weather protection, as applicable, and shall preserve continuity of existing fire ratings.
2. Patching shall successfully duplicate undisturbed adjacent finishes, colors, textures, and profiles. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the County's design consultant and County Project Manager's judgment shall be final.

1.3 COORDINATION AND PROTECTION

- A. Protect from damage all portions of the Work or work of the County or separate contractors adjacent to cutting or patching operations, including excavation.
- B. Obtain written permission prior to commencing cutting, patching or excavation operations on the work of the County or any separate contractors.
- C. Protect adjacent occupied spaces, roof membranes, and building envelope systems from damage during concrete cutting and coring.
- D. Security of facility to be maintained at all times.
- E. When requested in writing, allow the County or any separate contractor to perform reasonable cutting, patching or excavation operation on the Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
 1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.



3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching is to be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Designer to proceed with cutting and patching does not waive the Designer's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall be as specified in the applicable, individual SECTIONS of the Specifications and as required to match existing construction. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 GENERAL

- A. Perform cutting associated structural reinforcing and patching in a manner to prevent damage to other Work and to provide proper surfaces for the installation of materials, equipment, and repairs.
- B. Do not cut or alter structural members without prior consultation with the Project Manager.
- C. Wherever practicable, employ original installer or fabricator providing Work under this Contract to perform cutting and patching for new:
 1. Weather-exposed and moisture-resistant products.
 2. Fireproofing.
 3. Finished surfaces exposed to view.
- D. Adjust and fit products to provide a neat installation.



- E. Finish or refinish, as required, cut and patched surfaces to match adjacent finishes. Paint over complete surface plane, unless otherwise indicated. Over patched wall or ceiling surfaces, paint to nearest cutoff line for entire surface, such as intersection with adjacent wall or ceiling, beam, pilasters or to nearest opening frame, unless otherwise indicated. Painted surfaces shall not present a spotty, touched-up appearance.

3.2 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
 - 1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.3 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
 - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.



2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
 4. Comply with requirements of applicable Sections of Division-7 where cutting and patching requires repair of weather barriers, sheet metal flashing and trim, joint sealants.
 5. By-pass and safe-off utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.
 4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.5 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01 73 29



SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT

PART I - GENERAL

1.01 WORK INCLUDED

A. Waste Management Objective for the Project:

1. The County has established construction waste management goals that require this Project to minimize the generation of construction and demolition waste at the site. Factors that contribute to waste, such as over-packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination shall be minimized.
2. Waste disposal in local landfills shall be minimized and of the inevitable waste that is generated, as much of the waste materials as economically feasible shall be reused or recycled.
3. The expressed Construction Waste Management objective requires 'mandatory' participation by the Contractor.

B. Diversion from Landfill: Waste categories appropriate for diversion from landfill shall include, but not be limited to, the following:

1. Land clearing debris
2. Soil
3. Wood: Clean dimensional wood, palette wood
4. Sheet Wood: Plywood, OSB and particle board
5. Concrete
6. Concrete Masonry Units (CMU)
7. Asphalt Concrete
8. Paper
 - a. Bond
 - b. Newsprint
 - c. Cardboard and paper packaging materials
9. Cement Fiber Products: Shingles, panels, and siding
10. Metals



- a. Ferrous
- b. Non-ferrous
- 11. Paint
- 12. Rigid Foam
- 13. Glass
- 14. Plastics
- 15. Carpet and pad
- 16. Beverage containers
- 17. Insulation
- 18. Gypsum Board
- 19. Porcelain Plumbing Fixtures
- 20. Fluorescent Light Tubes (per Dept. of Toxic Substances Control regulations)

1.02 RELATED REQUIREMENTS

- A. Section 01 33 00: Submittal Procedures.
- B. Section 01 77 00: Closeout Procedures.

1.03 REFERENCES

- A. The California Integrated Waste Management Board (CIWMB); including the California Materials Exchange (CalMAX), Telephone 877-520-9703; www.ciwmb.ca.gov/calmax/.
- B. Local Integrated Waste Management Programs and Re-Use Programs in the Project area.
- C. The Department of Toxic Substances Control (DTSC)
- D. Republic Garbage Services
- E. Potrero Hills Landfill

1.04 DEFINITIONS

- A. Construction, Demolition, and Land Clearing (CDL) Waste: Includes all non-hazardous solid wastes resulting from construction, remodeling, alterations, repair, demolition and land clearing, and material that is recycled, reused, salvaged or disposed as garbage.
- B. Salvage: Recovery of materials for reuse.



- C. Reuse: making use of a material without altering its form. Materials can be reused on-site or reused on other projects off-site. Grinding of existing removed concrete for use as sub base road material would be an example.
- D. Recycling: Process of sorting, cleaning, treating, and reconstituting materials for the purpose of using the material in the manufacture of a new product.
- E. Source-Separated CDL Recycling: Process of separating recyclable materials in separate containers as they are generated on the job-site. The separated materials are hauled directly to a recycling facility or transfer station.
- F. Co-mingled CDL Recycling: Process of collecting mixed recyclable materials in one container on-site. The container is taken to a material recovery facility where materials are then separated for recycling.
- G. Approved Recycling Facility:
 - 1. A facility that can legally accept CDL waste materials for the purpose of processing the materials into an altered form for the manufacture of a new product.
 - 2. Material recovery Facility: General term used to describe a waste-sorting facility. Mechanical, hand separation, or a combination of both procedures, is used to recover recyclable materials.

1.05 WASTE MANAGEMENT

- A. Manager: Contractor shall designate an on-site party (or parties) responsible for instructing workers and subcontractors, and overseeing and documenting results of Waste Management for the Project.
- B. The Contractor shall develop a Waste Management Plan and review with Owner to obtain Owner's approval. Waste Management Plan to be prepared within thirty (30) days following Notice to Proceed.
- C. Meetings: Contractor shall conduct Waste Management meetings with subcontractors who generate construction waste. Contractor shall present current status of the Waste Management at regular job-site meetings.
- D. Materials Handling Procedures: Provide means by which waste materials will be protected from contamination and means to be employed in reuse or recycling of waste material consistent with requirements for acceptance by receiving facilities.
 - 1. Separation Facilities: Contractor shall lay out and label a specific area to facilitate separation of materials for reuse and recycling. Recycling and waste bin areas shall be kept neat and clean and clearly marked in order to avoid contamination of materials.



2. Hazardous Wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations, and in accordance with specifications for such work as may be included in this Project.
3. Instruction: Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at appropriate stages of the Project.

1.06 WASTE MANAGEMENT REPORT

- A. Upon completion of Work, including final cleanup, provide a final Waste Management Report containing the information listed below.
 1. The total quantity of each waste material generated; and the date(s) removed from the job-site.
 2. The percent of the total quantity generated of each material sent to landfill, the identity of the landfill (receiving facility), handling costs, transport costs, tipping fees paid at the landfill, and total landfill costs. Attach copies of manifests, weight tickets, receipts, and invoices.
 3. For each material reused or recycled from the Project, include the percent of the total quantity generated, the identity of the receiving facility, the total costs of handling and transportation, and income. Attach manifests, weight tickets, receipts, and/or invoices.
 4. Contractor shall develop forms to document Waste Management Report for the basis of documenting.
- B. Submit final Waste Management Report at completion of Project to document.

END OF SECTION 01 74 19



SECTION 01 77 00 - CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This SECTION describes the requirements for Contract closeout, including provisions for final cleaning, project record documents, operating and maintenance data, instruction of County's personnel, guarantees/warranties and bonds, service and maintenance contracts, preparation for final inspection, restoration of damaged Work, remedial Work, and extra materials.

1.2 RELATED REQUIREMENTS

- A. Documents 00 72 00/General Conditions of the Contract for Construction and 00 73 00/ Supplementary Conditions including all fiscal provisions, legal submittals and other administrative requirements.
- B. Section 01 11 00/ Summary of Work
- C. Section 01 31 00 Project Management and Coordination.
- D. Section 01 33 00/ Submittal Procedures.
- E. Section 01 51 00/ Temporary Facilities and Controls.
- F. Any other applicable Section containing Closeout provisions.

1.3 CLOSEOUT PROCEDURES

- A. Comply with procedures stated in Document 00 72 00/ General Conditions of the Contract for Construction, Article 9/ Payments and Completion for final inspection, Completion of the Work, Acceptance of the Work payment and retention procedures.
- B. Contractor shall start developing and completing punch list items prior to the end of the Contract Time as specified Document 00 73 00/ Supplementary Conditions, Article 1.3, Time of Completion and Section 01 32 16/ Construction Progress Schedules and Reports.
- C. When Contractor considers the Work complete, the Contractor shall request, in writing, a final inspection to be conducted by the County Project Manager. The County Project Manager shall conduct a final inspection within 14 days of receipt of the written request. Prior to requesting a final inspection, the Contractor shall have the entire Work completed in accordance with all Contract Requirements, including, but not limited to, all punch list items, and submittal of all documents and products listed in this section and other sections of the Project Manual. It is recommended that the Contractor request the final inspection as early as possible, and prior to the end of Contract Time, to allow for completion of punch list items discovered to be incomplete during the final inspection and for a final re-inspection, to avoid assessment of liquidated damages.
- D. The date of Substantial Completion of the Work and Beneficial Occupancy will be



determined as specified in Document 00 72 00, Article 9, Payments and Completion.

- E. Final cleaning shall be completed prior to occupancy or requesting a final inspection, whichever comes first.

1.4 FINAL CLEANING

- A. Comply with applicable regulatory requirements during the conduct of cleaning and disposal operations. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Division 2 through 33.
- B. Use cleaning materials that will not create hazards to health or property or cause damage to products or Work. Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
 - 1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - 2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.
- C. Use cleaning materials and methods recommended by the manufacturers of the products to be cleaned.
- D. Schedule operations to prevent dust and other contaminants resulting from cleaning operations from adhering to wet or newly finished surfaces.
- E. Perform the following cleaning operations as applicable to the Work of this Contract:
 - 1. Remove dust, dirt, grease, stains, fingerprints, labels, spilled and spattered, and other foreign materials from interior and exterior surfaces exposed to view.
 - 2. Wash and shine glazing and mirrors.
 - 3. Polish glossy surfaces to a clear shine.
 - 4. Ventilating Systems:
 - a. Clean permanent filters and replace disposable filters of units operated during construction.
 - b. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - 5. Vacuum and wipe insides of electrical panels and cabinetwork.
 - 6. Broom-clean interior spaces.
 - 7. Rake clean ground surfaces.



8. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
9. Remove labels that are not permanent labels.
10. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.
11. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.

1.5 PROJECT RECORD DOCUMENTS

A. Maintenance of Documents and Samples:

1. Store Project record documents and samples in field office apart from documents used for construction.
2. Maintain Project record documents in a clean, dry, legible condition and in good order.
3. Do not use Project record documents for construction.

B. Recording:

1. Record information carefully and neatly, with felt-tip pens, in color code designated, and in the manner approved in advance by the Architect.
2. Label each document "PROJECT RECORD" in large, neat, printed letters.

C. Record Drawings:

1. Record the following kinds of information on prints:
 - a. Changes made by Change Orders and other modifications described in the GENERAL CONDITIONS.
 - b. Locations of significant Work concealed inside the building whose general locations have been changed from those shown on the Contract Documents.
 - c. Locations of items, not necessarily concealed, which have been changed, with the Architect's prior acceptance, from the locations shown on the Contract Documents.
 - d. Revisions to routing of piping and conduit.



- e. Revisions to electrical circuitry.
- f. Actual equipment locations.
- g. Duct size and routing.
- h. In addition to the previously specified requirements for record drawings:
 - 1. Keep up to date during the entire progress of the Work, and make available to the Architect and the Project Manager at any time.
 - 2. Furnish additional drawings as necessary for clarification.
 - 3. Record deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
 - 4. Establish locations of underground Work by dimensions to column lines or walls, locating turns, and by referenced centerline or invert elevations and rates of fall.
 - 5. Give sufficient information to locate Work concealed in the building.
 - 6. Drawing to Scale:
 - i. Locate main runs of piping, conduit, ductwork, and similar items by dimensions.
 - ii. Locate other items either by dimensions or in relation to spaces within the building.
- 2. Furnish reproducible record drawings, made from final Shop Drawings which have been updated to show actual conditions, for Work specified in the individual Specification SECTIONS.
- 3. Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawing location.
- 4. Mark record sets with red non-erasable colored pencil/pen; use other colors to distinguish between changes for different categories of the Work at the same location.
- 5. Note Change Order numbers, Work Authorization numbers, and similar identification.
- 6. Responsibility for Mark-up: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record Drawings.



- a. Accurately record information in an understandable Drawing technique.
- b. Record data as soon as possible after it has been obtained. In the case of concealed installation, record and check the mark-up prior to concealment.

D. "As-Built" Drawings:

1. At time of acceptance of the Work and prior to final payment, using the record drawings for reference, prepare electronic "As-Built" drawings using AutoCAD 2007 plan backgrounds furnished by Architect.
2. Employ and pay a professional draftsman to prepare the "As-Built" drawings from the record drawings, using AutoCAD 2007.
3. After completing the preparation of electronic record drawings, print one full-size format image in Adobe Acrobat PDF file format of each Drawing, files shall be named to match the drawing sheet number as represented in the original Contract Documents set. Files shall be arranged in separate folders by discipline and shall be copied to USB flash drives. AutoCAD files shall be placed in separate folders from Adobe Acrobat PDF files. Each drives shall be clearly labeled identifying the Project, contents and date. Provide four (4) copies to Project Manager.
4. After completing the preparation of the Record Drawings, print on bond paper one (1) full size and three (3) half-size sets of each drawing set. Drawing sets shall be complete and include every sheet in the drawing set, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper covers sheets, with appropriate identification, including titles, dates and other information on cover sheets.
5. Organize and bind original marked-up set of prints that were maintained during the construction period in the same manner.
6. Submit the marked-up record set in PDF format. Provide three (3) hard copies (full size) to the Project Manager for County's records.

E. Specifications and Addenda:

1. Mark each Specification SECTION to record:
 - a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually incorporated in the Work.
 - b. Changes made by Change Order and other modifications described in the GENERAL CONDITIONS.
 - c. Edit original Adobe Acrobat PDF document specification files provided by Architect; strike out materials/manufacturers not used and insert text boxes to indicate all changes. When completed with the Record Specifications, copy onto USB flash drive media. Each drive shall be



clearly labeled with identifying the Project, contents and date. Provide three (3) copies to Project Manager.

F. Large-Scale Coordination Drawings:

1. The preparation of large-scale, detailed coordination drawings may be required for the Work of DIVISIONS 03, 04, 05, 21, 22, 23, 26, 27, 28 and 33 of these Specifications, other Sections may also be applicable. These coordination drawings are not Shop Drawings as defined by the GENERAL CONDITIONS, but, together with Shop Drawings or coordination drawings of other affected Work, are used to check, coordinate, and integrate the various types of Work.
2. If furnished, include the coordination drawings as part of the Project record documents.

G. As-Built Construction Schedule: Using as a basis the latest, updated Progress Schedule required by SECTION 01 33 00 "SUBMITTAL PROCEDURES," prepare and transmit a Record Construction Schedule to indicate the actual dates and durations of the various construction activities.

H. Sign and date the completed Project record documents and transmit them to the Architect, who will forward them to the County after final acceptance of the Work.

1.6 OPERATION TESTS

- A. Conduct operational tests as required to demonstrate that all systems have been completed and are in compliance with all requirements.
- B. Furnish a written record of test results using recording type instruments where applicable.

1.7 OPERATING, MAINTENANCE, AND PRODUCT DATA

- A. General: Where maintenance manuals, record data, and operating instructions are required in the individual Specification SECTIONS; and manufacturers' product data, specifications, installation instructions, and maintenance instructions for products incorporated in the Work; prepare such in three-ring, durable, plastic binders sized for 8-1/2" x 11" sheets and including at least the following:
 1. Identification on, or readable through, the front cover with the Project name and address and the general subject matter contained in the manual.
 2. Neatly typewritten index near the front of the manual furnishing immediate information as to locations in the manual of all emergency data regarding the equipment included in the manual.
 3. Complete instructions regarding operation and maintenance of the equipment included in the manual.
 4. Complete nomenclature of replaceable parts, their part numbers, current cost, and name and address of nearest source of parts.



5. Copy of each guarantee/warranty and service contract issued for the equipment included in the manual.
 6. Prepare and include additional data as required for the instruction of the County's operating and maintenance personnel.
- B. Extraneous Data: Where contents of manuals include manufacturers' catalog pages, clearly indicate the items included in this installation and delete, or otherwise clearly indicate, data, which is not applicable to this installation.
- C. Shop Drawings: With each copy of the manual, furnish one set of applicable reviewed Shop Drawings showing changes made during construction.
- D. Number of Copies Required:
1. Transmit digital file and three (3) hard copy manuals, unless otherwise specified, which will be retained by the Architect for forwarding to the County after acceptance of the Work.
- E. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals.
1. Before submittal of Request for Final Payment, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit in PDF format to the Project Manager/Architect for review. Include a complete index or table of contents of each manual.
 2. The Architect will return with comments within fifteen days of receipt.
 3. Submit one copy of the manuals in final form at least fifteen days before Final Inspection. This copy will be returned within fifteen days after Final Inspection, with comments.
 4. After Final Inspection make corrections or modifications to comply with the Architect's comments. Submit the specified number of copies of each approved manual to the Architect within fifteen days of receipt of the Architect's comments.

1.8 INSTRUCTION OF THE COUNTY'S PERSONNEL

- A. Where specified in the individual Specification SECTIONS, furnish qualified personnel for on-the-job instruction of the County's operating and maintenance personnel.
- B. Furnish instruction, including special start-ups and running time, changing from heating to cooling cycles, prior to occupancy of the building, at no additional expense to the County.
- C. Training:
1. Schedule training to conform to personnel availability at the facility and to conclude prior to startup of system. The base duration of training shall be determined by the complexity of the system or equipment and shall be done by qualified instructors from the manufacturer or contractor.



2. As part of the operator's training, one lesson plan shall be devoted to reviewing of videotape that shall be incorporated into the training program to allow new employees to view the tape at their own convenience and be able to comprehend the system without the need for an instructor in attendance.
3. Prepare videotapes to assist maintenance personnel in trouble- shooting the systems and making routine repairs. All videotapes shall be made at the Project facility to ensure that the video portrayal is representative of the true systems.
4. In addition to written technical descriptions, the training shall lay out prescribed hands-on-training under the supervision of others who have previously completed the training program. The foregoing techniques are to be developed to produce a program that is self-perpetuating and permits a high level of operator training in the event of high turnover rates among those who are assigned to duties in maintenance.

1.9 GUARANTEES/WARRANTIES AND BONDS

A. General:

1. Manufacturers' warranties notwithstanding warrant the entire Work against defects in materials and workmanship for 12 months from the date of Beneficial Occupancy if earlier, otherwise from day of recordation of the Notice of Completion of the Project. Other specified warranties may call for longer warranty period and should be submitted as such.
2. Guarantee/warranty or bond Work as required in the individual Specification SECTIONS.
3. Warranties between the Contractor and manufacturers, and the Contractor and suppliers, shall not affect guarantees/ warranties between the Contractor and the County.
4. The Contractor will not be held responsible for defects due to misuse, negligence, willful damage, improper maintenance, or accident caused by others, nor shall he be responsible for defective parts whose replacement is necessitated by failure of the County's maintenance forces to properly clean and service them, provided the Contractor has furnished complete maintenance instructions to the County.
5. Compile specified guarantees/warranties and bonds.
6. Co-execute as required.
7. Review guarantees/warranties and bonds to verify compliance with Contract Documents.
8. Transmit to the Architect for review. The Architect will forward guarantees/warranties and bonds to the County after acceptance of the Work.



B. Form of Guarantee/Warranty:

1. Submit the guarantees/warranties, typed on the Contractor's letterhead if for the entire Work, or on the Subcontractor's letterhead if for the Work of a Specification Section.
2. Provide guarantee/warranty verbiage in compliance with the standard guarantee/warranty form provided at the end of this section.

C. Submittal Requirements:

1. Time of Submittal:
 - a. For equipment or component parts of accepted equipment put into service for the County's benefit during the progress of the Work, submit guarantees/warranties within 10 calendar days after Substantial Completion.
 - b. Otherwise, submit guarantees/warranties within 10 calendar days after date of Substantial Completion, prior to request for Final Payment.
 - c. For items of Work where acceptance is delayed materially beyond the date of Substantial Completion, furnish updated submittal within 10 calendar days after such delayed acceptance, listing the date of delayed acceptance as the start of the guarantee/warranty period.
2. Form:
 - a. Assembled in durable, three-ring plastic binders sized for 8-1/2" x 11" sheets. Fold larger sheets to fit into binders. Submit electronic version in PDF format to Project Manager/Architect.
 - b. Identification on, or readable through, the front cover with the Project name and address, the Contractor's name and address, and the title "GUARANTEES/WARRANTIES AND BONDS".
3. Number of Original Signed Copies Required: Three (3) each.

D. Review Meeting: 11 months following date of acceptance, hold a meeting for the purpose of review of, and action upon, guarantees/ warranties, bonds, and service and maintenance contracts, as specified in SECTION 01 31 19 "PROJECT MEETINGS" for follow-up meeting.

E. WARRANTY REQUIREMENTS

1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.



2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the County has benefited from use of the Work through a portion of its anticipated useful service life.
4. County's Recourse: Written warranties made to the County are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the County can enforce such other duties, obligations, rights, or remedies.
 - a. Rejection of Warranties: The County reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
5. The County reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to counter-sign such commitments are willing to do so.

1.10 SERVICE AND MAINTENANCE CONTRACTS

- A. Compile, review, and transmit specified service and maintenance contracts as specified for guarantees/warranties and bonds.

1.11 PREPARATION FOR FINAL INSPECTION

- A. Perform final cleaning as specified hereinbefore.
- B. Assemble guarantees/warranties, service and maintenance contracts, operating and maintenance instructions, and other items as specified, and transmit to the Architect, who will forward them to the County after final acceptance of the Work.

1.12 RESTORATION OF DAMAGED WORK

- A. Restore or replace, as specified or determined by the Architect, material and finishes damaged from construction activities at no additional expense to the County.
- B. Restoration shall be equal to the original Work, and finishes shall match the appearance of existing adjacent Work.



1.13 REMEDIAL WORK

- A. Remedial Work necessary owing to faulty workmanship or materials shall be at no additional expense to the County.
- B. Work shall be coordinated with the County and performed at such time and in such manner to cause minimal interruption and inconvenience to the County's operations.

1.14 SPARE PARTS and EXTRA MATERIALS

- A. Where required in the individual Specification SECTIONS, furnish spare parts and extra materials in the quantities and manners specified. Prior to submitting any parts and materials submit a list of all extra parts and materials required in the specification sections.
- B. Delivery and certification of such extra spare parts and materials shall be a prerequisite to Substantial Completion. Deliver to Project Manager for sign-off.
- C. Package in clearly identifiable boxes.
 - 1. Indicate manufacturer's name, part name, and stock number.
 - 2. Indicate piece of equipment part or tool is for.
 - 3. Indicate name, address and phone number of closest supplier.

1.15 MISCELLANEOUS RECORD SUBMITTALS

- A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Final Acceptance, 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 the County's records.

1.14 WARRANTY BOND

- A. Prior to Final Payment, Contractor shall post a one-year Warranty Bond in the amount of 10% of the Final Contract Price.

END OF SECTION 01 77 00

NOTE: GUARANTEE/WARRANTY FORM FOLLOWS



GUARANTEE/WARRANTY.

_____ (Contractor) hereby unconditionally guarantees that the

_____ Work described in SECTIONS _____ performed pursuant to the **Asset Protection Project** has been done in accordance with the requirements of the Contract Documents and further guarantees the Work of the contract to be and remain free of defects in workmanship and materials for a period of _____ year(s) from the date of recordation of a Notice of Completion, Notice of Cessation, or actual cessation of Work, whichever is longer. The Contractor hereby agrees to repair or replace any and all Work, together with any adjacent Work which may have been damaged or displaced in so doing, that may prove to be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to Solano County; ordinary wear and tear, and unusual abuse and neglect only excepted. The Contractor has provided Contract bonds which will remain in full force and effect during the guarantee period.

The Contractor agrees that within ten (10) calendar days after being notified in writing by Solano County of any Work not in accordance with the requirements of the Contract or any defects in the Work, he will commence and prosecute with due diligence all Work necessary to fulfill the terms of this guarantee, and to complete the Work within a reasonable period of time. In the event he/she fails to so comply, he/she does hereby authorize Solano County to proceed to have such Work done at the Contractor's expense and he/she will pay the cost thereof upon demand. The County shall be entitled to all costs, including reasonable attorney fees, necessarily incurred upon the Contractor's refusal to pay the above costs.

Notwithstanding the foregoing paragraph, in the event of an emergency constituting an immediate hazard to the health or safety of the employees or property of Solano County, the County may undertake at the Contractor's expense without prior notice, all Work necessary to correct such hazardous condition when it was proven to be defective in its workmanship or materials, and to charge the same to the Contractor as specified in the preceding paragraph.

The guarantee set forth herein is not intended by the parties, nor shall it be construed, as in any way limiting or reducing Solano County's rights to enforce all terms of the Contract Documents referenced hereinabove or the time for enforcement thereof. This guarantee is in addition to, and not in lieu of, the County's rights on all other guarantees and warranties required by the Contract Documents.

Subcontractor Signature

Address, License Number

Date

Countersigned
By General Contractor

Address, License Number

Date



WARRANTY BOND

KNOW ALL THESE MEN BY THESE PRESENTS:

That, _____ (hereinafter called the Principal), as Principal, and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ (hereinafter called the Surety), as Surety, are held and firmly bound unto SOLANO COUNTY (hereinafter called the Obligee), in the amount of _____ Dollars (\$____) for the payment whereof, well and truly be made, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 20____, to the **Asset Protection Project - General Site Labor**, which contract is hereby referred to and made a part hereof as fully and to the same extent as if copies at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal Shall maintain and remedy said work free from defects in materials and workmanship for a period of _____ year(s) effective _____. Then this obligation shall be null and void; otherwise remain in full force and effect.

Witness our hands this _____ day of _____, 20, ____.

Principal

Seal

By

Surety

Seal

By

Agency of Record

Agency Address



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SECTION 02 40 00 – DEMOLITION AND REUSE OF MATERIALS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This work covered by this section consists of furnishing all labor, equipment and materials and performing all operations necessary for the entire or partial removal or the abandonment of existing items; and the disposal of demolition products or the salvaging, handling and reuse of designated materials related to the work as shown on the Drawings, as specified herein, or as otherwise directed by the County.
- B. Do not use any equipment or devices that might damage structures, facilities, fences, or property to be preserved or retained.
- C. Complete all operations necessary to remove or abandon existing items that may endanger the new construction before constructing new work.

1.02 SUBMITTALS

- A. Submit for review the following:
 - 1. Demolition Sequencing Plan. Provide a Plan for demolition sequencing, disposition of the resulting materials, and salvaging and reuse of materials.

1.03 BACKFILLING

- A. Backfill all trenches, holes, and pits resulting from breaking down, removing, or abandoning miscellaneous structures to the elevation of the natural ground, the finished earth subgrade, or finished slopes, as necessary, due to the location of the removed structure.

1.04 EQUIPMENT AND MATERIAL SALVAGE

- A. Carefully remove all materials designated for salvage to avoid damage. Handle salvaged material in a manner to protect item from any damage. If retaining a portion of the existing item, avoid damaging that portion during demolition operations.
- B. Salvaged equipment and material remain the property of the County. Deliver salvaged equipment and material to an on-site location designated by the County. Equipment and materials salvaged for reuse shall remain in possession of the Contractor.

PART 2 – PRODUCTS – NOT USED



PART 3 – EXECUTION

3.01 GENERAL

- A. Prior to beginning any work, carefully inspect the work and examine the plans and specifications to determine the extent of the demolition work. In the company of the County, visit the site and verify the extent of the demolition.
- B. Contact all appropriate utilities and agencies to coordinate and verify all abandonments and relocations.
- C. Use of explosives will not be permitted.
- D. Use means to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Comply with all local regulations regarding hauling and disposal.
- F. Cutoff material projecting aboveground at a minimum of one foot below finished grade in fill areas and removed to one foot below finish grade in cut areas. Backfill all holes caused by removal of materials and grade to drain, generally matching existing conditions.
- G. Completely remove all buried conduit, duct banks, pull boxes, manholes, piping and appurtenances, utilities, foundations, posts, or other debris as indicated in the plans to a minimum of 10 feet beyond limits of berm and flood wall foundations.
- H. Provide temporary connections for existing facilities, where necessary, to maintain service during construction. Maintain drainage during construction.

3.02 PROTECTION OF EXISTING WORK

- A. Take all necessary precautions to ensure against damage to existing work to remain in place, or to be salvaged. Any damage to such work shall be repaired or replaced as directed by the County.
- B. Construct and maintain shoring, bracing, and supports, as required. Ensure that structural elements are not overloaded from any cutting, removal, or demolition work performed. Increase structural support or add new supports, as may be required.

3.03 UTILITY DISCONNECTS

- A. Coordinate utility disconnections with responsible utilities as designated on the Drawings.
- B. Remove all underground and above-ground services within the construction limits identified for demolition back to connection with source or to limits as directed by County.



3.04 DEMOLITION

- A. General. The extent of removal of existing facilities shall be as shown on the Drawings. Materials not identified as being salvaged shall be removed and wasted.
- B. Hazardous Materials. Comply with all Federal, State, and local rules, regulations, ordinances, and statutes that apply to the handling, storage, and disposal of contaminated and hazardous materials. All work involving material containing asbestos must be performed in accordance with California Labor Code, Sections 6501.5 through 6510, and California Code of Regulations, Title 8, Section 5208, and any other pertinent regulations.
 - 1. Lighting ballasts and fluorescent lamps contain mercury and PCBs. Remove demolition waste materials from Project site and recycle and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
- C. Utilities. Remove all abandoned above and below-ground utilities within the limits of the project site as shown on the Drawings.
- D. Demolition. Demolish structures in accordance with all local regulations. Completely remove footings, foundation, and aboveground construction of all kinds. Structure demolition includes all walkways, sidewalks, concrete curbs, utilities, posts, fences, gates, piping, driveways, culverts, landscape hardscape, planters, access barriers, foundations, and other similar permanent improvements.

3.05 SELECTIVE DEMOLITION

- A. Pavement Removal. Roadway asphalt concrete pavement removal shall first be sawcut in neat and square lines for the full depth of pavement. Pavement removal shall extend beyond limits of planned activities to the extent required to maintain integrity of adjacent surfaces.
- B. Concrete. Where portions of concrete and foundations are to be selectively demolished, areas to be removed shall first be sawcut in neat and square lines for the full depth of the concrete.
- C. Fences and Gates. Preserve access control where fencing and gates are removed during construction. Repair damage caused by work under this contract to the satisfaction of the County.



- D. Electrical Demolition. Perform demolition of electrical raceways, duct banks, pull boxes, handholes, manholes, supports, and associated materials to the extents shown on the Drawings, and in accordance with the electrical specifications. Coordinate removal of conductors and cabling with the County, obtain release prior to demolition, and remove conductors to designated limits. Coordinate PG&E electrical service work with PG&E and obtain release for demolition. Coordinate phone service work with AT&T and obtain release for demolition. Coordinate on-site electrical demolition work with the County and obtain release for demolition.
- E. Storm Drain Pipe and Catch Basin Demolition. Perform abandonment, capping, removal, and waste of the storm drainage pipe and catch basins in accordance with the Drawings. Protect storm drainage pipe and catch basins indicated to remain.
- F. County Pump Station. Coordinate work on the pump station with the County to verify lock-out/tag-out of the storm drainage pump station.
- G. Irrigation System Demolition. Perform abandonment, capping, removal, and waste of the irrigation main pipe, lateral pipes, valves, and appurtenances in accordance with the Drawings. Coordinate demolition of the irrigation system with the County to verify lock-out/tag-out of the irrigation system water source.

3.06 SALVAGE AND REUSE OF AUTOMATED VEHICLE ACCESS BARRIER

- A. Carefully dismantle and salvage for reuse the Washington Street automated vehicle access gates, equipment and accessories; and signs as described herein and identified on the Drawings.
 - 1. Salvaged gate items to include, but limited to, barrier arms, card reader, motors, electronics, and controls.
 - 2. Signs to include the facility information sign adjacent to the card reader. Signpost shall not be reused, unless approved by the County.
 - 3. Anchors and mounting screws/bolts shall not be reused.
- B. Inventory, bundle, and store to protect from damage, deterioration, theft or vandalism. Materials damaged during removal, handling, or storage, or misplaced items shall be replaced with new matching materials or repaired to the County's satisfaction.
- C. Rehabilitate equipment prior to installation. Replace missing parts. Inspect equipment for deteriorated components and review equipment condition with the County. At the County's discretion, install replacements for deteriorated parts and components in accordance with manufacturer's recommendations. County will provide replacement for deteriorated parts; allow time for inspection and part ordering.



- D. Clean electrical equipment in accordance with specifications. Refer to **Division 26 00 00** for electrical requirements.
- E. Replacement anchors, bolts, screws, washers, nuts, and metalwork shall comply with **Division 05 10 00**.

3.07 SALVAGE AND REUSE OF STREETLIGHT AND AREA LIGHTS

- A. Carefully dismantle and salvage for reuse streetlights as identified on the Drawings.
 - 1. Salvaged Streetlights and Area Lights to include, but not limited to, fixture, arm (as applicable), pole and base.
 - 2. Anchors and mounting screws/bolts shall not be reused.

3.08 BACKFILLING

- A. Backfill all trenches, holes, and pits resulting from breaking down, removing, or abandoning miscellaneous structures with soil in accordance with Section 31 00 00 "Embankment Construction." Fill to the elevation of the natural ground, the finished earth subgrade, or finished slopes, as necessary, due to the location of the removed structure.

3.09 DEBRIS REMOVAL

- A. Remove all trash, rubble and debris generated by demolition activities from the site on a regular basis.

3.10 DISPOSITION OF MATERIALS

- A. Materials Salvaged for Reuse. Carefully remove all materials, equipment, parts, etc. designated for reuse to avoid damage. Transport equipment and material to be salvaged for the County to a designated location on the work site. Inventory, clean, bundle, and store to protect from damage, deterioration, theft or vandalism. If retaining a portion of the existing item, avoid damaging that portion during demolition operations. Materials damaged during removal, handling, or storage or misplaced items shall be replaced with new matching materials or repaired to the County's satisfaction.
- B. Wasted Materials. Title to all products of demolition to be wasted is vested to the Contractor upon receipt of the Notice-to-Proceed. Contractor shall assume responsibility for any loss or damage to such property after the Notice-to-Proceed. The condition of such material is not guaranteed, and the Contractor shall assume all liability for reuse of any such material.
- C. Disposal. All materials removed under this section, that are not salvaged by the County for reuse or otherwise recycled, shall be disposed of off-site at a commercial landfill. All material shall be removed from the job site prior to completion of the contract. Material shall not be sold on the site.



- D. Hauling. Debris shall be removed and transported in a manner to prevent spillage on streets or adjacent areas.

END OF SECTION



SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The work included under this section consists of furnishing all materials, forms, transportation, and equipment, and performing all necessary labor to do all the plain and reinforced concrete work shown on the Drawings, or incidental to the proper execution of the work, or as herein specified.
- B. Composition: Concrete shall be composed of cement, fine aggregate, coarse aggregate, admixtures, and water so proportioned and mixed as to produce a plastic workable mixture in accordance with all requirements under this section, suitable to the specific conditions of placement.
- C. Special inspection during the placement of reinforcing bars and concrete is addressed in the Drawings.

1.02 SUBMITTALS

- A. **PRODUCT DATA:** All materials specified shall be certified by the producer or manufacturer that the furnished material meets the specific requirements of the specifications. The following submittals shall be submitted by the contractor for approval prior to placement or use:
 - 1. Concrete mix designs, including test breaks.
 - 2. Admixtures.
 - 3. Concrete Aggregate:
 - a. Coarse and Fine
 - 4. Curing Compound
 - 5. Bonding Agent
 - 6. Concrete Accessories.
 - 7. Release agents.
 - 8. Waterstops
 - 9. Membrane curing compound
 - 10. Grout
- B. **SHOP DRAWINGS:**
 - 1. Reinforcing bars, including grade, mill certifications, shapes, bend diagrams, and complete Bill of Materials for each Reinforcement Submittal.
- C. **SAMPLES:**



1. Waterstop shop-fabricated horizontal and vertical joints. Contractor to submit samples to the Engineer.

1.03 CODES AND STANDARDS

- A. Comply with the following applicable provisions except as otherwise indicated:

1. ACI 301 "Specifications for Structural Concrete"
2. ACI 318 "Building Code Requirements for Structural Concrete"
3. ACI 347 "Guide to Formwork for Concrete"
4. ACI 304 "Guide for Measuring, Mixing, Transporting, and Placing Concrete"
5. ACI 350 "Code Requirements for Environmental Engineering Concrete Structures"

1.04 TESTING

- A. Air content shall be in accordance with ASTM C 231, one test for each set of compressive strength specimens.
- B. Sampling of freshly mixed concrete shall be in accordance with ASTM C 172.
- C. Slump: ASTM C 143
- D. Test results will be reported in writing to Engineer, Contractor, County, and Concrete producer on the same day tests are made.
- E. Laboratory Reports: Submit two (2) copies of laboratory test or evaluation reports for concrete materials and mix designs. Also submit electronically a copy of all reports in PDF format.

PART 2 – MATERIALS AND EQUIPMENT

2.01 PORTLAND CEMENT

- A. Shall comply with the standard specifications for Portland Cement, ASTM designation C 150, Type II, or Type III (high-early), where indicated on drawings.

2.02 CONCRETE AGGREGATE

- A. Shall conform to standard specifications for concrete aggregate, ASTM Designation C 33 or to ASTM C 330. Maximum size of aggregate shall not exceed one-fifth of the narrowest dimension between reinforcing bars.
- B. Fine Aggregate - Fine aggregate shall be clean, hard, strong, durable, uncoated particles of natural sand known as Lake Wales, Interlachen, or approved equal. The source, composition, quality, and gradation of the fine aggregate shall be



subject to the approval of the Engineer. Samples of the sand shall be furnished, together with certified copies of the gradation and analysis from the recognized testing laboratory.

1. The weight of extraneous or deleterious substances shall not exceed the following percentages:

Loss by Decantation	3%
Shale	1%
Clay Lumps	1%
Coal and Lignite	1%

2. The fine aggregate shall be reasonably well graded from coarse to fine and when tested by means of laboratory sieves shall meet the following requirements in percent of total weight:

<u>Total Retained On</u>	<u>Percent Retained</u>
No. 4 Sieve	0 - 5
No. 10 Sieve	3 - 30
No. 30 Sieve	30 - 70
No. 50 Sieve	65 - 95
No. 100 Sieve	95 - 100

- C. Deficiencies in the percentages of the fine aggregates passing the No. 50 and No. 100 Sieves may be remedied by the addition of pozzolanic or cementitious materials, with the exception of Portland cement. Such materials must meet the approval of the Engineer.

- D. Coarse Aggregate.

1. Coarse aggregate shall consist of hard, tough, durable components free from adherent coatings and vegetable matter, and shall not contain soft, friable, thin, or elongated particles in quantities considered deleterious by the Engineer. Coarse aggregate shall be properly graded from fine to coarse to produce concrete of desired strength, density, and workability. The source, composition, quality, and gradation of the coarse aggregate shall be subject to the approval of the Engineers. Samples of the coarse aggregate shall be furnished together with certified copies of the gradation and analysis from a recognized testing laboratory.
2. All coarse aggregate shall be washed and shall be free from disintegrated pieces, salt, alkali, vegetable matter, and adherent coatings. The total percentage of all deleterious substances shall not exceed five percent (5%) by weight. The substances designated shall not be present in excess of the following amounts.



Loss by Decantation	1%
Clay Lumps or Other Soluble Materials	3%
Soft Fragments	5%

3. Where the cover over reinforcing is 2 inches or more, the maximum size of aggregate shall be 1 inch. Where the cover over reinforcing is less than 2 inches, the maximum size of aggregate shall be 3/4 inch. The maximum size of aggregate shall not exceed one-fifth of the narrowest dimension between forms nor three-fourths of the minimum clear spacing between reinforcing bars. The grading of the coarse aggregate in the concrete shall be within the following limits.

Percent Passing

Maximum Size Square Mesh Screen	97 - 100%
2 Maximum Size Square Mesh Screen	40 - 70%
No. 4 Sieve	0 - 6%

E. Alkali-Silica Reaction: Comply with one of the following for each aggregate used:

1. Expansion Result of Aggregate: Not more than 0.04 percent at one year when tested in accordance with ASTM C1293.
2. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567. Do not use this option with fly ash with an alkali content greater than 4.0 percent. Submit supporting data for each aggregate showing expansion in excess of 0.10 percent when tested in accordance with ASTM C1260.
3. Alkali Content in Concrete: Not to exceed 4 lb./cu. yd. (2.37 kg/cu. m) for aggregate with expansion greater than or equal to 0.04 percent and less than 0.12 percent or 3 lb./cu. yd. (1.78 kg/cu. m) for aggregate with expansion greater than or equal to 0.12 percent and less than 0.24 percent. Test aggregate reactivity in accordance with ASTM C1293. Calculate alkali content of concrete in accordance with ACI 301 (ACI 301M). Do not use this option with natural pozzolan or fly ash that has a calcium oxide content greater than 18 percent or an alkali content greater than 4.0 percent; or for an aggregate with expansion at one year greater than or equal to 0.24 percent when tested in accordance with ASTM C1293.

2.03 WATER

- A. Water shall be clean and free from oil, acids, alkalis, organic materials, or other injurious substances.



2.04 REINFORCEMENT

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed bars.
- B. Welded Wire Fabric: ASTM A185, gauges, spacing and dimensions as indicated.
- C. Metal Bar Supports: CRSI MSP-1, Chapter 3, Class 2, Type B, Stainless Steel Protected Bar Supports, or otherwise approved by the Engineer. Use concrete supports for reinforcement in concrete placed on grade.
- D. Tie Wire: 16 gauge minimum, black, soft annealed.
- E. Coupler Splice Devices: Cadweld tensions couplers, capable of developing the ultimate strength of the bar as manufactured by Erico Products, Incorporated, Solon, Ohio, or equal.

2.05 FORM WORK

- A. Concrete surface finishes and form liners shall be in accordance with specification sections 03 35 01, "Concrete Finishing – Flood, Plaza, and Planter Walls" and 03 35 02, "Concrete Finishing – Colonnade Flood Walls".
- B. Lumber: Douglas Fir or Larch, No. 2 grade, seasoned and surfaced on four sides.
- C. Plywood: Plyform, Class 1, BB-Exterior type, mill oiled, and edge sealed, with thickness not less than 3/4 inch.
- D. Medium Density Overlay (MDO) Plywood Forms: PS-1, B-B High Density Concrete Form Overlay, Class I, unoled.
 - 1. Butt form panels, make contact surface fully flush, and seal butting holes with sponge form tape. Chamfer edges of beams and ceilings.
 - 2. Where MDO plywood is used to form beams, do not use MDO plywood that has been patched or damaged.
- E. Drip Forms: Varnished ponderosa pine or equally rigid non-staining plastic, 2-inch-wide on each leg.
- F. Steel Forms. Uncoated steel, 3/16-inch minimum thickness, fabricated to close tolerances, protected only by the specified release agent, braced so as not to bend, dent, or dimple under wet concrete load, vibrator impact, and tool impact. Maintain steel form in rust-free condition by use of steel wool and light grinding, followed by coats of specified release agent. Use forms that can be adjusted into true alignment without stops or ridges.
- G. Glass Fiber Reinforced Plastic (FRP) Forms: Smooth coated forms, braced so as not to bend, dent, or dimple under wet concrete loads, vibrator impact, and



tool impact, and at least 0.11 inch thick. Design forms for external bracing at piers and columns, without use of form ties.

H. Form ties:

1. General:

- a. Provide form ties for the forming system selected that are manufactured by a recognized manufacturer of concrete forming equipment.
- b. Do not use wire ties or wood spreaders of any form.
- c. Provide ties of type that accurately tie, lock, and spread forms.
- d. Provide form ties of such design that when forms are removed, they locate no metal or other material within 1-1/2 inches of the surface of the concrete.
- e. Do not allow holes in forms for ties to allow leakage during placement of concrete.

2. Cone-snap ties:

- a. Cone-snap ties shall form a cone-shaped depression in the concrete with minimum diameter of 1 inch at the surface of the concrete and minimum depth of 1-1/2 inches.
- b. Provide neoprene waterseal washer that is located near the center of the concrete.

3. Taper ties:

- a. Neoprene plugs for taper tie holes: Size so that after they are driven, plugs are located in center third of wall thickness.

I. Weep Hole Forms: PVC polyethylene, or ABS pipe, matching color of the concrete, 4 inch inside diameter, with outlet projecting 12 inches from wall and cutoff in a plane parallel to it.

J. Circular and Elliptical Column Forms: Fabricate of two (2) pieces, clamped watertight using gaskets and without horizontal joints. Install horizontal construction joints only where indicated or as directed by the Engineer.

K. Beam Forms: Provide in one length without form joints and suitable for cambering up to 1/160 of span without distortion of profile or opening of seams.

L. Styrofoam Board: Expanded polystyrene extruded into board form, closed cell, moisture resistant, capable of maintaining indicated clear space between concrete structures.



- M. Inserts: Galvanized cast steel or galvanized welded steel, complete with anchors to concrete and fittings such as bolts, wedges, and straps. Provide hanger inserts spaced to match grid of suspended ceilings.
- N. Shoring: As designed and executed by Contractor to support all loads.
- O. Chamfer Strips: Polyvinyl strips designed to be nailed in the forms to provide a 3/4-inch chamfer at exposed edges of concrete members.
- P. Form Release Agent: A blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms, and equal to Eucoslip VOX, by the Euclid Chemical Company, or Burke Release #1 VOC, by The Burke Company. Use a non-staining release agent that leaves the concrete with a paintable surface.

2.06 ADMIXTURES

A. Admixtures:

1. General:

- a. Do not use admixtures of any type, except as specified, unless written acceptance has been obtained from the Engineer.
- b. Admixtures shall be compatible with concrete and other admixtures. Admixtures other than pozzolans shall be the products of a single manufacturer to ensure compatibility.
- c. Do not use admixtures containing chlorides calculated as chloride ion in excess of 0.5 percent by weight of cement.
- d. Use in accordance with manufacturer's recommendations. Add each admixture to the concrete mix separately.

B. Air Entraining Admixture:

- 1. Air-entraining agent meeting the requirements of ASTM C 260 – Air Entraining Admixtures for Concrete, shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 5 percent. The OWNER reserves the right, at any time, to sample and test the air-entraining agent. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. Air content shall be tested at the point of placement. Air entraining agent shall be **MasterAir AE 90** by **Master Builders**; **Sika AEA-15** by **Sika Corporation**; **Darex AEA** by the **Dewey and Almy Chemical Company**, or equal.

C. Water Reducing and Retarding Admixture:



1. Concrete Without Superplasticizer:
 - a. Water Reducing Admixtures: ASTM C494, Type A, equal to Eucon WR-75 by the Euclid Company, MasterPozzolith 200 by Master Builders, Plastocrete 161 by Sika Chemical Corporation, and containing no calcium chloride.
 - b. Water Reducing and Retarding Admixtures: ASTM C494, Type D, equal to Eucon Retarder-75 by the Euclid Company, Pozzolith 100 XR by Master Builders, Plastiment by Sika Chemical Corporation, and containing no calcium chloride.
 - c. Accelerating Admixtures: ASTM C494, Type C or E, equal to Accelguard 80 by the Euclid Company, Darex 400 Set Accelerator by W.R. Grace, and containing no calcium chloride.
2. Concrete with Superplasticizer:
 - a. Water Reducing, High Range Admixtures: ASTM C494, Type F or G, equal to Eucon 37 by the Euclid Company, Rheobild 716 by Master Builders, Daracem 100 by W.R. Grace, Sikament by Sika Chemical Corporation, and consisting of a second-generation admixture, free of chlorides and alkalis (except for those attributable to water) composed of a synthesized sulfonated complex polymer, enabling the concrete to maintain its rheoplastic state in excess of two (2) hours if necessary.
 - b. Manufacturer's Job Site Representation: Provide the services of a competent field service representative from the manufacturer of each of the admixtures selected for use to provide at the job site advice and consultation on the use of the admixture materials, including the effect on the concrete in place, including recommending maximum discharge time for superplasticizer method and procedure to induce superplasticizer into mixer, quantities of admixtures to be used if variations are required because of temperature/humidity, wind or other environmental considerations, and to be available on short call at any time requested by the Owner, Contractor, or concrete producer.

2.07 MEMBRANE CURING COMPOUND.

- A. Membrane curing compound shall be wax-free, pigmented, 100 percent resin base compound such as A.C. Horn's "Horncure WB 30 C", Hunt Process Corporation; "All-Resin" by W.R Meadows, or equal.

2.08 BONDING AGENT

- A. Bonding agent shall be Colma Fix, as manufactured by Sika Chemical Corporation, of Passaic, New Jersey, or equal. To be considered equal, the material must be a two-component epoxy-polysulphide resin system, and it must



have a demonstrated record of strong adhesion to both wet and dry concrete in either the hardened or the plastic state. It must also be of equal strength.

2.09 ACCESSORIES

- A. Precast Concrete Block Supports for Reinforcing Bars: Comply with ACI 315. Provide blocks with No. 4 dowels bent 90° to support top bars.
- B. Membrane: 6 mil polyethylene film.
- C. Water Stops: Polyvinyl chloride meeting all requirements of U.S. Army Corps of Engineer's Specification CRD-C-572 and equal to Burke Water Stops as manufactured by The Burke Company. Provide flat dumbbell type and center bulb type 6 inches x 3/8 inches. Provide 6-inch split-ribbed with center bulb type at connections of new concrete structures with existing concrete. Provide water stops as indicated on the Drawings.
- D. Preformed Expansion Joint Filler:
 - 1. Bituminous type conforming to the requirements of ASTM D994.
 - 2. No-extruding type, self-expanding cork, 3/4-inch thick or as otherwise shown on the Drawings, conforming to the requirements of ASTM D1752, Type I, and compatible with the specified joint sealant compound.
- E. Joint Sealant: A multipart gray polyurethane sealant, meeting U.S. Federal Specification TT-S-00227E (3) Type 1, Class A self-leveling for horizontal joints, and Type II, Class A, non-sag for vertical joints, and recommended by the manufacturer for continuous immersion in water. Provide sealants as manufactured by Products Research and Chemical Corporation, Mameco International, The Burke Company, W.R. Meadows, or equal.
- F. Control Joint Filler: Use epoxy joint filler equal to Burke post Joint Filler to fill voids left by saw cuts and to resist against spalling caused by vehicle traffic in concrete slabs.
- G. Tongue and Groove Joint Forms: 24-gauge steel forms complete with steel stakes and splice plates, designed for joints not to receive a poured seal, and equal to Burke Keyed Kold Joint as manufactured by The Burke Company.
- H. Inserts: Galvanized steel to fit the proposed hanger or support.
- I. Mortar for Repair of Concrete: Same materials as used for concrete, except omit coarse aggregate and use not more than one part cement to two and one-half parts sand by damp loose volume. Use no more mixing water than is necessary for handling and placing.
- J. Burlap Mats: Conform to AASHTO Specification M182.



2.10 CONDUITS AND PIPES EMBEDDED IN CONCRETE

- A. Conduits, pipes, and sleeves of any material not harmful to concrete shall be permitted to be embedded in concrete with approval of the Engineer, provided they are not considered to replace structurally the displaced concrete.
- B. Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent electrolytic action between aluminum and steel.
- C. Conduits and pipes, with their fittings, embedded within a column shall not displace more than four percent (4%) of the area of cross section on which strength is calculated or which is required for fire protections.
- D. Conduits, pipes, sleeves passing through a slab, wall, or beam shall not significantly impair the strength of the construction.
- E. Except when plans for conduits and pipes are approved by the Engineer, conduits and pipes embedded within a slab, wall, or beam shall satisfy the following:
 - 1. They shall not be larger in outside dimension than one-third overall thickness of slab, wall, or beam in which they are embedded.
 - 2. They shall not be spaced closer than three diameters or widths on center.

2.11 PIPES CONTAINING LIQUID, GAS, OR VAPOR

- A. Pipes that will contain liquid, gas or vapor may be embedded in structural concrete under the following conditions:
 - 1. Pipes and fittings shall be designed to resist effects of the material, pressure, and temperature to which they will be subjected.
 - 2. No liquid, gas, or vapor, except water not exceeding 90°F (32C) nor 50 psi (345 kPa) pressure, shall be placed in the pipes until the concrete has attained its design strength.
 - 3. Concrete cover for pipes, conduits and fittings shall be not less than 6 inches (38 mm) for concrete exposed to earth or weather or in contact with ground.
 - 4. Reinforcement with an area of not less than 0.002 times area of concrete section shall be provided normal to piping.
 - 5. Piping and conduit shall be so fabricated and installed that cutting, bending or displacement of reinforced from its proper location will not be required.



PART 3 – EXECUTION

3.01 PROPORTIONING

- A. Mix Design shall conform to ACI 318, Chapters 19 and 26. Submit mix design for each Class of concrete.
- B. The proportions of aggregate to cement shall be such as to produce a thoroughly plastic mixture which will work readily into the corners and angles of the forms and around the reinforcement, but without permitting the materials to segregate or excess free water to collect on the surface. The percentage of sand shall not be less than thirty percent (30%) nor more than fifty percent (50%) of the total weight of the aggregate. No more than 10% Fly Ash shall be substituted for Cement.
- C. The Maximum Water-to-Cement W/C Ratio shall be as follows:
 - .37 (LBS/LB) - Concrete with superplasticizer
 - .45 (LBS/LB) - Class "A" Concrete without superplasticizer
 - .55 (LBS/LB) - Class "B" Concrete without superplasticizer
- D. The amount of air entrained in the freshly mixed concrete shall not be less than three percent (3%) nor more than five percent (5%).
- E. Slump: 4 inches plus or minus 1 inch for Class A and B Concrete without superplasticizer. Slump shall be measured at point of placement.
 - 1. 7 inches plus or minus 1 inch for Class A and B Concrete with superplasticizer.
 - 2. 8 inches plus or minus 1 inch for tremie concrete or as specified by details.
- F. The Cement content per cubic yard, by weight, shall be 565 to 611 for Class "A" Concrete and 470 minimum for Class "B" Concrete. Concrete materials shall be accurately measured by weight. Measurement of materials for ready-mixed concrete shall conform to the "Standard Specifications for Ready-Mixed Concrete" (A.S.T.M. designation C-94).
 - 1. Class "A" concrete for all structures shall have minimum compressive strength of 4,000 psi at 28 days.
 - 2. Class "B" concrete for sidewalks shall have minimum compressive strength of 3,000 psi at 28 days.



3. All concrete shall be Class "A" unless otherwise shown on the drawings.

3.02 MIXING AND PLACING

- A. Concrete shall be mixed, conveyed and deposited in accordance with the ACI 301.).
- B. Prior to placing any concrete, the Contractor shall submit for the Engineer's approval a design mix, calculated by a recognized testing laboratory, and using the approved aggregates to produce a workable mix of the desired strength, together with certified copies of 7-day and 28-day tests of cylinders taken from concrete made according to the design mix. The mixes shall be designed to secure concrete having a minimum compressive strength at age 28 days.
- C. Ready-mixed concrete delivered shall be accompanied by delivery tickets showing the following:
 1. Date and time leaving plant
 2. Type of cement and weight
 3. Quantity of water and time added
 4. Additives (if any)
 5. Site arrival time
 6. Site leaving time
- D. Concrete.
 1. Ready-mixed concrete shall be used. All mixing requirements specified herein shall be enforced, and the Owner's laboratory representative and the Engineer shall have free access to the mixing plant at all times.
 2. Except for materials and/or procedures otherwise specified herein, ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C 94.
 3. No water shall be added to the concrete after it leaves the plant except where part of the design water was purposely omitted at the plant, and then only as approved by the Engineer.
- E. Mixer Speed.
 1. Neither the speed of any mixer nor the quantity of material loaded into any mixer shall exceed the recommendations of the manufacturer.
 2. Excessive over-mixing, required additions of water to preserve the required consistency, shall be cause for rejection of the batch.
 3. Concrete shall not remain in a transit mixer or agitator truck more than ninety (90) minutes after the water has been introduced, and not for more than forty-five (45) minutes if any approved retarding agent is not used.



4. Minimum mixing time shall be fifty (50) revolutions of drum at rated speed.

F. Measurement.

1. Equipment necessary to determine and control the actual amounts of all materials entering the concrete shall be provided by the concrete manufacturer.
2. All materials shall be measured by weight, except that water may be measured by volume, calculated at 8-1/3 pounds per gallon. One bag of cement will be considered as 94 pounds in weight.

G. Placing Concrete.

1. All concrete shall be placed in clean, damp forms that are not hot to the touch.
2. To prevent segregation, concrete shall be deposited as nearly as practicable in final position and not allowed to drop freely more than necessary and in no case more than five feet, except in an approved funnel or tremie. All concrete shall be placed during daylight unless otherwise authorized by the County at least four (4) hours in advance. Where the reinforcing steel above the top of the concrete being placed becomes coated with laitance or partially set-up concrete, all such concrete shall be removed from the reinforcing steel prior to placing concrete around the bars.
3. Concrete shall be packed carefully and tightly around pipe and other items to secure maximum adhesion.
4. Concrete shall be placed in layers not over 12 inches deep before compacting. Concrete shall be compacted by internal vibrating equipment supplemented by spading and hand-rodming between reinforcing steel and form to eliminate air bubbles and honeycomb. Vibrators shall not be used to move the concrete laterally inside the forms. Duration of vibration shall be limited to the time necessary to provide satisfactory consolidation without causing segregation, not less than five and not more than 15 seconds per square foot of exposed top surface. The vibrator shall be constantly relocated and shall be placed in each specific spot only once for each layer. The Contractor shall take steps to assure that sufficient personnel are available to devote full time to operating vibrator, spading and rodming.
5. Wall concrete shall be placed in layers as indicated above, with the first lift preceded by a 1-inch minimum layer of 1:2-1/2 cement-sand grout, with a 6-inch to 8-inch slump, placed on existing concrete not more than twenty (20) minutes before concrete placement. The surface of previously placed hardened concrete shall be clean and wet before grouting or shall be treated with a bonding agent as required. Puddles of water in



horizontal recessed keys shall be avoided by the use of drain recesses to outside edge of concrete. Concrete in walls and deep beams shall be placed in lifts not to exceed three layers at 12 inches each for the full length of the pour before proceeding higher. The placing of concrete shall not be delayed more than twenty (20) minutes between layers or lifts.

6. Slab forms shall be thoroughly cleaned after placing wall concrete below. Concrete in beams or walls shall be placed to bottom of floor slab. After concrete in walls below floor slab has been in place for approximately thirty (30) minutes, the concrete for the floor slab and upper portion of the beam shall be placed and vibrated.
7. When concrete is conveyed by chutes, the equipment shall be of proper size and design to ensure a continuous flow in the chute. The chutes shall be metal or metal-lined, and the different portions shall have approximately the same slope. The slope shall not be less than one vertical to three horizontal or more than one vertical to two horizontal, and there shall be provision for a baffle at the discharge end of the chute to prevent segregation. If the vertical distance between the discharge end of the chute and the surface of the concrete is more than five feet, a spout shall be used. The lower end of the spout shall be kept as near the surface of the deposit as is practicable. All chutes and spouts shall be thoroughly cleaned before and after each run. All debris and water shall be discharged outside the forms.

3.03 CURING AND PROTECTION

A. Curing:

1. Immediately after surface defects have been repaired, apply a spray coat of curing compound to all exposed surfaces, including slabs, walls, beams, and columns in accordance with the manufacturer's recommendations. Protect exposed steel keyways and other embedded items from the curing compound. Water cure, as specified in paragraph B hereunder, all concrete surfaces that are to be exposed to wastewater, surfaces that are to be coated with a coal tar epoxy system, and concrete floors requiring a bond for special finishes.
2. Do not apply compound during periods of rainfall. Should the film become damaged from any cause within the required curing period, immediately repair the damaged portions with additional compound. Upon removal of forms, immediately coat the newly exposed surfaces to provide a curing treatment equal to that provided for the surface.
3. Curing and Sealing Compound: Use clear compound conforming to Federal Specification TT-C-800A, thirty percent (30%) solids content minimum, having test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq. cm. when applied at a coverage rate of 300 sq. ft per gallon, and equal to Super Floor Coat or



Super Pliocure by The Euclid Chemical Company or Masterseal 66 by Master Builders. Furnish manufacturer's certification as required.

4. Apply specified clear curing and sealing compound to all horizontal areas so noted on the Drawings or in the Specifications. Apply immediately after final finishing. Apply this compound to non-structural construction joints of slabs on grade to act as a bond breaker prior to placement of adjacent concrete.

B. Water Curing Method: Cure all concrete that is to be water cured by either the wet burlap method, by continuous fogging or by covering with waterproof sheet.

1. Wet Burlap Method: Cover concrete surface with a double thickness of burlap, cotton mats, or other approved material, kept thoroughly saturated with water. Keep the forms wet until removed and upon removal, start the curing specified herein immediately. Cure the concrete for a period of seven (7) days for normal Portland cement or four (4) days for high early strength cement. Do not submerge concrete poured in the dry until it has attained sufficient strength to adequately sustain the stress involved and do not subject it to flowing water across its surface until it has cured four (4) days.
2. Continuous Fogging: Perform continuous fogging by fogging with a nozzle which so atomizes the flow of water that a mist, and not a spray, is formed. Fog the concrete surface regularly without allowing any part of the surface to become dry. Take all necessary precautions to prevent erosion of the concrete surface by the water.
3. Covering with Waterproof Sheets: Keep the entire area to be cured continuously wet by fogging, as specified in the fogging paragraph above, for at least eighteen (18) hours and then immediately cover with waterproof curing sheet conforming to ASTM C171, waterproof paper and polyethylene film, free of holes or tears. Keep sheet fully flat, without wrinkles or air bubbles, held down tautly at all edges. Do not use this method on slabs which will be exposed to view.

3.04 PLACING REINFORCEMENT

- A. All reinforcement shall be detailed, fabricated, and erected in accordance with the ACI "Manual of Standard Practice for Detailing Reinforced Concrete Structure" (ACI 315), including bar supports and spacers. At splices, all reinforcing bars shall be lapped a minimum of 24 bar diameters but not less than 12 inches, unless noted otherwise on the drawings.
- B. The reinforcing shall be fabricated to the shapes and dimensions shown and shall be placed where indicated on the drawing. Before placing, all reinforced steel shall be thoroughly cleaned of rust, mill scale or coatings, which would reduce or destroy the bond. Reinforcing bars shall conform to the requirements of the latest editions of the ACI Code and the CRSI Manuals.



- C. Wire mesh, unless otherwise shown on the drawings or specified, shall be 6" x 6" No. 10 woven or electrically welded wire fabric conforming to the requirements of ASTM Designation A185, latest revision.
- D. Space chairs and bolsters in accordance with ACI 315 and 318 using height to furnish cover over reinforcing required. Chairs with plastic feet or stainless steel shall be used in all beams and elevated slabs. Chairs for other concrete adjacent to or on the ground shall be minimum 3-inch-tall pre-cast concrete Dobies with tie wires.
- E. When placed in the forms, reinforcement shall be clean and free of all loose rust, scale, dust, dirt, paint, oil, or other foreign material, and shall be accurately and securely positioned both laterally and vertically before placing concrete. Minimum clearances between the steel and face of concrete shall be maintained as shown.
- F. The rebars shall be fastened together at every intersection or at intervals not greater than 24 bar diameters by wire ties or by some alternate method acceptable to the Engineer. In areas where large bars are closer together, the wire ties may be spaced not more than 30 bar diameters apart, rather than as specified above.

3.05 FORMS

- A. Installation and erection shall be in accordance with ACI 347 and as specified hereinafter.
- B. Forms shall conform to shape, lines and dimensions of numbers indicated, and shall be sufficiently tight to prevent leakage of mortar. They shall not deflect under dead load weight of construction as a liquid or of construction load. Forms shall be properly braced or tied together so as to maintain position and shape within specified tolerances. Construct forms so that they can be removed steadily without hammering or prying against the concrete. Forms for exposed concrete shall be carefully made and accurately placed to obtain correct shape and line.
- C. Forms shall be of wood, metal, or other approved materials. Metal forms shall be of a type and manufacture acceptable to the Engineer. Plywood, fiberboard, or absorptive-type form linings may be used where appropriate. Sectional forms shall produce a uniform surface and shall be assembled in a modular pattern. Pours will not be scheduled until all erection and bracing is complete. Walers, ties and braces shall be required for all forms.
- D. Chamfer strips made from nominal dimensional 1" x 1" lumber cut on the diagonal shall be installed at the top of the forms on all exposed edges of walls, slabs, beams, and other structures above grade.
- E. Drip edge shall be made from wood quarter round and installed where shown. Extruded plastic fillets shall be used where detailed. Circular structures shall be formed with special care and attention to the appearance of the finished structure. Random location of fillers, non-modular sections, and excessive deviations from true circular segments shall be cause for rejection of the forms.



- F. The Contractor shall be fully responsible for the adequacy of formwork in its entirety. Forms shall support required loads and shall maintain their dimensional and surface correctness to produce members required by drawings.
- G. Slots, chases, recesses, or other openings as shown on the drawings or as needed for the work of any other trades shall be boxed out.
- H. Box out for all temporary openings and build forms to seal them up when and as required.
- I. After sealing and immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form-releasing agent, applied in compliance with the manufacturer's instructions.
- J. Reused forms shall be thoroughly cleaned out of dirt, debris, concrete, and foreign matter. Forms shall not be reused if they have developed defects that would affect their tightness and strength or desired surface finish. Used forms shall not be used for architectural concrete.
- K. Forms shall be removed in a manner that will prevent injury to concrete. Supporting forms or shoring shall not be removed until the members have acquired sufficient strength to support their weight and any load thereon.
- L. Removal shall be in sequence as approved by the Engineer. Unless test cylinders warrant another procedure, the forms shall not be removed from members prior to the time listed in the schedule hereinafter unless otherwise directed.
- M. Bonding to Existing Surfaces: Clean existing concrete surfaces that are to have new concrete bonded thereto of all grease, oil, dust, dirt, and loose particles and coat with an epoxy bonding agent just prior to placing of the new concrete. Apply the bonding agent as recommended by the manufacturer and allow the agent to become tacky before the new concrete is placed. Do not allow the bonding agent to overlap or be spilled on the surfaces to be exposed after the work is completed.

3.06 FORM REMOVAL

- A. Maintain formwork in place for the following structural conditions until the concrete has attained the minimum percentage of indicated design compressive strength or for the period of time specified in the following table.

Note: Time periods in the table include all days except those in which the temperature falls below 40°F.



Structural Member or Condition	Normal Strength Concrete	Normal High-Early Strength Concrete	Minimum Compressive Strength for Form Removal (% Design Strength)
Cantilevers	12 days	7 days	90
Over 20 feet between supports	12 days	7 days	90
Stairway	10 days	5 days	80
Floor Slabs	5 days	3 days	70
Free standing walls, column and piers	5 days	3 days	70
Walls, piers, columns, sides of beams, footings, slabs on grade, and vertical surfaces	24-48 hours	12-24 hours	70
Front face form of curbs	6-24 hours	6 hours	70

3.07 CONCRETE FINISHINGS

A. Repair of Surface Defects:

1. General: Repair surface defects, including tie holes immediately after form removal. Dampen the area to be patched and an area at least six inches wide surrounding it to prevent absorption of water from the patching mortar. Notify the Engineer prior to commencing operations.
2. Removal of Defective Concrete: Remove all honeycombed and other defective concrete down to sound concrete. Cut edges perpendicular to the surface or slightly under cut. Sandblast surfaces to receive repair.
3. Bonding Grout: Thoroughly dampen surfaces to be patched and apply a coat of bonding grout consisting of one part cement to one part fine sand passing a No. 30 sieve and having the consistency of thick cream.
4. Placing Patching Mortar: After the bonding grout begins to lose its water sheen, apply a premixed patching mortar, thoroughly consolidating it into place and striking it off so as to leave the patch slightly higher than the surrounding surface. Leave mortar undisturbed for one hour to permit initial shrinkage and then finally finish.
5. Tie Holes: After being cleaned and thoroughly dampened, fill the tie holes solid with patching mortar.



B. Concrete Finishes:

1. Formed Surfaces: After removal of forms, chip off all irregular projections, grind flush with adjacent surfaces, and finish concrete surfaces in accordance with the following schedule:

Finish

Designation

Area Applied

F-1	Exterior walls below grade not exposed to water: Repair defective concrete, fill depressions deeper than two inches, and fill tie holes.
F-2	Exterior and interior walls exposed to water: Repair defective concrete, remove fins, fill depressions 3 inches or deeper, and fill tie holes.
F-3	Walls of structures or buildings exposed to view and underside of formed floors or slabs: In addition to Finish F-2, fill depressions and airholes in mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-half parts sand by damp loose volume on the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.
F-4	Tops of walls, beams, and similar unformed surfaces occurring adjacent to formed surfaces: Strike smooth after concrete is placed and float to a texture reasonably consistent with that of formed surfaces.

2. Slab Surfaces:

- a. General: After concrete has been consolidated, finish all concrete slabs with a floated finish. After floating, trowel finish all concrete slabs, except for areas to receive roofing, insulation, tile, or topping, and immediately light broom finish. Where a finish is not indicated, provide a troweled finish.



Finish

Designation

Area Applied

- | | |
|-----|---|
| S-1 | Slabs and floors not water bearing: Smooth steel trowel finish. |
| S-2 | Slabs and floors which are water bearing and slab surfaces on which mechanical equipment moves: Steel trowel finish free from trowel marks and all irregularities. |
| S-3 | Slabs, floors, and stair treads of structures or buildings exposed to view: Steel trowel finish without local depressions or high points, and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage. |
| S-4 | Slabs and floors at slopes greater than ten percent (10%): Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage. |
| S-5 | Exposed edges of slabs, floors, and tops of walls: Finish with a 3-inch radius edge if a chamfer is not indicated. |

- C. Floated Finish: After concrete has been placed, consolidated, struck off, and leveled, do not work the surface further until water sheen has disappeared and the surface has hardened sufficiently to permit floating. During the first floating, check the planeness of the slab with a 10-foot straightedge applied at no less than two angles. Cut down all high spots and fill all low spots to produce a surface having the required tolerance. Then refloat the slab to a uniform sandy texture.
- D. Light Broomed Finish: After floating, power trowel slabs to receive a light broomed finish to produce a smooth surface, relatively free of defects. Before the surface sets, pass a soft broom drag over the surface to produce a surface uniform in texture and appearance.
- E. Troweled Finish: After floating, power trowel slabs to receive a troweled finish to produce a smooth surface, relatively free of defects. Hand trowel after the surface has hardened sufficiently. When a ringing sound is produced as the trowel is moved over the surfaces, perform final troweling by hand to produce a surface which is thoroughly consolidated, free from trowel marks, uniform in texture and appearance and plane to a tolerance of 1/8 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction.
- F. Hardener Finish: Where indicated to receive a troweled hardener finish, water cure slabs without application of curing and sealing agent. When slab is at least twenty (20) days old and thoroughly dry, apply the hardener in accordance with



the manufacturer's recommendations. Where dry-shake hardener or slip resistant finish is required, apply the hardener or slip-resistant product prior to complete curing and finishing, in accordance with the requirements and recommendations of the product manufacturer.

- G. Saw Cut Joints: Cut joints that are to be saw cut not sooner than two (2) hours after the concrete is poured and not later than eight (8) hours after the pour.

3.08 TESTS

- A. Compressive strength tests shall be made by breaking standard 6-inch diameter by 12-inch high test specimens prepared, cured, and broken in accordance with the American Society for Testing Materials Standard Methods C-31 and C-39, latest revision. Four (4) specimen test cylinders shall be taken from each pour of five cubic yards or more. One additional test shall be taken from each 100 cubic yards or fraction thereof in each pour in excess of 100 cubic yards.
- B. Test specimens shall be taken from manhole bottom pours of less than five cubic yards as directed by the Engineer. Test specimens shall be taken in the presence of the Engineer. One cylinder from each pour shall be broken at seven (7) days, the remainder at twenty-eight (28) days. Additional test cylinders may be ordered for determining the characteristics of a new design mix or changes in equipment or methods, and under adverse weather or curing conditions.
- C. Slump test shall be made in accordance with ASTM C143, latest revision, and shall be made with each load and at time of cylinders.
- D. The Contractor shall supply all cylinder molds, slump cones, tools and labor for preparing specimen, and shall provide clean, moist sand or burlap for curing. Cylinder shall not be shipped to the testing laboratory until the third day following preparation and shall be protected from accidental damage at all times.
- E. The test cylinders shall be tested in a recognized commercial testing laboratory at the expense of the Contractor.

3.09 EXPANSION JOINTS, CONSTRUCTION JOINTS AND WATER STOPS

- A. Expansion Joints shall be placed as indicated on the drawings. Joint materials for surfaces exposed to water and sewage shall conform to ASTM D175, Preformed Joint Filler, non-extruding and resilient (bituminous type), thickness as shown on the drawings. Joint materials for isolation joints, slab-on-grade joints and wall joints not exposed to water and sewage shall conform to ASTM D994, preformed expansion joint filler for concrete (bituminous type), thickness as shown on the drawings.
- B. Construction Joints shall be located at a maximum of every thirty (30) feet on center unless noted otherwise on the drawings. Construction joints are not to be placed within four (4) feet of any corner or change in direction of a wall, footing, or slab. All construction joints are to be shown in the schedule of pours which



shall be prepared and submitted by the Contractor. Vertical construction joints shall be held to the minimum number consistent with good standard practice.

- C. Water Stops. Material for water stops shall be 6-inch PVC multi-rib center-bulb type for expansion joints, and 1/4" x 4" and 1/8" x 4" structural steel sheets for construction joints. PVC joint material shall be as manufactured by The Burke Company or approved equal.

END OF SECTION



SECTION 03 35 01 CONCRETE FINISHING – STORMWATER PROTECTION, PLAZA, AND PLANTER WALLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section includes:

1. Concrete stormwater protection, plaza and planter wall finish

B. Related Sections:

1. Section 01 33 00, Submittal Procedures
2. Section 03 30 00, Cast-in-place Concrete

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 117 Specifications for Tolerances for Concrete Construction and Materials and Commentary
2. ACI 301 CH. 6 Specifications for Structural Concrete.
3. ACI 303R Guide to Cast-in-Place Architectural Concrete Practice.
4. ACI 309 CH. 7 Guide for Consolidation of Concrete.
5. ACI 347 CH. 5 Guide to Formwork for Concrete

1.3 SUBMITTALS

A. Colored Concrete

1. Manufacturer's product data and installation instructions for color additives and curing compounds.
2. Submit samples of color additive sample chip, indicate color additive number and required dosage rate.

B. Architectural Formliners

1. Manufacturer's product data and installation instructions for formliner and release agent.
2. Sample Panel: Submit a 36" x 36" sample of the formliner pattern.
3. Shop Drawings: Plan, elevation, and details showing overall pattern, joint locations, form tie locations, end locations and other special conditions.
 - a. Space form ties 24" o.c. horizontally and 12" o.c. vertically in grid pattern.
 - b. Space joints 6' o.c. horizontally. See civil drawings and specifications for joint sizing
4. Form ties samples and description, showing method of break-back when forms are removed.



1.4 MOCK UPS

- A. Provide site mock-ups of finishes of wall for Owner Representative approval. At least 2 feet by 6 feet in size and demonstrate joints. Indicate materials and methods that was used to produce finishes.
- B. Number of mock-up panels required shall be the number necessary to obtain the Owner Representative's approval of texture and color.
- C. Maintain approved mock-ups and use as the standard for the aesthetic quality of the survey finish for work represented by mock-ups. Remove mock-ups when permitted by Owner Representative.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Cover formliners to protect from oil, dirt and UV exposure.
- B. Color Additive: Deliver, store, and handle in accordance with manufacturer's instructions.
- C. Concrete: Schedule delivery to provide consistent mix times from time color additive is placed in mixture until placement of integrally colored concrete.

PART 2 – PRODUCTS

2.1 COLORED ADDITIVES

- A. Manufacturer: Davis Colors (www.daviscolors.com) or equal.
- B. Colors: Davis color Dark Gray (8084) or equal.
- C. Materials
 - 1. Colored concrete additive made with pure, concentrated mineral pigments especially processed for mixing into concrete and complying with ASTM C 979.
 - 2. Base dosage rates on weight of Portland cement, fly ash, silica fume, lime and other cementitious materials not but aggregate or sand.
 - 3. Curing compound for colored concrete – Davis colors W-1000 clear cure and seal, or equal; complying with ASTM C 309
- D. Mixes
 - 1. Mix color additives in accordance with manufacturer's instructions until color additives are uniformly dispersed through-out mixture.



2.2 ARCHITECTURAL FORMLINERS

A. Product

1. Sika smooth finish (#340) multi-cast formliner or equal.

B. Accessories

1. Sika Greenstreak Form Release or equal, verified to be compatible with the formliner material.
2. Sika Chamfer radius continuous PVC Strip with 1/2 inch leg

2.3 ACCESSORIES

- A. Form Ties – Use form ties required to achieve structural stability of formwork and spacing shown on shop drawings. Exterior hole left from removal of form tie head to be 1/2" diameter.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Comply with color admixture manufacturer's recommendations unless otherwise specified in this Section.
- B. Before placing concrete, verify lines and levels of formwork and formliner patterns are within allowable tolerances.
- C. On multiple-use grades, clean formliner before each use. Replace damaged formliner whose continued use or repair would negatively impact the aesthetics of the concrete finish.
- D. Apply formliner release at rate recommended by manufacturer. Attempt to schedule concrete placement soon after application of form release agent to avoid precipitation, dust, and debris. Protect reinforcing steel from exposure to release agents.

3.2 INSTALLATION

- A. Seal formliner joints, rustication/chamfer joints, and tie holes to prevent cement paste from bleeding.
- B. Provide solid backing at formliner joints where unsupported by formwork to prevent deflection.
- C. Provide openings, offsets, keyways, recesses, chamfers, blocking, and screeds as required to achieve architectural concrete textured finish.



- D. Drill or cut formliner to accommodate form ties.
- E. Fasten formliner to formwork 12" to 24" on center. Increase spacing as necessary to accommodate form stripping pressures without damaging formliner intended for multiple use.
- F. Install backup strips as required to prevent deflection of the formliner due to form pressures.

3.3 CONCRETE PLACEMENT

- A. Form pressures not to exceed 1000 psf.
- B. Keep concrete lifts less than 24 inches. Thoroughly vibrate concrete to achieve good consolidation, and eliminate entrapped air thereby minimizing voids. Internally vibrate through to previous lift to avoid lift lines. Avoid vibrator contact with the formliner.
- C. Concrete temperatures in excess of 140°F will adversely affect the material properties of the formliners.

3.4 ACCESSORY INSTALLATION

- A. Tightly form corners indicated to be chamfered with Sika rounded PVC chamfer. Chamfered corners shall be smooth, solid, unbroken, continuous lines.

3.5 FORMLINER STRIPPING

- A. Leave forms in place for minimum 12 hours and remove preferably within 24 hours of concrete placement. Extending time from placement to stripping can increase force required. To prevent inconsistent coloring, remove all formliners after same duration from concrete placement.
- B. Apply curing compound as soon as forms are stripped.

3.6 PATCHING

- A. Fill holes and defects in concrete surface within 48 hours of form removal.
- B. When patching defects, use the same materials used in the original concrete mix.
- C. Leave form tie holes exposed. Do not patch.

3.7 CLEANING

- A. Efflorescence: Remove efflorescence as soon as practical after it appears and as part of final cleaning.



- B. Use least aggressive cleaning techniques possible
- C. If proprietary cleaning agents are used, pre-wet surface, test cleaning agent on small, inconspicuous area, and check effects prior to proceeding. Begin cleaning at top and work down. Thoroughly rinse surface afterwards with clean water. Follow cleaner manufacturer's instructions.
- D. Do not use muriatic or hydrochloric acid on integrally colored concrete.

END OF SECTION



SECTION 03 35 02 CONCRETE FINISHING – COLONNADE STORMWATER PROTECTION WALLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section includes:

1. Concrete stormwater protection wall finish at existing colonnade on Union Avenue

B. Related Sections:

1. Section 01 33 00, Submittal Procedures
2. Section 03 30 00, Cast-in-place Concrete

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 117 Specifications for Tolerances for Concrete Construction and Materials and Commentary
2. ACI 301 CH. 6 Specifications for Structural Concrete.
3. ACI 303R Guide to Cast-in-Place Architectural Concrete Practice.
4. ACI 309 CH. 7 Guide for Consolidation of Concrete.
5. ACI 347 CH. 5 Guide to Formwork for Concrete

1.3 SUBMITTALS

A. Product Data: Manufacturer's specifications and instructions for color additives and curing compounds.

B. Submit samples of color additive sample chip, indicate color additive number and required dosage rate.

C. Samples of aggregate (if applicable)

Submit samples not less than 36" x 36" of finish to be used for walls. Indicate materials and methods used to produce finish.

D. Shop Drawings: Elevation and details showing overall pattern and joint/recess locations. Joint/recess locations and size to match existing colonnade walls.

1.4 MOCK UPS

- A. Provide site mock-ups of finish to match existing colonnade columns for Owner Representative approval. At least 2 feet by 6 feet in size and demonstrate joints and joint layout. Indicate materials and methods that was used to produce finishes.



- B. Number of mock-up panels required shall be the number necessary to obtain the Owner Representative's approval of texture and color.
- C. Maintain approved mock-ups and use as the standard for the aesthetic quality of the survey finish for work represented by mock-ups. Remove mock-ups when permitted by Owner Representative.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Color Additive: Deliver, store, and handle in accordance with manufacturer's instructions.
- B. Concrete: Schedule delivery to provide consistent mix times from time color additive is placed in mixture until placement of integrally colored concrete.

PART 2 – PRODUCTS

2.1 COLORED CONCRETE

- A. Manufacturer: Davis Colors (www.daviscolors.com) or equal.
- B. Colors: As required to match existing colonnade columns. If exact color cannot be achieved, use a darker color than the existing colonnade columns. Do not use lighter color.
- C. Materials
 - 1. Colored concrete additive made with pure, concentrated mineral pigments especially processed for mixing into concrete and complying with ASTM C 979.
 - 2. Base dosage rates on weight of Portland cement, fly ash, silica fume, lime and other cementitious materials not but aggregate or sand.
 - 3. Curing compound for colored concrete – Davis colors W-1000 clear cure and seal, or equal; complying with ASTM C 309
- D. Mixes
 - 1. Mix color additives in accordance with manufacturer's instructions until color additives are uniformly dispersed through-out mixture.

PART 3 – EXECUTION

3.1 SANDBLAST FINISH (IF APPLICABLE)

- A. Blasting Operations and Requirements:
 - 1. Apply sandblasted finish to exposed concrete surfaces where indicated.
 - 2. Perform sand blasting at least 72 hours after placement of concrete. Coordinate with formwork construction, concrete placement schedule, and



formwork removal to ensure that surfaces to be blast finished are blasted at the same age for uniform results.

3. Determine type of nozzle, nozzle pressure, and blasting techniques required to match the control samples.
4. Abrasive blast corners and edge of patterns carefully, using back-up boards, to maintain uniform corner or edge line.

B. Depths of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surface to match the control samples as follows:

1. Medium Sand Blast Finish: Generally expose coarse aggregate; 3/16-inch to 1/4- inch reveal.

C. Surface Continuity: Perform sand blast finishing in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish on each surface or area of work. Maintain patterns of variances in depths of cuts as indicated.

D. Construction Joints: Use technique acceptable to the Owner's Representative to achieve uniform treatment of construction joints.

E. Protection and Repair:

1. Protect adjacent materials and finishes from dust, dirt, and other surface or physical damage during abrasive blast finishing operations. Provide protection as required and remove from site at completion of the work.
2. Repair or replace other work damaged by finishing operations.

3.2 PATCHING

A. Fill holes and defects in concrete surface within 48 hours of form removal.

B. When patching tie holes or other defects, use the same materials used in the original concrete mix.

3.3 CLEANING

A. Efflorescence: Remove efflorescence as soon as practical after it appears and as part of final cleaning.

B. Use least aggressive cleaning techniques possible

C. If proprietary cleaning agents are used, pre-wet surface, test cleaning agent on small, inconspicuous area, and check effects prior to proceeding. Begin cleaning at top and work down. Thoroughly rinse surface afterwards with clean water. Follow cleaner manufacturer's instructions.

D. Do not use muriatic or hydrochloric acid on integrally colored concrete.



END OF SECTION



SECTION 03 40 00 – PRECAST CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work under this Section includes the design, casting, delivery, and erection of concrete structures as indicated on the Drawings.

1.02 QUALITY ASSURANCE

- A. Standards: Unless otherwise indicated, all materials, workmanship, and practices shall be in accordance with the current editions of the following standards:
1. ACI 318, Building Code Requirements for Reinforced Concrete.
 2. PCI MNL 116, Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
 3. AASHTO, Standard Specifications for Highway Bridges
 4. ASTM C478, Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
 5. ASTM C33, Standard Specification for Concrete Aggregates
 6. ASTM C330, Standard Specification for Lightweight Aggregates for Structural Concrete
 7. ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
 8. ASTM, A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 9. ASTM C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 10. SS-S-210A, Federal Specification: Sealing Compound, Preformed Plastic, For Expansion Joints And Pipe Joints
 11. ASTM C387, Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar
 12. ASTM C923, Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
 13. ASTM A48, Standard Specification for Gray Iron Castings
 14. ASTM C32, Sewer and Manhole Brick (Made From Clay and Shale)



1.03 SUBMITTALS

- A. The following information shall be submitted for approval in accordance with Section 01 33 00 "Submittal Procedures".
 - 1. Qualification Data: Satisfactory evidence shall be submitted that plant and production methods meet the requirements of PCI MNL 116.
 - 2. Design Data:
 - a. Calculations: Complete calculations including shear, moment, buoyancy, and camber calculations shall be submitted. All computation sheets shall be stamped and signed by a Professional Engineer registered in the State of California. Design water table shall be assumed to be at finished grade.
 - b. Reference the Structural Drawings for Design parameters.
 - c. Concrete mix design
 - 3. Shop Drawings: Complete fabrication and erection drawings shall be submitted. All drawings shall be stamped and signed by a Professional Engineer registered in the State of California.
 - 4. Manufacturer's data sheets shall be submitted on the following:
 - a. Joint mastic and gaskets.
 - b. Pipe connections.
 - c. Grout material.
 - d. Hatches and manhole covers.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Transportation and erection shall be done by qualified personnel using proper equipment. Lifting and supporting shall be done only at points indicated on the shop drawings.

PART 2 – PRODUCTS

2.01 MATERIALS AND FABRICATION

- A. Precast Concrete Structures
 - 1. Design loads shall consist of dead load, live load, impact, soil and water loads, AASHTO HS-20 soils surcharge and top deck loading as well as other loads which may be imposed upon the structure. Wetwells and manholes shall be designed in accordance with ASTM C-478. The



minimum wall thickness for valve vaults shall be 6 inches. The minimum wall thickness for 4-foot inside diameter (I.D.) manholes shall be 6 inches. The minimum wall thickness for wetwells up to 7 feet I.D. shall be 8 inches. The minimum wall thickness for wetwells over 7 feet I.D. to 12 feet I.D. shall be 10 inches. The minimum wall thickness for wetwells over 12 feet I.D. shall be 12 inches unless shown otherwise by stamped and signed calculations to be less than 12 inches.

2. Forms used for precast concrete shall be of metal and sufficiently designed and braced to maintain their alignment under pressures of the concrete during placing. Base and first section of precast structures shall be an integral cast.
3. Aggregates: All aggregates, fine and coarse, other than lightweight aggregate, shall conform to ASTM C33. Lightweight aggregates, fine and coarse, shall conform to ASTM C330. Aggregates shall be free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Both types of aggregate shall be graded in a manner so as to produce a homogenous concrete mix. All materials are to be accurately weighed at a central batching facility for mixing.
4. Cement shall be Portland cement Type II.
5. Minimum compressive strength of concrete used for precast concrete structures shall be 5000 psi at 28 days.
6. Placing. All concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the approved unit is completed. Maximum elapsed time from batching to placement shall be two (2) hours. Concrete shall be placed in layers not over two feet deep. Each layer shall be compacted by mechanical internal or external vibrating equipment. Duration of the vibration cycle shall be limited to the time necessary to produce satisfactory consolidation without causing objectionable segregation.
7. Curing:
 - a. For purposes of early reuse of forms, precast concrete may be steam cured after an initial set has taken place. The steam temperature shall not exceed 160°F, and the temperature shall be raised from normal ambient temperatures at a rate not to exceed 40°F per hour.
 - b. The steam-cured unit shall not be removed from the forms until sufficient strength is obtained for the unit to withstand any structural strain to which it may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound may



be used, and shall be of a clear or white type, conforming to ASTM C309.

8. Reinforcing steel shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be ASTM A615 Grade 60.
 9. Joints shall be tongue and groove pipe ends sealed with round or other flexible type natural rubber joint ring gaskets in conformance with ASTM C443 or by a flexible performed bitumastic sealing material equal to Ram-Nek as manufactured by R.K. Snyder and Co., Houston, Texas. If rubber joint ring gaskets are used, interior and exterior voids in the pipe joints shall be sealed with flexible sealing material specified above, installed in strict accordance with the manufacturer's printed instructions. If manhole sections are sealed with a flexible preformed bitumastic sealing material, adequate material shall be applied so that "squeeze out" occurs at the interior and exterior of the joint. Rubber joint ring gaskets and flexible preformed bitumastic sealing material shall be provided by the manhole manufacturer.
 10. Eccentric precast concrete cone sections shall be manufactured of precast concrete with reinforcing and joints as specified above for the straight riser.
 11. Lifting holes through the structures is not permitted. Equally spaced lifting lugs, rings, or non-penetrating lift inserts shall be provided.
 12. Top slabs for shallow manholes, valve vaults, and pumping station wet wells may be precast or cast-in-place. Steel reinforcing shall be as required for the dead load of the slab plus an AASHTO H-20 designation live load. Concrete for top slabs shall have a compressive strength of 4,000 psi at 28 days. Thickness of concrete for top slabs shall be a minimum of six inches for shallow manholes and valve vaults, and eight inches for pumping station wet wells.
 13. Manhole inverts shall be precast into the manhole base section by the manhole manufacturer unless prior approval is obtained from the Engineer to construct inverts in the field. The drop from inlet to outlet shall be a minimum of one inch unless detailed on the drawings or approved by the Engineer. The channel height of the manhole invert shall match the crown of the exit pipe. Manhole benches shall be sloped a minimum of one inch per foot from the outside periphery of the manhole to the edge of the invert channel.
- B. Sealing Compound and Grout: Plastic sealing compound shall comply with Federal Specification SS-SS-00210. Mortar shall comply with ASTM C387, Type S, or grout complying with Section 03 60 00, "Grouting".



C. Pipe Connections:

1. Pipe connections for wet wells and manholes shall be resilient, waterproof connections design in accordance with ASTM C923. Resilient pipe connectors shall either be cast into the manhole wall or installed following casting in a cored section of the manhole wall. Resilient connectors shall either be a gasket-type connector equal to the A-Lok pipe to manhole seal as manufactured by Atlantic Concrete Products, Inc., or a flexible neoprene boot with stainless steel clamps equal to KOR-N-Seal System as manufactured by the Dukor Corporation. When the pipe is installed in the resilient manhole connector, the pipe shall be capable of 20 degrees minimum deflection in any direction.
2. Pipe connections for wall penetrations for valve vaults and for manholes and wetwells where resilient connectors cannot be used shall be provided with wall sleeves and link seals or as specified in Section 33 40 00, "Stormwater Utilities."

D. Frames and Covers: Cast iron manhole frames and covers shall be provided for manholes and aluminum access hatches shall be provided for wetwells and valve vaults as specified below:

Standard Manhole Frames and Covers: Shall be gray iron castings conforming to ASTM A48, Class 30B for Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections, and other harmful defects. The seating surfaces of both the frame and cover shall be machined so that the cover will not rock after it has been seated. The cover shall be provided with a precisely machined dovetail groove with a neoprene O-ring gasket to provide a self-sealing cover. The gasket shall be glued in place at the foundry. The manhole cover shall be solid with two non-penetrating pick holes. Manholes frames and covers shall be coated on all non-machined surfaces with two coats of coal tar epoxy as specified for the Class 7 Coating System in accordance with Section 09 90 00, "Painting and Coating". Manhole frames and covers shall be U.S. Foundry and Manufacturing Corp. No. 38B, Ref. Cat. No. 225, Neenah Foundry Company No. R-1642 with a Type "B" cover or an equal approved by the Engineer.

- a. Manhole Frames and Covers shall be designed to support AASHTO HS-20 loading.
- b. Anchor Bolts: Anchor bolts for bolting manhole frame to precast manholes shall be 3/4-inch diameter galvanized all thread steel rods with a five-inch hook for embedment in the precast manhole top. The bolts shall be of sufficient length to provide a minimum two-inch thread projection through the flange of the manhole frame. Two (2) anchor bolts shall be cast into the precast manhole top section or slab, positioned at 180 degrees, at the time of manufacturer. Manhole frames shall be drilled to match the bolt settings prior to coating.



2. Aluminum Access Hatches: Aluminum hatches shall be provided for wetwells, and valve vaults sized as indicated on the Drawings. Access hatches shall be as specified in Section 05 50 00, "Miscellaneous Metals"..

E. Coatings:

1. Interior and exterior surfaces of precast structures shall be coated with a primer coat and two (2) finish coats of coal tar epoxy as specified in Section 09 90 00, "Painting and Coating".

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Earthwork: The Contractor shall prepare an excavation large enough to accommodate the structure and permit sealing of openings, waterproofing, and backfilling operations. Earthwork shall conform to the applicable sections of Division 31.
- B. Installation of Precast Concrete Structures: Precast concrete structures shall be constructed in a workmanlike manner at the locations and dimensions indicated on the Drawings. Precast structures shall be set on a foundation of crushed stone, 12 inches thick. Crushed stone material shall be a well graded crushed stone or crushed gravel meeting the requirements of ASTM C33, Gradation No. 67 (3/4 inch to No. 4 sieve). The precast structures shall be constructed such that the structure will not transmit dead or live loads to the piping. Care shall be taken to prevent earth and other material from entering precast structures.
- C. Sealing and Grouting: Fill all interior and exterior joints between precast sections with a joint sealant, as recommended by the structure manufacturer.
 1. Set each precast concrete unit plumb on a bed of sealant to make a watertight joint at least two inches thick with the concrete base or with a preceding unit. Point the inside joint and wipe off the excess sealant.
 2. Assemble units so that the cover conforms to the elevations shown on the Drawings.
 3. Pipe connections at precast structures shall be provided at the locations shown on the Drawings. Connections shall be resilient and waterproof.
 4. All voids in interior and exterior manhole section joints and lift holes for manhole sections shall be filled with a non-shrinking, non-metallic grout. Grout shall be applied and cured in strict accordance with the manufacturer's recommendations. The grout shall be finished smooth and flush with the wall surface of the manhole.
- D. Manhole Flow Channels and Bench Walls:



1. Unless prior approval is obtained from the Engineer, manhole flow channels (inverts) and bench walls shall be precast into the manhole base section as specified above.
2. Upon prior approval from the Engineer, manhole inverts may be constructed in the field. Invert channel bottoms shall be smooth and semicircular in shape conforming to inside of adjacent sewer sections. Changes in direction of flow shall be made with a smooth curve of as large radius as the size of manhole will permit. Changes in size and grade of channels shall be made gradually and evenly to give a smooth uninterrupted flow pattern through the manhole. Channel height shall match the crown of the connection sewer pipe exiting the manhole. Manhole bench walls shall be smooth and shall slope one inch per foot from the edge of the invert channel to the precast manhole wall. Invert channels may be constructed by forming in concrete or by building up brick and mortar to form the manhole bench walls on each side of the channel, and plastering over bricks with cement mortar with a minimum thickness of two inches. Manhole invert construction shall only be performed by experienced and qualified workmen.
3. Bricks used to construct manhole invert channels and bench walls shall be standard size (22 in. H x 4 in. W x 8 in. L) brick in conformance with ASTM C32 "Sewer and Manhole Brick (Made From Clay and Shale)" Grade MS. Mortar used for masonry work shall be prepared by thoroughly mixing: One (1) volume of Type II Portland Cement with three (3) volumes of sand and sufficient clean water to produce a rich mass of approved consistency. Mixing mortar on the ground or any paved surface shall not be permitted. Sand to be used in making mortar shall be clean, well-graded, and shall pass a standard No. 4 sieve.

E. Setting Frames and Covers:

1. Unless otherwise indicated on the Drawings, in unpaved areas, the tops of manholes shall be set 0.5 feet above finished grade and the tops of wetwells, and valve vaults shall be set 0.5 feet above finished grade.
2. The top of all precast manholes may be brought to proper grade for receiving manhole frame by using not more than three courses of brick or precast concrete grade rings. Bricks and mortar used for manhole top grade adjustments shall be as specified above in Paragraph 3.01.D.3. Precast concrete grade rings shall be precast with steel reinforcement in conformance with ASTM C478 and concrete with a compressive strength of 4000 psi in 28 days. Precast concrete grade rings shall be manufactured in half annular shapes for ease of handling. The grade ring's dimensions shall be two inches thick with an annular width of eight inches and an inside diameter of 24 inches.
3. Masonry construction shall be performed by experienced and qualified workmen only. All work shall be laid plumb, straight, level, square, and



true. Brick shall be laid in full beds of mortar and shoved into place. All joints shall be full and not more than 2 inches in thickness. The Contractor shall set in place and bond in the masonry all necessary anchor bolts and miscellaneous items specified elsewhere. The masonry walls shall be plastered on the inside and outside with a one-half-inch coat of Portland Cement mortar.

4. Following curing of any masonry required for manhole top adjustment, set manhole frame in a bed of 3- to 2-inch thick flexible bitumastic sealing material (Ram-Nek) and anchor in place with two 3/4 inch anchor bolts, which shall be securely embedded in the top of the manhole. Seal the flange of the manhole ring to the top of the manhole with cement mortar.
- F. Interior Lining: The interior coating system shall be applied following installation of the precast structures and any piping or equipment that will penetrate or attach to the walls. Surface preparation and application of the coating system shall be in accordance with the manufacturer's recommendations. Refer to Specification Section 09 90 00, "Painting and Coating" for additional specifications.
- G. Backfill: After the structure and all appurtenances are in place and approved, backfill shall be placed to the original ground line or to the limits designated on the Drawings. Backfill material shall consist of sand or loose earth, free from stones, clods, or other deleterious material. It shall be placed in horizontal layers not exceeding 12 inches in depth and shall be moistened and thoroughly compacted to a minimum relative density conforming to the requirements of Division 31.

END OF SECTION



SECTION 03 60 00 - GROUTING

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Provide all labor, materials, tools, and equipment and perform all grouting as specified hereinafter and indicated on the Drawings.

1.02 RELATED WORK

- A. Section 03 30 00: Cast-In-Place Concrete.

1.03 SUBMITTALS

- A. Submit manufacturer's literature for review on the following items:
 - 1. Product Data: Non-shrink grout data, including grout properties, mixing, surface preparation, and installation instructions.

1.04 DELIVERY AND STORAGE

- A. Deliver and store grouting materials in unbroken containers with seals and labels intact as packaged by the manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Non-shrink epoxy grout:
 - 1. Manufacturers: One of the following or equal:
 - a. Five Star Products, Inc., Five Star Epoxy Grout.
 - b. BASF Construction Chemicals, Masterflow 648 CP Plus.
 - c. L&M Construction Chemicals, Inc., EPOGROUT.
 - 2. Non-shrink epoxy grout shall be 100 percent solid, premeasured, prepackaged system containing 2-component thermosetting epoxy resin and inert aggregate.
 - 3. Maintain flowable consistency for at least 45 minutes at 70 degrees Fahrenheit.
 - 4. Shrinkage or expansion: Less than 0.0006 inches per inch when tested in accordance with ASTM C 531.
 - 5. Minimum compressive strength: 10,000 pounds per square inch at 24 hours and 14,000 pounds per square inch at 7 days when tested in



accordance with ASTM C579, Method B.

6. Compressive creep: Not exceed 0.0027 inches/per inch when tested under 400 pounds per square inch constant load at 140 degrees Fahrenheit in accordance with ASTM C1181.
7. Coefficient of thermal expansion: Not exceed 0.000018 inches per inch per degree Fahrenheit when tested in accordance with ASTM C531, Method B.

B. Non-shrink grout:

1. Manufacturers: One of the following or equal:
 - a. Five Star Products, Inc., Five Star Grout.
 - b. BASF Construction Chemicals, Masterflow 928.
 - c. L&M Construction Chemicals, Inc., CRYSTEX.
2. In accordance with ASTM C 1107.
3. Preportioned and prepackaged cement-based mixture.
4. Contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings.
5. Require only the addition of potable water.
6. Water for pre-soaking, mixing, and curing: Potable water.
7. Free from emergence of mixing water from within or presence of water on its surface.
8. Remain at minimum flowable consistency for at least 45 minutes after mixing at 45 degrees Fahrenheit to 90 degrees Fahrenheit when tested in accordance with ASTM C230.
 - a. If at fluid consistency, verify consistency in accordance with ASTM C939.
9. Dimensional stability (height change):
 - a. In accordance with ASTM C1107, volume-adjusting Grade B or C at 45 degrees Fahrenheit to 90 degrees Fahrenheit.
 - b. Have 90 percent or greater bearing area under bases.
10. Have minimum compressive strengths at 45 degrees Fahrenheit to 90 degrees Fahrenheit in accordance with ASTM C1107 for various periods from time of placement, including 5,000 pounds per square inch at 28



days when tested in accordance with ASTM C109 as modified by ASTM C1107.

C. TOPPING GROUT AND CONCRETE/GROUT FILL

1. Where fill is thicker than 3 inches, structural concrete or sitework concrete, as indicated in Section 03 30 00 - Cast-in-Place Concrete, may be used when accepted by the ENGINEER. Omit the coarse aggregate in topping grout used in clarifiers.
2. Grout for topping of slabs and concrete/grout fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and be mixed as indicated. Materials and procedures indicated for normal concrete in Section 03 33 00 - Cast-in-Place Concrete, shall apply unless indicated otherwise.
3. Topping grout and concrete/grout fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water-cement ratio of 0.45. Topping grout in clarifiers shall contain between 750 and 800 pounds of cement per cubic yard with a maximum water-cement ratio of 0.42.
4. Coarse aggregate shall be graded as follows:

U.S. Standard Sieve Size	Percent By Weight Passing
1/2 in	100
3/8 in	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

5. Final mix design shall be as determined by trial mix design as indicated in Section 03 30 00, except that drying shrinkage tests are not required.
6. Topping grout and concrete grout/fill shall contain an air-entraining agent per Section 03 30 00.
7. Strength: Minimum compressive strength of topping grout and concrete/grout fill at 28 Days shall be 4000 psi.



8. Topping grout used in clarifiers shall contain fiber reinforcing. Fiber shall be 100 percent virgin polypropylene fibrillated fibers specifically manufactured in a blended gradation for use as concrete secondary reinforcement. Fibers shall be added at a rate of 1.5 pounds per cubic yard of concrete. Fibers shall conform to ASTM C 1116 – Standard Specification for Fiber-Reinforced Concrete, Type III.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Clean all bonding surfaces for dust and oil.

3.02 INSTALLATION

- A. Non-shrink Grout:

1. Use non-shrink, non-metallic grout for column base plates, anchor bolts, reinforcing bars, pipe sleeves, machinery supports, and pump base plates. Use epoxy grout for anchor bolts, etc., where indicated on the Drawings.
2. Mix and place non-shrink grout as recommended by the manufacturer.
3. Mix grout as close to the work area as possible and transport quickly to its final position in a manner that will not permit segregation of materials.
4. Cure non-shrink grout with water-saturated burlap for at least three (3) days or with an application of Super Rez Seal cure and seal compound applied immediately after grout placement.
5. Do not operate machinery set on grout pads until the grout has cured for at least twenty-four (24) hours.

- B. Topping Grout and Concrete/Grout Fill

1. Mechanical, electrical, and finish WORK shall be completed prior to placement of topping or concrete/grout fill. To ensure bonding to the base slab, the base slab shall be given an exposed aggregate finish. Alternatively, where accepted by the ENGINEER, the base slab shall be given a roughened textured surface by a close-spaced rake while the surface is green. After curing, high-pressure washing shall expose the aggregates and produce not less than a 3/16-inch amplitude roughness. Jackhammers or chipping hammers shall not be used.
2. The minimum thickness of grout topping and concrete/grout fill shall be one inch. Where the finished surface of concrete/grout fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2 inches wide by 1-



1/2 inches deep.

3. The base slab shall be thoroughly cleaned and wetted to saturated surface dry (SSD) condition per the International Concrete Repair Institute (ICRI) -- Technical Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, prior to placing topping and fill. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat cement grout shall be broomed into the surface of the slab just before topping or fill placement. The neat cement grout shall not be allowed to dry before topping placement. If it does dry, it must be immediately removed using wet stiff brooms and reapplied. The topping and fill shall be compacted by rolling or thorough tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade. Coat surface with evaporation retardant as needed to prevent plastic shrinkage cracks.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping or fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement, or mixture of dry cement and sand shall be applied to the surface.
6. As soon as topping or fill finishing is completed, coat surface with curing compound. After the topping is set and sufficiently hard in clarifiers and where required by the ENGINEER, the tank shall be filled with sufficient water to cover the entire floor for 14 days.

3.03 CURING

- A. Cement-based grouts shall be cured per 03 30 00 and per the manufacturer's recommendations.

END OF SECTION



SECTION 04 22 00 – CONCRETE UNIT MASONRY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry-joint reinforcement.
 - 5. Masonry-cell fill.

1.03 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.
- B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.
 - 1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 36 inches high by full thickness.
 - 2. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Owner in writing.



- a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Medium-weight Concrete Masonry Units
 2. Masonry Grout
 3. Class M Cement Mortar
- B. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Samples for Initial Selection:
 1. Colored mortar.
- D. Samples for Verification: For each type and color of the following:
 1. Exposed CMUs.
 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include data on material properties material test reports substantiating compliance with requirements.
 2. Integral water repellent used in CMUs.
 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 4. Mortar admixtures.



5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 6. Grout mixes. Include description of type and proportions of ingredients.
 7. Reinforcing bars.
 8. Joint reinforcement.
 9. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 602/ACI 530.1/ASCE 6.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 FIELD CONDITIONS



- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.02 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with TMS 602/ACI 530.1/ASCE 6.

2.03 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet (6 m) vertically and horizontally of a walking surface.



2.04 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average **net-area compressive strength of 2800 psi**.
 - 2. Density Classification: Medium weight unless otherwise indicated.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
 - 4. Exposed Faces: Provide color and texture matching the range represented by Owner's sample.

2.05 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content is not more than 0.1 percent when tested in accordance with ASTM C114.
- B. Mortar Cement: ASTM C1329/C1329M.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- D. Aggregate for Mortar: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.



- E. Aggregate for Grout: ASTM C404.
- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- G. Water: Potable.

2.06 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

2.07 TIES AND ANCHORS

- A. General: Ties and anchors extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following, unless otherwise indicated:
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A641/A641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.

2.08 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from **neoprene**.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.09 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.



1. Do not use calcium chloride in mortar or grout.
2. For reinforced masonry, use masonry cement mortar.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 1. For masonry below grade or in contact with earth, use Type M.
 2. For reinforced masonry, use Type M.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 1. Pigments do not exceed 10 percent of portland cement by weight.
 2. Pigments do not exceed 5 percent of masonry cement by weight.
 3. Mix to match Owner's sample.
- E. Grout for Unit Masonry: Comply with ASTM C476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.
- F. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
 1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.



1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.
 - a. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
 - b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 2. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
- C. Joints:
 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.



2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- E. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.



3.06 MASONRY-JOINT REINFORCEMENT

- A. General: Install horizontal reinforcing bars as indicated on the drawings.

3.07 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry shall be placed at twelve feet on center maximum spacing.
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.

3.08 REINFORCED UNIT MASONRY

- A. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.09 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.
- B. Inspections: Special inspections in accordance with Level 2 in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.



- D. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.
- E. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

3.10 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.11 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION



SECTION 05 50 00 - MISCELLANEOUS METALWORK

PART 1 – GENERAL

1.01 THE REQUIREMENT

- A. Provide miscellaneous metalwork and appurtenances, complete and in place, as indicated in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Federal Specifications

1. MIL-G-18015 A (3) (Ships) Aluminum Planks. (6063-T6)
2. MIL-PRF-907F Antiseize Thread Compound, High Temperature

B. Codes

1. CBC 2022 2022 California Building Code

C. Commercial Standards

1. AA-M32C22A41 Aluminum Assn.
2. AASHTO HS-20 Truck Loading
3. AISC Manual of Steel Construction
4. AISI Design of Light Gauge, Cold-Formed Steel Structural Members
5. ASTM A 36 Carbon Structural Steel
6. ASTM A 48 Gray Iron Castings
7. ASTM A 53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
8. ASTM A 123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
9. ASTM A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
10. ASTM A 193 Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
11. ASTM A 194 Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
12. ASTM A 307 Carbon Steel Bolts and Studs, 60,000 psi Tensile



Strength

13. ASTM A 325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
14. ASTM A 500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
15. ASTM A 992 Steel for Structural Shapes for Use in Building Framing
16. ASTM F 1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
17. ANSI/AWS D1.1 Structural Welding Code - Steel
18. ANSI/AWS D1.2 Structural Welding Code - Aluminum
19. ANSI/AWS QC1 Qualification and Certification of Welding Inspectors

1.03 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with the requirements of Section 01 33 00, "Submittal Procedures".
- B. Shop Drawings
 1. Shop Drawings shall conform to AISC recommendations and specifications, and shall show holes and the like, as may be required for other parts of the WORK.
 2. Shop Drawings shall include complete details of members and connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams for the sequence of erection.
- C. Grating
 1. Submit layout drawings for grating, showing the direction of span, type and depth of grating, size and shape of grating panels, seat angle details, and details of grating hold-down fasteners.
 2. Submit load and deflection tables for each style and depth of grating used.
- D. Handrails and Guardrails
 1. Submit layout drawings for all handrail and guardrail systems, showing plan and elevations of each section, and details of connections and anchorage methods.



2. Submit calculations for all guardrail systems and associated anchorage stamped and signed by a registered Engineer in the State of California.

E. Anchor Submittals

1. Submit an ICC-ES or IAPMO-UES report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor.
2. Submit manufacturer's recommended installation instructions and procedures for anchors.
3. Upon review by the ENGINEER, these instructions shall be followed specifically.
4. No substitution for the indicated anchors will be considered unless accompanied by an ICC-ES or IAPMO-UES report verifying strength and material equivalency.
5. Complete structural calculations and anchorage details shall be prepared and submitted by the Contractor for all anchors and anchor groups that are shown but not completely detailed (type, size, location, spacing, and embedment) on the Contract Documents. Calculations and anchorage details shall be signed and stamped by a Professional Engineer registered in the state in which the project is located.

1.04 QUALITY ASSURANCE

- A. Weld procedures and welder qualifications shall be available in the CONTRACTOR's field office for review.
- B. Welding shall be inspected by an agency independent from the CONTRACTOR qualified in accordance with AWS requirements and approved by the ENGINEER.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Steel

Wide Flange Shapes	ASTM A 992
Shapes, Plates, Bars	ASTM A 36
Pipe, Pipe Columns, Bollards	ASTM A 53, Type E or S, Grade B standard weight unless indicated otherwise
HSS	ASTM A 500 Grade B



B. Corrosion Protection

1. Unless otherwise indicated, fabricated steel metalwork that will be used in a corrosive environment and/or will be submerged in water or wastewater shall be coated in accordance with the requirements of Section 09 90 00, "Painting and Coating," and shall not be galvanized prior to coating.
2. Other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication.

C. Stainless Steel

1. Unless otherwise indicated, stainless steel metalwork and bolts shall be fabricated from Type 304 or Type 316 stainless steel.

D. Aluminum

1. Unless otherwise indicated, aluminum metalwork shall be fabricated from Alloy 6061-T6.
2. Aluminum in contact with concrete, masonry, wood, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with the requirements of Section 09 90 00, "Painting and Coating."

E. Cast Iron

1. Unless otherwise indicated, iron castings shall conform to the requirements of ASTM A 48, Class 50B, or better.

2.02 ALUMINUM RAILINGS

A. General

1. Aluminum handrails and railings shall be component systems, complete with anchors, attachments, balusters, brackets, caps, fasteners, gates (swing with self-latching hardware or be removable), posts, sleeves, trim, and any other related items as required or necessary for a complete installation.
2. Gates and removable rail sections shall be complete with hardware such as self-closing hinges, self-latching latches, hasps, and the like.
3. Railings shall conform to Building Code and OSHA requirements, General Industry Occupational Safety and Health Standards (29CFR1910).
4. Materials shall conform to the following requirements:



- a. Aluminum
 - 1) Aluminum shall be U.S. Alloy 6063 T-5 or T-6.
 - 2) Aluminum pipe rail shall not be less than 1-1/2-inch diameter Schedule 40 pipe.
- b. Sleeves shall be of galvanized steel or PVC.
- c. Grout for handrail posts shall consist of an inorganic, non-shrink, non-metallic premixed grout in accordance with the requirements of Section 03 60 00, "Grout," with a minimum 28-Day compressive strength of 4,000 psi.
- d. Fasteners, screws, and bolts shall be concealed and shall be fabricated from stainless steel or aluminum.
- e. Aluminum welding rods shall be of a type recommended by the aluminum manufacturer for anodized finished products.
- f. Kickplates shall be provided on railings and not set in curbs.
- 5. Pipe railing systems, including handrails, railings, tube caps, and other miscellaneous parts of the rails, shall be provided with a clear anodized finish, AA-M32C22A41.
- 6. Manufacturers or Equal
 - a. C-V Pipe Rail by Crane Veyor Corp.
 - b. Connectorail by Julius Blum and Co.

2.03 STEEL PIPE HANDRAILS AND GUARDRAILS

- 1. Schedule 40 black steel pipe with minimum 1.9-inch outside (Nominal) diameter, or larger where indicated on the Drawings.
- 2. Fabricate posts in single, unspliced pipe length.
- 3. Kick plates: Galvanized steel.
- 4. Attachment devices: Provide clip angles and other fasteners necessary for securing handrails and guardrails to other construction as indicated on the Drawings.
- 5. Continuously weld joints and grind smooth.
- 6. Bend rails to profile indicated on the Drawings, without sharp bends or flat spots. Rails shall be round after bending.
- 7. Neatly weld intersection of rails and posts, and grind surfaces smooth.



2.04 STAINLESS STEEL PIPE HANDRAILS AND GUARDRAILS

1. Manufacturers: One of the following or equal:
 - a. R & B Wagner, Inc.
 - b. Julius Blum and Company.
2. General: Prefabricated shop-assembled type, field-welded type, or mechanically joined type.
3. Materials: Type 304 or Type 316 stainless steel posts, rails, brackets, and accessory parts:
 - a. Railings and posts: Nominal 1-1/2 inch, Schedule 5 pipe with minimum 1.90-inch outer diameter and 0.065-inch wall thickness.
 - b. Post insert reinforcing for all posts: 1.750-inch outside diameter pipe, of 0.083-inch wall thickness, and 26 inches long.
 - c. Fasteners, connection plates, splice bars, and fittings: Type 304 or Type 316 stainless steel.
 - d. Stainless steel finish: Number 4 satin finish in accordance with NAAMM Metal Finishes Manual.
4. Fabrication:
 - a. Fabricate guardrails and posts to be in the same plane.
 - b. Fabricate posts in a single, unspliced pipe length.
 - c. Make handrail and guardrail sections with 20 feet maximum between splices.
 - d. Form bends in pipe without use of fittings where practical. Form with internal mandrels on power benders.
 - e. Where handrail and guardrail are welded, make intersections and joints with continuous 360-degree welds and grind welds smooth.
 - f. Where handrail and guardrail are mechanically joined, make joints with mechanical connections utilizing stainless steel machine screws with lock washers and threaded tubular rivets.]

2.05 SAFETY STAIR NOSINGS

- A. Safety stair nosing shall be provided on concrete stairs and other locations as indicated.
- B. The nosing shall be 3 inches wide and fabricated from extruded aluminum with



cast-in abrasive strips and integral extruded anchors.

C. The color of the cast abrasive shall be as selected by the COUNTY from among the manufacturer's standard colors.

1. The nosing shall be Amstep Products Style 231-A, Grating Pacific XRS-3, Robertson Grating Products Type 9511, or equal.

2.06 LADDERS

A. Materials

1. Ladders which may be partially or wholly submerged, or which are located inside a hydraulic structure, shall be fabricated entirely of Type 316 stainless steel.
2. Other ladders shall be fabricated from carbon steel, hot-dip galvanized after fabrication.
3. Ship's ladders shall be as follows:
 - a. Support a minimum of 500 lbs Live Load
 - b. Fabricated from Aluminum.
 - c. Minimum vertical clearance of 38 inches.
 - d. Minimum top step span of 24 inches.
 - e. Maximum width of 30 inches.
 - f. Ladder shall have guard/handrails on both sides.
 - g. Steps shall be serrated.

B. Pop-Up Extension

1. Every ladder that does not have an exterior handhold should be equipped with a pop-up extension.
2. The pop-up extension device shall be manufactured of the same material and finish as the ladder and shall be provided with a telescoping tubular section that locks automatically when fully extended.
3. Upward and downward improvement shall be controlled by stainless steel spring balancing mechanisms.
4. The units shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

2.07 METAL GRATING



A. General

1. Metal grating shall be of the indicated design, size, and type.
2. Grating shall be supported around an opening by support members.
3. Where grating is supported on concrete, unless otherwise indicated, provide embedded support angles that match the grating material and are mitered and welded at their corners.
4. Banding
 - a. The grating shall be completely banded at edges and cutouts.
 - b. The banding material and cross-section shall be equivalent to the bearing bars.
 - c. The banding shall be welded to each cut bearing bar.
 - d. The grating pieces shall be fastened to each support in 2 locations.
 - e. Where grating forms the landing at the top of a stairway, the edge of the grating that forms the top riser shall have an integral non-slip nosing with a width equal to that of the stairway.
 - f. Where the grating depth is not indicated, provide grating within allowable stress levels and which shall not exceed a deflection of 1/4 inch or the span divided by 180, whichever is less.

B. Design Loading

1. For standard duty plank and safety grating, the loading to be used for determining stresses and deflections shall be the uniform live load of the adjacent floor or 100 psf, whichever is greater, or a concentrated load of 1000 pounds.
2. For heavy-duty grating, the loading used for determining stresses and deflections shall be in accordance with AASHTO HS-20.

C. Material

1. Except where indicated otherwise, bar grating shall be fabricated entirely of:
 - a. Galvanized steel
2. Safety grating shall be fabricated from galvanized steel.
3. Plank grating shall be fabricated from galvanized steel.



4. Grating that may be partially or wholly submerged shall be fabricated entirely of Type 316 stainless steel.

D. Standard-Duty Grating

1. Standard duty grating shall be composed of serrated bar grating.
2. Cross bars shall be welded or mechanically locked tightly into position such that there is no movement between the bearing and cross bars.

E. Safety Grating

1. Safety grating shall be fabricated from sheet metal punched into an open serrated diamond pattern and formed into plank sections.
2. The open diamond shapes shall be approximately 1-7/8 inches by 11/16-inch in size.
3. Safety grating shall be **Grip Strut** by **Metal Products Division, United States Gypsum Company**, **Deck Span** by **IKG Industries**, or equal.

F. Heavy-Duty Grating

1. Heavy-duty grating shall be fabricated from welded steel, galvanized after fabrication.
2. Crossbars shall be welded in position.

2.08 CHECKERED PLATE

- A. Checkered plate shall be provided with a pattern of raised lugs on one face and shall be smooth on the opposite face.

B. Lugs

1. Lugs shall be a minimum of one inch in length and raised a minimum of 1/2 inch above the surface.
2. The lugs shall be in a pattern in which the lugs are oriented at 90 degrees from the adjacent lugs in 2 orthogonal directions.
3. The rows of lugs shall be oriented at 45 degrees from the edges of the plates.

- C. Where no material is indicated, the plates shall be fabricated from aluminum.

- D. Unless indicated otherwise, the minimum plate thickness shall be as required to limit deflection resulting from a live load of 100 psf to 1/4 inch, or the span divided by 240, whichever is less.

2.09 HATCHES



- A. Where access hatches are mounted on a floor slab (including top slabs that are not covered with a roofing membrane) or on a concrete curb, the hatch shall be flush-type as indicated.
- B. Hatches shall be fabricated from aluminum 5086 H34, 6063-T5, or 6061-T6, unless otherwise indicated.
- C. Hatch hardware shall be fabricated from Type 316 stainless steel and shall be gutter-type.
- D. The design live load shall be in accordance with AASHTO HS-20, unless indicated otherwise.
- E. Configuration
 - 1. Hatch opening sizes, number, and swing direction of door leaves, and locations shall be as indicated.
 - 2. Indicated sizes are for the clear opening.
 - 3. Where the number of leaves is not indicated, openings larger than 42 inches in either direction shall be provided with double-leaf doors.
 - 4. Unless indicated otherwise, hinges shall be located on the longer dimension side.
 - 5. Unless indicated otherwise, ladder hatches shall be a minimum of 30 inches wide by 36 inches long, with the ladder centered on the shorter dimension and the door hinge opposite the ladder.
- F. Door leaves shall be fabricated from a minimum of 1/4-inch thick checkered-pattern plate.
- G. Channel frames shall be fabricated from a minimum 1/4-inch material with an anchor flange around the perimeter.
- H. Hatches shall be provided with an automatic hold-open arm with a release handle.
- I. Hatches shall be designed for easy opening from both inside and outside.
- J. Hatches shall be designed to be water-tight and shall be equipped with a joint gutter and a moat-type edge drain and drain piping, length and size required, to remove the water outside all dry spaces accessed by the hatch.
- K. A minimum 1-1/2-inch diameter drain connection shall be provided, located by the manufacturer.
- L. Submersible Pump Station Hatches



1. Hatches for submersible pump stations shall include a **Unistrut**, or equal, channel around the frame perimeter.
2. The face of the channel shall be flush with the face of the frame and shall be compatible with the upper guide rail bracket of the submersible wastewater pump.
3. Hatches shall be provided with a recessed hasp for a padlock covered by a hinged lid that is flush with the surface.
4. Hatches shall be **Bilco Type J** or **JD**, **Babcock-Davis Type B-FGA**, or equal.

M. Nets

1. Unless indicated otherwise, hatch nets shall be provided on floor hatches.
2. Hatch nets shall conform to OSHA requirements.
3. Hatch nets shall be **Hatch Net 121**, as manufactured by **Safe Approach, Inc.**, Auburn, ME, or equal.

2.10 MANHOLE RUNGS

A. Rungs shall meet ASTM C 478 - Precast Reinforced Concrete Manhole Sections and the following requirements:

1. Rungs shall be spaced not less than 10 inches apart nor more than 14 inches apart, as measured between centerlines of the rungs.
2. Rungs shall be parallel, level, and uniformly spaced.
3. The rungs shall be shaped such that a person's foot cannot slide off the end of the rung.
4. Rungs shall be surfaced to prevent injury from punctures or lacerations, and to prevent snagging of clothing.
5. The minimum perpendicular clearance between rungs and any obstruction behind the ladder shall be 6 inches.
6. The minimum width of rungs shall be 14 inches.

B. Submit certified test results in accordance with ASTM C 497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile, Section 10, for the following loads:

1. The horizontal pull-out load shall be 400 pounds.
2. The vertical load shall be 800 pounds.



C. Material

1. Rungs shall be fabricated from co-polymer polypropylene that encapsulates a minimum 1/2-inch grade 60 steel reinforcing rod.
2. The co-polymer polypropylene shall meet ASTM D 4101, Type PP200B33430.

2.11 FALL PREVENTION SYSTEM

- A. The fall protection system at each ladder shall include a carrier rung, ladder ring clamps, sleeves and full body harnesses, dismount section, and other components as necessary for a complete system.
- B. The carrier rail shall be fabricated from the same material as the ladder, except for fiberglass ladders, which shall be provided with stainless steel carrier, rails, and shall be the length recommended by the manufacturer for the ladder dimensions, including extensions.
- C. Provide an extension for each ladder.
- D. The fall protection system shall be **2000 Climb Rite** by **Sellstrom Manufacturing Company**, **Saf-T-Climb** by **North Safety Products Ltd.**, or equal.

2.12 BOLTS AND ANCHORS

- A. Standard Service (Non-Corrosive Application)
 1. Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be fabricated from steel as indicated.
 2. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing.
 3. Except as otherwise indicated, steel for bolt material, anchor bolts, and cap screws shall be in accordance with the following requirements:
 - a. Structural Connections: ASTM A 307, Grade A or B, hot-dip galvanized
 - b. Anchor Rods: ASTM F1554, Grade 36, hot-dip or mechanically galvanized with Grade A matching nuts
 - c. High-Strength Bolts, where indicated: ASTM A 325
 - d. Pipe and Equipment Flange Bolts: ASTM A 193, Grade B-7
- B. Corrosive Service



1. Bolts, nuts, and washers, in the locations listed below, shall be fabricated from stainless steel as indicated.
 - a. buried locations
 - b. submerged locations
 - c. locations subject to seasonal or occasional flooding
 - d. inside hydraulic structures below the top of the structure
 - e. inside buried vaults, manholes, and structures that do not drain through a gravity sewer or to a sump with a pump
 - f. chemical handling areas
 - g. inside trenches, containment walls, and curbed areas
 - h. locations indicated or designated by the ENGINEER to be provided with stainless steel bolts
- C. Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be fabricated from Type 316 stainless steel, Class 2, conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts.
- D. Buried pipe flange bolts and nuts on Class 275 and greater pipes shall be in accordance with ASTM A193/A194, Grade B7.
- E. Coating
 1. Threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, meeting government specification MIL-A-907E.
 2. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.
 3. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.
 4. Antiseize lubricant shall be "PURE WHITE" by **Anti-Seize Technology**, Franklin Park, IL, 60131, **AS-470** by **Dixon Ticonderoga Company**, Lakehurst, NJ, 08733, or equal.
- F. Bolt Requirements
 1. The bolt and nut material shall be free-cutting steel.
 2. The nuts shall be capable of developing the full strength of the bolts.
 3. Threads shall be Coarse Thread Series conforming to the requirements of



the American Standard for Screw Threads.

4. Bolts and cap screws shall have hexagon heads, and nuts shall be Heavy Hexagon Series.
5. Bolts and nuts shall be installed with washers fabricated from material matching the base material of bolts, except that hardened washers for high-strength bolts shall conform to the requirements of the AISC Specification.
6. Lock washers fabricated from material matching the bolts shall be installed where indicated.
7. The length of each bolt shall be such that the bolt extends at least 1/8 inch beyond the outside face of the nut before tightening, except for anchor bolts, which shall be flush with the face of the nut before tightening.

G. Adhesive Anchors

1. General

- a. Unless otherwise indicated, drilled concrete or masonry anchors shall be adhesive anchors.
- b. No substitutions will be considered unless accompanied by a current ICC-ES or IAPMO-UES report verifying strength and material equivalency.

H. Epoxy Anchors

1. Epoxy adhesive anchors are required for drilled anchors for outdoor installations; in submerged, wet, splash, overhead, and corrosive conditions; and for anchoring handrails and reinforcing bars.
2. Epoxy shall be in accordance with the requirements of Section 05 81 00, Anchorage in Concrete and Masonry.
3. Threaded rod shall be galvanized for general-purpose applications and fabricated from Type 316 stainless steel for use in corrosive applications.
4. Epoxy anchors shall not be permitted in areas where the concrete temperature is more than 100 degrees F or higher than the limiting temperature recommended by the manufacturer, whichever is lower.
5. Epoxy anchors shall not be used where anchors are subject to vibration or fire.
6. Minimum substrate temperatures shall be maintained during the full curing period as required by the manufacturer.



7. Unless otherwise noted, ordinary steel threaded rod shall be galvanized.

I. Expanding-Type Anchors

1. Expanding-type anchors, if indicated or permitted, shall be fabricated from galvanized steel, shall be of the expansion type, and shall be **Simpson Strong-Tie Strong-Bolt 2 anchors, Hilti Kwik-Bolt TZ anchors, Powers Power-Stud+ SD1 or SD2 anchors**, or equal.
2. Lead caulking anchors will not be permitted.
3. Size, as a minimum, shall be as indicated on the Contract Documents.
4. Non-embedded buried or submerged anchors shall be fabricated from stainless steel.

J. Non-Shrink Grouted Anchors

1. Grouted anchors, if indicated or permitted, shall be grouted with a non-shrink cementitious grout in accordance with the manufacturer's recommendations.
2. Non-shrink grout material shall be Class B or C in accordance with Section 03 60 00 – Grout.

PART 3 – EXECUTION

3.01 FABRICATION AND INSTALLATION REQUIREMENTS

A. Fabrication and Erection

1. Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

B. Aluminum Railings

1. Aluminum railing fabrication and installation shall be performed by craftsmen experienced in the fabrication of architectural metalwork.
2. Exposed surfaces shall be free from defects or other surface blemishes.
3. Dimensions and conditions shall be verified in the field.
4. Joints, junctions, miters, and butting sections shall be precision fitted with no gaps occurring between sections, and with surfaces flush and aligned.
5. Electrolysis protection of materials shall be provided.

C. Steel and Stainless Steel Railings



1. Field welding of steel pipe handrail joints will be permitted only if approved by the ENGINEER, and then only in accordance with the ENGINEER's instructions.

- D. Unless otherwise indicated, provide a 1/2-inch drain line to the nearest floor drain for floor hatches.

3.02 WELDING

A. Method

1. Welding shall be performed by the metal-arc method or gas-shielded arc method as described in the American Welding Society "Welding Handbook" as supplemented by other pertinent standards of the AWS.
2. The qualification of the welders shall be in accordance with the AWS Standards.

B. Quality

1. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained in order to minimize distortion and control dimensions.
2. Weld reinforcement shall be as indicated by the AWS Code.
3. Upon completion of welding, remove weld splatter, flux, slag, and burrs left by attachments.
4. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions.
5. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32 inch on the flat.

3.03 GALVANIZING

- A. Structural steel plates, shapes, bars, and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123.
- B. Any galvanized part that becomes warped during the galvanizing operation shall be straightened.
- C. Bolts, anchor bolts, nuts, and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.
- D. Field Repairs



1. Field repairs to damaged galvanizing shall be performed by preparing the surface and applying a coating.
2. Surface preparation shall consist of removing oil, grease, soil, and soluble material by cleaning with water and detergent (SSPC SP1) followed by brush-off blast cleaning (SSPC SP7) over an area extending at least 4 inches into the undamaged area.
3. The coating shall be applied to at least 3 mils dry film thickness, and shall be **Zinc-Clad XI** by **Sherwin-Williams**, **Galvax** by **Alvin Products**, **Galvite** by **ZRC Worldwide**, or equal.

3.04 DRILLED ANCHORS

- A. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions.
- B. Holes shall be roughened with a brush on a power drill, and then cleaned and dried.
- C. Drilled anchors shall not be installed until the concrete has reached the required 28-day compressive strength.
- D. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.
- E. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes shall be adjusted to avoid drilling through or cutting any existing reinforcing bars.
- F. If reinforcement is encountered when drilling, abandon the hole and fill the abandoned hole with an epoxy-based, non-shrink, water-tight grout.

3.05 FALL PREVENTION SYSTEM

- A. A fall prevention system shall be provided on ladders used to ascend heights exceeding 20 feet.

END OF SECTION



SECTION 05 81 00 – ANCHORAGE IN CONCRETE AND MASONRY

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers the procurement and installation of anchors in concrete for structural applications, equipment anchorage, and supports. It includes cast-in-place anchor bolts, adhesive anchors, expansion and undercut anchors, and epoxy grouted anchor bolts and reinforcing steel to be installed in concrete.
- B. Special inspection during the installation of anchors, is addressed in Section 01 40 00, "Quality Requirements," and on the Drawings.

1.02 GENERAL

- A. Unless otherwise specified or indicated on the Drawings all anchors and anchor bolts shall be cast-in-place anchor bolts with forged heads or embedded nuts and washers. J-bolts are not allowed unless specified by the Engineer. Unless otherwise indicated, bolts in concrete shall have a diameter of at least 3/4 inch. All expansion anchors shall be at least 1/2 inch in diameter.
- B. Adhesive anchors and expansion anchors may be used instead of cast-in-place anchors where specifically indicated or permitted on the drawings or with the specific acceptance by the Engineer.

1.03 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures", the following:
 - 1. Product Data: Catalog cuts, supporting product data, and letters of certification indicating the manufacturer and types of adhesive anchors, expansion anchors, and epoxy grouts. All anchorage products and systems used shall have a current product report on file with the International Code Council (ICC).
- B. If Contractor requests use of products other than those indicated herein, calculations prepared by a licensed professional engineer using methods and procedures required by the building code may be required as part of the submittal package. The calculation shall be stamped and signed by a registered engineer in the State of California and submitted to the Engineer for review and approval.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be handled, transported, and delivered in a manner that will prevent damage or corrosion. Damaged materials shall be promptly replaced. Materials shall be shipped and stored in the original manufacturer's packaging.



PART 2 – PRODUCTS

2.01 MATERIALS

- A. Unless otherwise indicated on the Drawings, anchors and anchor bolts used in the following locations and applications shall be of the indicated materials. Other anchors and anchor bolts shall be as indicated on the Drawings.

Cast-In-Place Anchor Bolts

Submerged locations	Stainless steel
Locations subject to splashing	Stainless steel
Buried locations	Stainless steel
Anchorage of structural steel columns	Galvanized steel
Other exterior locations	Galvanized steel
Other interior locations	Carbon steel

Threaded Rod and Expansion Anchors

Submerged locations	Stainless steel
Locations subject to splashing	Stainless steel
Buried locations	Stainless steel
Anchorage of structural steel columns	Stainless steel unless specified as galvanized steel on the drawings
Other exterior locations	Stainless steel unless specified as galvanized steel on the drawings
Other interior locations	Carbon steel

Anchor Bolts and Nuts

Carbon steel	ASTM F 1554, Grade 36 with compatible nuts.
Stainless steel	Bolts, ASTM F 593, Alloy Group 1 or 2. Nuts, ASTM F 594, Alloy Group 1 or 2.



Galvanized steel	ASTM F 1554, Grade 36 with compatible nuts; hot-dip galvanized, ASTM F 2329.
Flat Washers	ANSI B18.22.1; of the same material as anchor bolts and nuts.
Reinforcing Bars	ASTM A 615, Grade 60, deformed.
Reinforcing Bars (Weldable)	ASTM A 706, Grade 60, deformed.
Expansion Anchors in Concrete	Products shall be single component anchors tested in accordance with ICC AC193 and shall have an ICC ESR report in compliance with the California Building Code (2022). The anchors shall be approved for use in cracked concrete, and for resisting seismic forces. Hilti "Kwik-Bolt TZ", ITW Red Head "Trubolt+", Powers Fasteners "Power-Stud+SD2", Simpson "Strong-Bolt".
Undercut Anchors in Concrete	Products shall be tested in accordance with ICC AC193 and shall have an ICC ESR report in compliance with the California Building Code (2022). Hilti "HDA Undercut Anchor", USP Structural Connectors "DUC Undercut Anchor", Powers Fasteners "Atomic+ Undercut Anchor".
Adhesive Anchors in Concrete	Products shall be tested in accordance with ICC AC308 and shall have an ICC ESR report in compliance with the California Building Code (20c2). The anchors shall be approved for use in cracked concrete, and for resisting seismic forces.
Threaded Rod Anchors/Nuts	As recommended by the adhesive manufacturer; materials as indicated on the Drawings or in this specification.
Adhesive	Hilti "HIT-RE 500-V3" or "HIT-HY 200", Powers Fasteners "PE1000+", Simpson "Set-XP".
Epoxy Grout for Reinforcing Bars, Threaded Rod Anchors, and Anchor Bolts	
Adhesive	
For Floors and Horizontal Surfaces	Sika "Sikadur 35, Hi-Mod LV"; ChemRex "Concresive Liquid LPL"; Sika "Sikadur 32 Hi-Mod".
For Vertical Surfaces and Overhead Applications	Sika "Sikadur 31 Hi-Mod Gel".



Aggregate	As recommended by the epoxy grout manufacturer.
Water	Clean and free from deleterious substances.
Screen Tubes	As recommended by the manufacturer.

2.02 ANCHORS

A. Cast-in-Place Anchor Bolts

1. Cast-in-place anchor bolts shall be delivered in time to permit setting before the structural concrete is placed.
2. Anchor bolts shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the concrete form or the supporting template. Two nuts, a jam nut, and a washer shall be furnished for cast-in-place anchor bolts indicated on the drawings to have locknuts; two nuts and a washer shall be furnished for cast-in-place anchor bolts without locknuts.

B. Adhesive and Expansion Anchors

1. When adhesive, expansion or undercut anchors are indicated on the Drawings, only acceptable systems shall be used. Acceptable systems shall include only those systems and products specified or specifically indicated by product name on the drawings. Alternative anchoring systems may be used only when specifically accepted by the Engineer. An acceptable adhesive anchor system may be used as an alternative in locations where epoxy grouted anchor bolts and epoxy grouted threaded rod anchors are specified or indicated.
2. Threaded rod anchors in adhesive anchor systems shall be furnished with a sufficient length to provide an embedment depth of at least 15 rod diameters and free of coatings that would weaken the bond with the adhesive. Anchor bolts and threaded rod anchors that are to be epoxy grouted shall be clean and free of coatings that would weaken the bond with the epoxy.
3. Unless otherwise required, a single nut and washer shall be furnished for threaded rod anchors, adhesive anchors, and expansion anchors.
4. Adhesive anchors in hollow masonry shall utilize screen tubes as recommended by the manufacturer.

C. Epoxy Grouted Anchor Bolts and Reinforcing



1. Epoxy grout for installing reinforcing steel dowels and anchor bolts not indicated to be adhesive anchors shall consist of a two-component liquid epoxy adhesive of viscosity appropriate to the location and application, and an inert aggregate filler component, if recommended by the adhesive manufacturer.
2. Components shall be packaged separately at the factory and mixed immediately before use.
3. Anchor bolts and reinforcing steel shall be as indicated on the Drawings.

PART 3 – EXECUTION

3.01 GENERAL

- A. Anchor bolts shall be installed at the locations indicated on the Drawings. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless-steel anchors immediately before final installation and tightening of the nuts.
- B. ESR Report Compliance. Anchors shall be installed in accordance with all applicable requirements of the ESR report for the anchoring system. If conflicts are found between the Drawings and the ESR report installation requirements, Contractor shall notify the Engineer for resolution.
- C. Special Inspection. Special inspection shall be performed during installation of all anchors covered in this section. Anchorage work shall be performed in a manner that allows the inspections to take place without adversely impacting the schedule.
- D. For cast-in-place anchor bolts, bolts shall be positioned in advance of the concrete placement so that the inspector will have sufficient time to inspect the bolts prior to placing concrete.
- E. For other types of anchors, the minimum frequency and extent of the inspections shall be as indicated in the anchor system's ESR report.

3.02 CAST-IN-PLACE ANCHORS AND ANCHOR BOLTS

- A. Cast-in-place anchors and anchor bolts shall be carefully positioned with templates and secured in the forms prior to placing concrete. Contractor shall verify that anchorage devices are positioned in accordance with the design drawings and with applicable equipment submittal drawings. Anchors and bolts shall be positioned sufficiently in advance of the concrete placement so there is sufficient time to perform special inspection of the bolts prior to placing concrete.
- B. Threads, bolts, and nuts spattered with concrete during placement shall be cleaned prior to final installation of the bolts and nuts.

3.03 EPOXY GROUT



- A. Epoxy grout components shall be packaged separately at the factory and shall be mixed immediately before use. Proportioning and mixing of the components shall be done in accordance with the manufacturer's recommendations.
- B. Preparation. Where indicated on the Drawings, anchor bolts, threaded rod anchors, and reinforcing bars shall be epoxy grouted in holes drilled into hardened concrete. Diameters of holes shall be as follows:

<u>Item</u>	<u>Diameter of Hole</u>
Reinforcing Bars and Threaded Rod Anchors	1/8 inch larger than the outside diameter of the bar or the rod.
Headed Anchor Bolts	Bolt diameter plus 2 inches and sufficient to clear the bolt head.

- C. The embedment depth for epoxy grouted anchor bolts, threaded rod anchors, and reinforcing bars shall be at least 15 bolt, rod, or bar diameters, unless otherwise indicated on the drawings.
- D. Holes shall be prepared for grouting as recommended by the epoxy grout manufacturer.
- E. Installation. Anchor bolts, threaded rod anchors, and reinforcing bars shall be clean, dry, and free of grease and other foreign matter when installed. The bolts, rods, and bars shall be set and positioned, and the epoxy grout shall be placed and finished in accordance with the recommendations of the grout manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with epoxy grout, without voids.
- F. Temperature of substrate and epoxy grout during installation and curing shall not exceed manufacturer's recommendations.

3.04 ADHESIVE ANCHORS

- A. When adhesive anchors are indicated on the drawings, only an acceptable system shall be used. Alternative anchoring systems may be used only when acceptable to the Engineer. An acceptable adhesive anchor system may be used as an alternative in locations where epoxy grouted anchor bolts and threaded rod anchors are specified or indicated.
- B. The embedment depth for adhesive anchors shall be at least 15 rod diameters unless a greater depth is indicated on the Drawings.
- C. Adhesive for adhesive anchors shall be statically mixed in the field during application. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.
- D. Anchors shall be installed in holes drilled into hardened concrete or grout-filled



masonry. Diameter of holes shall be 1/16 inch larger than the outside diameter of the rod unless recommended otherwise by the anchor system manufacturer. Holes shall be prepared for insertion of the anchors by removing all dust and debris using procedures recommended by the adhesive manufacturer.

- E. Adhesive anchors and holes shall be clean, dry, and free of grease and other foreign matter at the time of installation. The adhesive shall be placed, the rods shall be set and positioned, and the adhesive shall be finished, all in accordance with the recommendations of the material manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids, and remain filled with adhesive until completion of the curing period. Adhesive shall be cured in accordance with the recommendations of the adhesive manufacturer.

3.05 EXPANSION AND UNDERCUT ANCHORS

- A. When expansion and undercut anchors are indicated on the Drawings, only an acceptable expansion anchor shall be used. Alternative anchoring systems may be used only when acceptable to the Engineer.
- B. Expansion and undercut anchors shall be installed in accordance with the drawings and ICC report, but in no case shall the depth of the hole be less than eight bolt diameters.
- C. The minimum distance between the center of any expansion anchor and an edge or exterior corner of concrete shall be at least six times the diameter of the bolt. Unless otherwise indicated on the Drawings, the minimum distance between the centers of expansion anchors shall be at least 12 times the diameter of the bolt.

3.06 STAINLESS STEEL ANCHORS:

- A. During assembly of all threaded stainless-steel components, anti-seize thread lubricant shall be liberally applied to the threaded portion not embedded in concrete.

END OF SECTION



SECTION 09 90 00 – PAINTING AND COATING

PART 1 – GENERAL

1.01 SCOPE

- A. This specification defines the methods of surface preparation, coating systems, and methods of application for painting as outlined herein.
- B. The Contractor shall furnish all supervision, labor, tools, materials, equipment, scaffolding, or other structures, and supervision required for the transportation, unloading, storage, and application of the paint and associated products covered by this specification.
- C. The work includes painting and finishing of interior and exterior exposed items above and below grade surfaces, such as structural steel, miscellaneous metals, ceilings, walls, floors, doors, frames, pipe, handrails, posts, fittings, valves, pumps, tanks, equipment, and all other work obviously required to be painted unless otherwise specified herein or on the drawings. The omission of minor items in the schedule of work shall not relieve the Contractor of his obligation to include such items where they come with the general intent of the specification as stated herein.
- D. The following items will not be painted:
 - 1. Any code requiring labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
 - 2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated.
 - 3. Aluminum handrails, walkways, windows, louvers, and grating unless otherwise specified herein.
 - 4. Signs and nameplates.
 - 5. Finish hardware.
 - 6. Stainless steel angles, tubes, pipe, etc.
 - 7. Products with polished chrome, aluminum, nickel, or stainless-steel finish.
 - 8. Plastic switch plates and receptacle plates.
 - 9. Flexible couplings, lubricated bearing surfaces, insulation, and metal and plastic pipe interior.



10. Sprinkler heads.

- E. All work shall be done in strict accordance with this specification, the design drawings, and the painting package, including manufacturer's printed instructions.
- F. The Contractor will obtain, at its own expense, all permits, licenses, and inspections and shall comply with all laws, codes, ordinances, rules, and regulations promulgated by authorities having jurisdiction, which may bear on the work. This compliance will include Federal Public Law 91-596, more commonly known as the "Occupational Safety and Health Act of 1970."
- G. Wherever the word "Engineer" occurs in this specification, it shall apply to the authorized representative of Mead & Hunt. Where the word "Contractor" occurs in this specification, it shall apply to the Contractor performing any part of or all of this work.
- H. Surfaces to be painted: (Refer to 17.0 Coating Schedule for description of surfaces to be painted and their specified coating systems and colors).

1.02 SUBMITTALS

- A. Submit the following in accordance with the requirements specified in Section 01 33 00, "Submittal Procedures."
- B. Submit color cards for all coatings proposed for use, together with complete descriptive specifications and the completed Coating Schedule, to Field Inspector for review and color selection. Requests for review submitted directly to Field Inspector by coating suppliers will not be considered.
- C. For proposed products in contact with raw or treated water, Contractor shall submit certifications that the proposed systems are in compliance with ANSI/NSF 61.
- D. Contractor shall submit a Coating Schedule for each separately identified surface in the Coating Schedule that will be used on the contract, using a Coating Schedule similar to that shown at the end of this specification. Each field coating system shall be acceptable to the coating material manufacturer. Each Coating Schedule shall include application temperature requirements, including recoat window requirements for the ambient conditions at the site, including elevated temperatures up to 130° F. Temperature requirements shall be specified by the coating manufacturer.

1.03 DEFINITIONS

- A. Field Painting is the painting of new or rebuilt items at the job site. Field painting shall be the responsibility of the Contractor.



- B. Shop Painting is the painting of new or rebuilt items in the shop prior to delivery to the jobsite.

1.04 ABBREVIATIONS

- A. The abbreviations and definitions listed below, when used in this specification, shall have the following meanings:
 - 1. SSPC – Society for Protective Coatings
 - 2. DFT – Dry Film Thickness
 - 3. Exterior – Outside, exposed to weather
 - 4. Interior Dry – Inside, not subject to immersion service
 - 5. Interior Wet – Inside, subject to immersion service
 - 6. ASTM – American Society of Testing Materials
 - 7. NACE – National Association of Corrosion Engineers
 - 8. NSF – National Sanitation Foundation
 - 9. AWWA – American Water Works Associates

1.05 RESOLUTION OF CONFLICTS

- A. It shall be the responsibility of the Contractor to arrange a meeting prior to the start of painting or flooring installation between the Contractors, the Paint Manufacturer whose products are to be used, and the Engineer. All aspects of surface preparation, application, and coating systems as covered by this specification will be reviewed at this meeting.
- B. Clarification shall be requested promptly from the Engineer when instructions are lacking, conflicts occur in the specification, or the procedure seems improper or inappropriate for any reason.
- C. Copies of all manufacturer's instructions and recommendations shall be furnished to the Engineer by the Painting Contractor.
- D. It shall be the responsibility of the Coating Manufacturer to have their factory representative meet in person with the Contractor and Engineer a minimum of three (3) times during the job as a consultant on surface preparation, mil thickness of coating and proper application of coating unless meeting is determined to be unnecessary by the Engineer.

1.06 INSPECTION OF SURFACES



- A. Before application of the prime coat and each succeeding coat, all surfaces to be coated shall be subject to inspection by the Engineer. Any defects or deficiencies shall be corrected by the Contractor before application of any subsequent coating.
- B. Samples of surface preparation and of painting systems shall be furnished by the Contractor to be used as a standard throughout the job, unless omitted by the Engineer.
- C. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the Engineer, and where, in his opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the Contractor's expense. Recoating times of manufacturer's printed instructions shall be adhered to.
- D. Coating thickness shall be determined by the use of a properly calibrated "Nordson-
- E. "Mikrotest" or "Positest" Coating Thickness Gauge (or equal) for ferrous metal or an OG232 "Tooke" Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note that the use of the "Tooke" gauge is classified as a destructive test.

1.07 EQUIPMENT

- A. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used. Separators shall be placed as far as practical from the compressor.
- B. All equipment for application of the paint and the completion of the work shall be furnished by the Contractor in first-class condition and shall comply with the recommendations of the paint manufacturer.
- C. Contractor will provide free of charge to the Engineer a "Nordson-Mikrotest" or "Positest" dry film thickness gauge for ferrous metal and an OG232 "Tooke" gauge or equal for non-ferrous and cementitious surface, to be used to inspect coatings by the Engineer and Contractor. The gauges may be used by the Contractor and returned each day to the Engineer. Engineer will return gauges to Contractor at completion of job.

PART 2 – MATERIALS

- A. All materials specified herein are manufactured by the TNEMEC Company, Inc., Xypex Chemical Corporation, or Chemprobe Technologies, Inc. These products are specified to establish standards of quality and are approved for use on this project.



- B. Equivalent materials of other manufacturers may be substituted on approval of the Engineer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information and evidence of satisfactory past performance and an independent laboratory certification that their product meets the performance criteria of the specified materials. Unless otherwise stated, the latest revision of identified specifications shall be used.
1. Abrasion – Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load
 2. Adhesion – Elcometer Adhesion Tester
 3. Exterior Exposure – Exposed at 45 degrees facing the ocean (South Florida Marine Exposure)
 4. Hardness – ASTM D3363
 5. Humidity – ASTM D2247
 6. Salt Spray (Fog) – ASTM B117
- C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the Engineer at least ten (10) days prior to the bid opening. Substitutions which decrease the film thickness, the number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.
- D. All coatings to be shop applied must meet the requirements for volatile organic compounds (VOC) of not more than 3.5 lbs/Gallon after thinning.
- E. Colors, where not specified, shall be as selected by the Owner or their Representative.
- F. All coatings in contact with potable water need to be NSF Certified in accordance with ANSI/NSF Standard 61.

2.02 WORKMANSHIP AND MATERIALS

- A. Surface Preparation
1. The surface shall be cleaned as specified for the paint system being used. All cleaning shall be as outlined in the Steel Structures Painting Council's Surface Preparation Specification, unless otherwise noted. If surfaces are subject to contamination, other than mill scale or normal atmospheric rusting, the surfaces shall be pressure washed, and acid or caustic pH residues neutralized, in addition to the specified surface preparation.



B. Standards for Surface Preparation

1. SSPC-SP1 Chemical and/or Solvent Cleaning
 - a. Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter, and contaminants, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning.
2. SSPC-SP2 Hand Tool Cleaning
 - a. Removal of loose rust, loose mill scale, and loose paint to a clean sound substrate by hand chipping, scraping, sanding, and wire brushing.
3. SSPC-SP3 Power Tool Cleaning
 - a. Removal of loose rust, loose mill scale, and loose paint to a clean, sound substrate by power tool chipping, descaling, sanding, wire brushing, and grinding.
4. SSPC-SP4 Flame Cleaning
 - a. Dehydrating and removal of rust, loose mill scale, and some light mill scale by use of flame, followed by wire brushing.
5. SSPC-SP5 (NACE-1) White Metal Blast Cleaning
 - a. Complete removal of all mill scale, rust, rust scale, previous coating, etc., leaving the surface a uniform gray-white color.
6. SSPC-SP6 (NACE-3) Commercial Grade Blast Cleaning
 - a. Complete removal of all dirt, rust scale, mill scale, foreign matter, and previous coatings, etc., leaving only shadows and/or streaks caused by rust stain and mill scale oxides. At least sixty-six percent (66%) of each square inch of surface area is to be free of all visible residues, except slight discoloration.
7. SSPC-SP7 (NACE-4) Brush-Off Blast Cleaning
 - a. Removal of rust scale, loose mill scale, loose rust, and loose coatings, leaving tightly bonded mill scale, rust and previous coatings. On concrete surfaces, brush-off blast cleaning shall remove all laitance, form oils, and solid contaminants. Blasting



should be performed sufficiently close to the surface so as to open up surface voids, bug holes, air pockets, and other subsurface irregularities, but so as not to expose underlying aggregate.

8. SSPC-SP8 Pickling

- a. Complete removal of rust and mill scale by acid pickling, duplex pickling, or electrolytic pickling (may reduce the resistance of the surface to corrosion, if not to be primed immediately).

9. SSPC-SP10 (NACE-2) Near-White Blast Cleaning

- a. Removal of all rust scale, mill scale, previous coating, etc., leaving only light stains from rust, mill scale, and small specks of previous coating. At least ninety-five percent (95%) of each square inch of surface area is to be free of all visible residues, and the remainder shall be limited to slight discoloration.

10. SSPC-SP11-87 Power Tool Cleaning to Bare Metal

- a. Complete removal of rust, rust scale, mill scale, foreign matter, and previous coatings, etc., to a standard as specified on a Commercial Grade Blast Cleaning (SSPC-SP6, NACE-3) by means of power tools that will provide the proper degree of cleaning and surface profile.

11. SSPC-SP13 (NACE-6) Surface Preparation of Concrete

- a. Surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.

C. Visual standards

- 1. SSPC-VIS-1 (Swedish SIS OS 5900), "Pictorial Surface Preparation Standards for Painting Steel Surfaces," and the National Association of Corrosion Engineers, "Blasting Cleaning Visual Standards" TM-01-70 and TM-01-75 shall be considered as standards for proper surface preparation.
- 2. Oil, grease, soil, dust, etc., deposited on the surface preparation that has been completed shall be removed prior to painting according to SSPC-SP1 Solvent Cleaning.



3. Weld flux, weld spatter, and excessive rust scale shall be removed by Power Tool Cleaning as per SSPC-SP11-87T.
4. All weld seams, sharp protrusions, and edges shall be ground smooth prior to surface preparation or application of any coatings.
5. All areas requiring field welding shall be masked off prior to shop coating, unless waived by the Engineer.
6. All areas that require field touch-up after erection, such as welds, burnbacks, and mechanically damaged areas, shall be cleaned by a thorough Power Tool as specified in SSPC-SP11-87T.
7. Touch-up systems will be same as original specification except that an approved manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this system was originally used. Also, strict adherence to manufacturer's complete touch-up recommendations shall be followed. Any questions relative to the compatibility of products shall be brought to the Engineer's attention; otherwise, Contractor assumes full responsibility.

2.03 PRE-TREATMENTS

- A. When specified, the surface shall be pretreated in accordance with the specified pretreatment prior to application of the prime coat of paint.

2.04 STORAGE

- A. Materials shall be delivered to the job site in the original packages with seals unbroken and with legible unmutated labels attached. Packages shall not be opened until they are inspected by the Engineer and required for use. All painting materials shall be stored in a clean, dry, well-ventilated place, protected from sparks, flame, and direct rays of the sun or from excessive heat. Paint susceptible to damage from low temperatures shall be kept in a heated storage space when necessary. The Contractor shall be solely responsible for the protection of the materials they have stored at the job site. Empty coating cans shall be required to be neatly stacked in an area designated by the Engineer and removed from the job site on a schedule determined by the Engineer. Engineer may request a notarized statement from Contractor detailing all materials used on the project.

2.05 PREPARATION OF MATERIALS

- A. Mechanical mixers, capable of thoroughly mixing the pigment and vehicle together, shall mix the paint prior to use where required by manufacturer's instructions; thorough hand mixing will be allowed for small amounts up to one gallon. Pressure pots shall be equipped with mechanical mixers to keep the pigment in suspension, when required by manufacturer's instructions. Otherwise,



intermittent hand mixing shall be done to assure that no separation occurs. All mixing shall be done in accordance with SSPC Vol. 1, Chapter 4, "Practical Aspects, Use and Application of Paints" and/or with manufacturer's recommendations.

- B. Catalysts or thinners shall be as recommended by the manufacturer and shall be added or discarded strictly in accordance with the manufacturer's instruction.

2.06 APPLICATION

- A. Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather, unless otherwise allowed by the paint manufacturer. Except as provided below, painting shall not be permitted when the atmospheric temperature is below 50°F, or when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or when it can be anticipated that these conditions will prevail during the drying period.
- B. No coatings shall be applied unless surface temperature is a minimum of 5°F above dew point; temperature must be maintained during curing.

2.07 DEW POINT CALCULATION CHART

- A. Ambient Air Temperature – Fahrenheit

	1. Relative										
Humidity	20	30	40	50	60	70	80	90	100	110	120
90%	18	28	37	47	57	67	77	87	97	107	117
85%	17	26	36	45	55	65	76	84	95	103	113
80%	16	25	34	44	54	63	73	82	93	102	110
75%	15	24	33	42	52	62	71	80	91	100	108
70%	13	22	31	40	50	60	68	78	88	96	105
65%	12	20	29	38	47	57	66	76	85	93	103
60%	11	20	27	36	45	55	64	73	83	92	101
55%	9	17	25	34	43	53	61	70	80	89	98
50%	6	15	23	31	40	50	59	67	77	86	94
45%	4	13	21	29	37	47	56	64	73	82	91
40%	1	11	18	26	35	43	52	61	69	78	87
35%	-2	8	16	23	31	40	48	57	65	74	83
30%	-6	4	13	20	28	36	44	52	61	69	77



SURFACE TEMPERATURE AT WHICH CONDENSATION OCCURS

- B. Dew Point
 - 1. Temperature at which moisture will condense on surface. No coatings should be applied unless surface temperature is a minimum of 5°F above this point. Temperature must be maintained during curing.
- C. Example
 - 1. If air temperature is 70°F and relative humidity is 65%, the dew point is 57°F. No coating should be applied unless surface temperature is 62°F minimum.
- D. No coatings shall be applied unless the relative humidity is below eighty-five percent (85%).
- E. Suitable enclosures to permit painting during inclement weather may be used if provisions are made to control atmospheric conditions artificially inside the enclosure, within limits suitable for painting throughout the painting operations.
- F. Field Painting in the immediate vicinity of, or on, energized electrical and rotating equipment, and equipment and/or pipes in service shall not be performed without the approval of the Engineer.
- G. Extreme care shall be exercised in the painting of all operable equipment, such as valves, electric motors, etc., so that the proper functioning of the equipment will not be affected.
- H. The Contractor's scaffolding shall be erected, maintained, and dismantled without damage to structures, machinery, equipment or pipe. Drop cloths shall be used where required to protect buildings and equipment. All surfaces required to be clear for visual observations shall be cleaned immediately after paint application.
- I. Painting shall not be performed on insulated pipe within three (3) feet of insulation operations or on insulation where covering and surface coat have not had time to set and dry. Painting shall not be performed on uninsulated pipe within one (1) foot of any type of connection until the connection has been made, except as directed by the Engineer.
- J. The prime coat shall be applied immediately following surface preparation and in no case later than the same working day. All paint shall be applied by brushing, paint mitt and roller, conventional spraying, or airless spraying, using equipment approved by the paint manufacturer.
- K. Each coat of paint shall be recoated as per manufacturer's instructions. Paint



shall be considered recoatable when an additional coat can be applied without any detrimental film irregularities, such as lifting or loss of adhesion.

- L. Surfaces that will be inaccessible after assembly shall receive either the full specified paint system or three shop coats of the specified primer before assembly.
- M. Finish colors shall be in accordance with the COLOR SCHEDULE and shall be factory mixed (i.e., there shall be no tinting by the Contractor, unless authorized by the Engineer).
- N. All edges and weld seams in immersion service shall receive a “stripe coat” (applied by brush) of the first coat prior to application of the full first coat.
- O. All open seams in the roof area of tanks shall be filled after application of the topcoat with a flexible caulking such as Sika Flex 1A.

2.08 WORKMANSHIP

- A. The Contractor must show proof that all employees associated with this project shall have been employed by the Contractor for a period not less than six (6) months.
- B. Painting shall be performed by experienced painters in accordance with the recommendations of the paint manufacturer. All paint shall be uniformly applied without sags, runs, spots, or other blemishes. Work, which shows carelessness, lack of skill, or is defective in the opinion of the Engineer, shall be corrected at the expense of the Contractor.
- C. The Contractor shall provide the names of at least six (6) other projects of similar size and scope that they have successfully completed under their current company name.

C. Application of Paint

1. BY BRUSH AND/OR ROLLERS

- a. Top-quality, properly styled brushes and rollers shall be used. Rollers with a baked phenohl core shall be utilized.
- b. The brushing or rolling shall be done so that a smooth coat as nearly uniform in thickness as possible is obtained. Brush or roller strokes shall be made to smooth the film without leaving deep or detrimental marks.
- c. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or sheepskins, and paint mitt.



- d. It may require two (2) coats to achieve the specified dry film thickness if application is by brush and roller.

D. Air, Airless, Or Hot Spray

1. The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied, and shall be equipped with suitable pressure regulators and gauges.
2. Paint shall be applied in a uniform layer, with a fifty percent (50%) overlap pattern. All runs and sags should be brushed out immediately, or the paint shall be removed and the surface resprayed.
3. High-build coatings should be applied by a crosshatch method of spray application to ensure proper film thickness of the coating.
4. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or sheepskins shall be used, as authorized by the manufacturer.
5. Special care shall be taken with thinners and paint temperatures so that paint of the correct formula reaches the receiving surface.
6. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer of the paint being sprayed.
7. The first coat on concrete surfaces in immersion service should be sprayed and backrolled.

2.09 PROTECTION AND CLEAN-UP

- A. It shall be the responsibility of the Contractor to protect at all times, in areas where painting is being done, floors, materials of other crafts, equipment, vehicles, fixtures, and finished surfaces adjacent to paint work. Cover all electric plates, surface hardware, nameplates, gauge glasses, etc., before the start of painting work.
- B. At the option of the Engineer during the course of this project, the Contractor will contain all spent abrasives, old paint chips, paint overspray, and debris by means suitable to the Engineer, including but not limited to, full shrouding of the area.
- C. If shrouding is required, the Contractor must provide a complete design of the intended shroud or cover. Care must be taken not to modify or damage the structure during the use of the shroud. If damage should occur, the Contractor is held responsible for all repairs.
- D. At completion of the work, remove all paint where spilled, splashed, splattered, sprayed, or smeared on all surfaces, including glass, light fixtures, hardware,



equipment, painted, and unpainted surfaces.

- E. After completion of all painting, the Contractor shall remove from the job site all painting equipment, surplus materials, and debris resulting from this work.
- F. The Contractor is responsible for the removal and proper disposal of all hazardous materials from the jobsite in accordance with Local, State, and Federal requirements as outlined by the Environmental Protection Agency.
- G. A notarized statement shall be presented to the Engineer that all hazardous materials have been disposed of properly including but not limited to: Name of disposal company, disposal site, listing of hazardous materials, weights of all materials, cost per pound, and EPA registration number.

2.10 TOUCH-UP MATERIALS

- A. The Contractor shall provide at the end of the project at least one gallon of each generic topcoat in each color as specified by the Engineer for future touch-up. Two gallons may be required for two component materials.

2.11 ON-SITE INSPECTION

- A. During the course of this Project, the Engineer will reserve the option of incorporating the services of a qualified inspection service. The inspection service will be responsible for assuring the proper execution of this specification by the successful Contractor.

PART 3 – EXECUTION

3.01 COATING SYSTEM SCHEDULE

A. STEEL – STRUCTURAL, TANKS, PIPES, AND EQUIPMENT

1. EXTERIOR EXPOSURE (NON-IMMERSION)

A.1 System No. 73-1 Epoxy/High Build Urethane

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	<u>DFT-Mils</u>
<u>1st Coat:</u> 66-1255 Epoxoline Primer	3.0 – 4.0
<u>2nd Coat:</u> 66-Color Hi-Build Epoxoline	2.0 – 3.0
<u>3rd Coat:</u> 73-Endura-Shield	<u>2.0 – 3.0</u>
	7.0 -10.0

Minimum 8.0 Mils

NOTE: This system is highly resistant to abrasion, wet conditions, corrosive fumes, and chemical contact. Provides 2-3 times the color and



gloss retention of conventional paints. Second coat to be same color or close to finish color. Specify Series 1074 Endura-Shield for a gloss finish. Specify Series 161 in lieu of the 66 for faster recoats or lower temperature curing.

A.2 System No. 73-2 High Build Urethane For Marginally Cleaned Surfaces or Topcoating Existing Systems.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning or SSPC-SP3 Power Tool Cleaning Feather all edges.

	<u>DFT-Mils</u>
<u>Shop Coat:</u> Manufacturer Standard Primer (or existing coating)	1.5 – 2.0
<u>Tie Coat:</u> 135 Chembuild	3.0 – 5.0
<u>Topcoat:</u> 73-Color Endura-Shield	<u>2.0 – 3.0</u> 6.5-10.0
	Minimum 7.5 Mils

NOTE: This system can be used over factory finish paint or over non-sandblasted steel and offer the high performance of a urethane coating. Specify Series 1074 Endura-Shield for gloss finish. A test patch is always recommended to insure proper application.

A.3 System No. 82-1 Silicone Alkyd Enamel – Gloss

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	<u>DFT-Mils</u>
<u>1st Coat:</u> 37H-77 Chem-Prime H.S.	2.0 – 3.5
<u>2nd Coat:</u> 23-Color Enduratone	1.5 – 2.5
<u>3rd Coat:</u> 82-Color Silicone Alkyd Enamel	<u>1.0 – 2.5</u> 4.5 – 8.5
	Minimum 5.5 Mils

A.4 System 90-97 Zinc/Epoxy/Urethane

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	<u>DFT-Mils</u>
<u>Primer:</u> 90-97 Tneme-Zinc	2.5 – 3.5
<u>2nd Coat:</u> 66-Color Hi-Build Epoxoline	2.0 – 3.0
<u>3rd Coat:</u> 73 Endura-Shield III	<u>2.0 – 3.0</u>



6.5 – 9.5

Minimum 8.0 Mils

NOTE: This system offers the added corrosion protection of a zinc rich primer. Series 90-97 Tneme-Zinc is an organic zinc-rich primer that can be used for field touch up of a zinc primer or for touch up of galvanized surfaces that are damaged. You can substitute Series 91-H₂O Hydrozinc for the 90-97. You can substitute Series 1074 for the Series 73 if a gloss finish is desired.

A.5 System No. 30-1 DTM Acrylic Overcoat System

Surface Preparation: Pressure Clean @ 3500 PSI

Spot SP2, SP3, SP6, or SP7

Feather all edges.

	<u>DFT-Mils</u>
<u>Spot Primer:</u> 135 Chembuild	2.0 – 4.0
<u>2nd Coat:</u> 30 Spra-Saf EN	2.0 – 4.0
<u>3rd Coat:</u> 30 Spra-Saf EN	<u>2.0 – 4.0</u>
Total	4.0 – 8.0
Total	6.0 – 12.0 (Spots)

NOTE: This is an excellent coating system to overcoat existing unknown coating systems with limited surface preparation, using a non-stressful coating with excellent color and gloss retention. This coating should be spray applied and has excellent dry fall properties. The brush and roller version of Series 30 with a SG finish is the Series 29 Tufcryl. A test patch is always recommended to assure proper adhesion.

B. INTERIOR EXPOSURE (NON-IMMERSION)

B.1 System No. N69-1 High Solids Epoxy

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	<u>DFT Mils</u>
<u>1st Coat:</u> N69-Color Hi-Build Epoxoline II	5.0 – 7.0
<u>2nd Coat:</u> N69-Color Hi-Build Epoxoline II	<u>5.0 – 7.0</u>
	10.0 – 14.0
	Minimum 12.0 Mils

NOTE: This coating will provide maximum protection. It offers chemical and corrosion resistance for long-term protection against salt spray,



moisture, corrosive fumes, and chemical attack. Series N69 is a polyamidoamine cured epoxy. Primer coat must be touched-up before 2nd coat is applied.

B.2 System No. 66-2 Polyamide Epoxy

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

DFT-Mils

<u>1st Coat:</u>	66-Color Hi-Build Epoxoline	3.0 – 5.0
<u>2nd Coat:</u>	66-Color Hi-Build Epoxoline	<u>4.0 – 6.0</u> 7.0 – 11.0
		Minimum 9.0 Mils

NOTE: This system will provide chemical and corrosion resistance against abrasion, moisture, corrosion fumes, chemical contact, and immersion in non-potable water. Primer coat must be touched-up before 2nd coat is applied. Substitute Series 161 for low temperature cure or quick recoats.

B.3 System No. 66-6 High Build Epoxy (Over OEM Finishes)

Surface Preparation: Spot SSPC-SP6 Commercial Blast Cleaning or
SSPC-SP11 Power Tool Cleaning To Bare Metal

DFT-Mils

<u>1st Coat:</u>	Manufacturer's Standard (or existing coating)	1.0 – 2.0
<u>2nd Coat:</u>	135 Chembuild	3.0 – 5.0
<u>3rd Coat:</u>	66-Color Hi-Build Epoxoline	<u>3.0 – 5.0</u> 6.0–10.0
		Minimum 7.0 Mils

NOTE: This system is to be used over standard manufacturer's primer to offer a high-performance epoxy finish. Excellent for areas of rust not able to be completely cleaned.

B.4 System No. 23-1 Alkyd Enamel – Semi-Gloss

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

DFT-Mils

<u>1st Coat:</u>	37H-77 Chem-Prime H.S.	2.0 – 3.5
<u>2nd Coat:</u>	23-Color Enduratone	1.5 – 2.5



3rd Coat: 23-Color Enduratone 1.5 – 2.5
5.0 – 8.5
Minimum 6.0 Mills

C. IMMERSION

C.1 System No. N69-2 High Solids High Build Epoxy (Non-Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

	<u>DFT-Mils</u>
<u>Stripe Coat:</u> N69-Color Hi-Build Epoxoline II by brush and roller to all weld Seams and plate edges	3.0 – 5.0
<u>1st Coat:</u> N69-Color Hi-Build Epoxoline II	5.0 – 7.0
<u>2nd Coat:</u> N69-Color Hi-Build Epoxoline II	<u>5.0 – 7.0</u> 10.0-14.0 (Excluding stripe coat)
	Minimum 12.0 Mills

NOTE: This system provides maximum protection in immersion service. Scarify the surface before topcoating if the Series N69 has been exterior-exposed for 60 days or longer. If primer coat is damaged, it must be touched-up before 2nd coat is applied.

C.2 System No. 66-2 High Build Epoxy (Non-Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

	<u>DFT-Mils</u>
<u>Stripe Coat:</u> 66-Color to all weld seams and plate edges	2.0 – 4.0
<u>1st Coat:</u> 66-Color Hi-Build Epoxoline	3.0 – 5.0
<u>2nd Coat:</u> 66-Color Hi-Build Epoxoline	3.0 – 5.0
<u>3rd Coat:</u> 66-Color Hi-Build Epoxoline	<u>3.0 – 5.0</u> 9.0 – 15.0 (Excluding stripe coat)
	Minimum 11.0 Mills

NOTE: This system will provide chemical and corrosion resistance for protection against abrasion, moisture, corrosive fumes, chemical contact,



and immersion. Primer coat must be touched-up before 2nd coat is applied. Scarify the surface before top coating if the Series 66 has been exterior-exposed for 60 days or longer. Substitute Series 161 for low temperature cure or quick recoats.

C.3 System No. 20-1 Epoxy-Polyamide (Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

	<u>DFT-Mils</u>
<u>Stripe Coat:</u> 20-1255 Pota-Pox (Beige) to all weld seams and plate edges	2.0 – 4.0
<u>1st Coat:</u> 20-15BL Pota-Pox (Tank White)	3.0 – 5.0
<u>2nd Coat:</u> 20-1255 Pota-Pox (Beige)	4.0 – 6.0
<u>3rd Coat:</u> 20-15BL Pota-Pox (Tank White)	<u>4.0 – 6.0</u> 11.0–17.0 (Excluding stripe coat) Minimum 12.0 Mils

Caulk: Seal all open roof seams with a flexible NSF Certified caulking such as Sika Flex 1A

NOTE: This system meets American Water Works Association AWWA D 102 Inside Paint System Number 1. Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series FC20 for low temperature cure or quick recoats.

C.4 System No. N140 High Solids Epoxy (Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning

	<u>DFT-Mils</u>
<u>Stripe Coat:</u> N140-15BL Pota-Pox Plus (by brush and roller to all weld seams and plate edges)	3.0 – 5.0
<u>1st Coat:</u> N140-1255 Pota-Pox Plus (Beige)	6.0 – 8.0
<u>2nd Coat:</u> N140-15BL Pota-Pox Plus (Tank White)	<u>6.0 – 8.0</u> 12.0 -16.0



(Excluding stripe coat)

Minimum 14.0 Mils

NOTE: Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61.

C.5 System No. 46-30 Coal Tar-Epoxy (Non-Potable Water)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning*

DFT-Mils

One Coat: 46H-413 Hi-Build Tneme-Tar 16.0 – 20.0

NOTE: May be applied in a two-coat application. Review critical recoat time if utilized.

*SSPC-SP6 Commercial Blast Cleaning may be used for non-immersion service.

C.6 System No. 91-H₂O Zinc/Epoxy (Potable Water)

Surface Preparation: SSPC-SP10 Near White Metal Blast

DFT-Mils

Stripe Coat: 91-H₂O Hydrozinc 2000 2.5 – 3.5

(by brush & roller to all weld seams and plate edges.)

1st Coat: 91- H₂O Hydrozinc 2000 2.5 – 3.5

2nd Coat: 20-1255 Pota-Pox (Beige) 4.0 – 6.0

3rd Coat: 20-15BL Pota-Pox (Tank White) 4.0 – 6.0

10.5 -15.5

Minimum 12.0 Mils

Caulk: Seal all open roof seems with a flexible NSF Certified caulking such as Sika-Flex 1A.

NOTE: Can substitute Series N140, or FC20 for Series 20 if preferred. Meets AWWA D102-97 Inside Coating System No. 3.

D. OVERHEAD METAL DECKING, JOIST – INTERIOR EXPOSURE

D.1 System No. 115-1 Uni-Bond DF

Surface Preparation: Surfaces must be dry, clean, and free of oil, grease, and other contaminants. Allow concrete to cure 28 days. Galvanized metal



decking must be scarified.

DFT-Mils

Coating: 115-Color Uni-Bond DF

2.0 – 4.0

NOTE: This system should be used on ceiling areas where a one-coat system is desired. Can be applied over steel, galvanized, and aluminum decking, joist, beams, conduits, and concrete.

E. EXTERIOR EXPOSURE**E.1 System No. 135-5 Epoxy/DTM Acrylic**

Surface Preparation: Pressure clean to remove all dirt, oil, grease, chemicals, and foreign contaminants. Remove loose paint and all rust by hand and power tool cleaning (SSPC-SP 2 & 3). Feather all edges.

Dry Film-Mils

Spot Primer: 135 Chembuild

3.0 – 5.0

1st Coat: 30 Spra-Saf EN

2.0 – 4.0

2nd Coat: 30 Spra-Saf EN

2.0 – 4.0

TOTAL 4.0 – 8.0 (For (2) Coats)

NOTE: This system can be applied over a wide variety of coatings and factory finishes. It can also be applied direct to galvanized aluminum decking, joists, conduits, and tight rust.

F. MILL COATED STEEL PIPE – EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)**F.1 System No. 66-3 Epoxy-Polyamide**

Surface Preparation: Surface shall be clean and dry. Scarify by Brush Blasting if surface is hard and glossy.

DFT-Mils

1st Coat: 66-Color Hi-Build Epoxoline

3.0 – 4.0

2nd Coat: 66-Color Hi-Build Epoxoline

4.0 – 6.0

*3rd Coat: 73 Endura-Shield

(2.0 – 3.0)

(9.0 –13.0)

Minimums 11.0 Mils for 3 coats

9.0 Mils for 2 coats

*Optional topcoat for exterior exposure

NOTE: This system can be applied directly to mill coated steel pipe without



sandblasting for use in non-immersion. There may be some bleed through with the 1st coat. Do not apply over glossy varnish type mill coatings without thorough scarification.

G. GALVANIZED STEEL – PIPE AND MISCELLANEOUS FABRICATIONS – EXTERIOR (NON-IMMERSION)

G.1 System No. 73-2 Epoxy/High Build Urethane

Surface Preparation: SSPC-SP1 Solvent Cleaning and Scarify by Brush Off Blasting, Hand Sanding, or Chemical Treatment

	<u>DFT-Mils</u>
<u>1st Coat:</u> 66-Color Hi-Build Epoxoline	2.0 – 4.0
<u>2nd Coat:</u> 73-Color Endura-Shield	<u>2.0 – 4.0</u>
	4.0 – 8.0
Minimum	5.0 Mils

NOTE: Series 66 has excellent adhesion to galvanized steel. This system is highly resistant to abrasion, wet conditions, corrosive fumes, and chemical contact. Provides 2-3 times the color and gloss retention of conventional paints. First coat to be same color as or close to the finish color. Specify Series 1074 Endura-Shield for gloss finish.

H. INTERIOR EXPOSURE (NON IMMERSION)

H.1 System No. 66-6 Polyamide Epoxy

Surface Preparation: SSPC-SP1 Solvent Cleaning and Scarify by Brush Off Blasting, Hand Sanding, or Chemical Treatment

	<u>DFT-Mils</u>
<u>1st Coat:</u> 66-Color Hi-Build Epoxoline	2.0 – 4.0
<u>2nd Coat:</u> 66-Color Hi-Build Epoxoline	<u>2.0 – 4.0</u>
	4.0 – 8.0
Minimum	5.0 Mils

I. IMMERSION (POTABLE WATER)

I.1 System No. 20-1 Epoxy-Polyamide (Potable Water)

Surface Preparation: Solvent Clean Per SSPC-SP1 & Abrasive Blast per SSPC-SP7

DFT-Mils



<u>1st Coat:</u>	20-1255 Pota-Pox Primer	4.0 – 6.0
<u>2nd Coat:</u>	20-15BL Pota-Pox Finish	<u>4.0 – 6.0</u>
		8.0–12.0
	Minimum	10.0 Mils

NOTE: Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series FC20 for low temperature cure or quick recoat.

J. CHAIN-LINK FENCES – GALVANIZED STEEL & NON-FERROUS METAL

J.1 **System No. 6-2 Oil Based Enamel**

Surface Preparation: Surface shall be clean and dry

		<u>DFT-Mils</u>
<u>1st Coat:</u>	80 Galv-Gard	2.5 – 4.0
<u>2nd Coat:</u>	80 Galv-Gard	<u>2.5 – 4.0</u>
		5.0 – 8.0
	Minimum	5.0 Mils

K. CONCRETE – EXTERIOR ABOVE GRADE

K.1 **System No. 180-1 High Build Acrylic Emulsion – Smooth**

Surface Preparation: Surface shall be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	180-Color W.B. Tneme-Crete	4.0 – 6.0*
<u>2nd Coat:</u>	180-Color W.B. Tneme-Crete	<u>4.0 – 6.0*</u>
		8.0 –12.0 Mils
	Minimum	10.0 Mils

*This coating should be spray applied to achieve the recommended DFT. Application by roller would possibly require additional coats to achieve the recommended DFT for the system.

NOTE: Series 180 is a high-build decorative acrylic coating in a smooth finish. Substitute Series 181 if a sand texture finish if desired.

K.2 **System No. 6-1 Acrylic Emulsion**

Surface Preparation: Surface must be clean and dry.

	<u>DFT-Mils</u>	
<u>1st Coat:</u>	6-Color Tneme-Cryl	2.0 – 3.0



<u>2nd Coat:</u>	6-Color Tneme-Cryl	<u>2.0 – 3.0</u>
		4.0 – 6.0
	Minimum	5.0 Mils

NOTE: If semi-gloss finish is desired, use Series 29 Tuf-Cryl as the 2nd coat @ 1.5 – 2.0 mils DFT.

K.3 System No. 156-1 Modified Acrylic Elastomer

Surface Preparation: Surface must be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	156-Color Enviro-Crete	4.0 – 8.0
<u>2nd Coat:</u>	156-Color Enviro-Crete	<u>4.0 – 8.0</u>
		8.0 – 16.0
	Minimum	10.0 Mils

NOTE: If texture is needed, use 157 Enviro-Crete TX (medium texture). For application over previously applied coatings, use TNEMEC Series 151 Elasto-Grip at 1.0 – 2.5 mils DFT prior to the application of Series 156 Enviro-Crete.

K.4 System No. 100 Concrete Stain

Surface Preparation: The surface must be clean, dry, sound, and free of cracks, and paint.

		<u>SF/Gal/Ct</u>
<u>Sealer:</u>	Chemprobe Prime A Pell H ₂ O	65-200
<u>Concrete Stain:</u>	Two coats of Chemprobe	75-200

Conformal Stain

L. EXTERIOR – BELOW GRADE

L.1 System No. 46-61 Coal Tar Pitch Solution

Surface Preparation: Surface must be clean and dry. Allow new concrete to cure at least 28 days.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	46-465 H.B. Tnemecol	8.0 – 12.0
<u>2nd Coat:</u>	46-465 H.B. Tnemecol	<u>8.0 – 12.0</u>
		16.0 - 24.0



Minimum 16.0 Mils

L.2 System No. 46-31 Coal Tar Epoxy

Surface Preparation: Surface shall be clean and dry. Allow New concrete to cure at least 28 days.

DFT-Mils

One Coat: 46H-413 Hi-Build Tneme-Tar 14.0-20.0

L.3 System No. 100-1 Crystalline Waterproofing

Surface Preparation: Surface to be clean and opened up by Brush Blasting, Acid Etching, or Water Blasting w/Turbo Tips. Surface must be pre-wetted prior to application.

1st Coat: XYPEX Concentrate @ (1.5 #/SY)

2nd Coat: XYPEX Modified @ (1.5 #/SY)

NOTE: This system can be applied to concrete that is still wet or hasn't developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure. Application shall be per XYPEX specification manual.

M. INTERIOR EXPOSURE (NON-IMMERSION)**M.1 System No. 6-1 Acrylic Emulsion (Interior/Exterior)**

Surface Preparation: Surface shall be clean and dry. Allow concrete to cure for 28 days.

DFT-Mils

1st Coat: 6-Color Tneme-Cryl 2.0 – 3.0

2nd Coat: 6-Color Tneme-Cryl 2.0 – 3.0

4.0 – 6.0

Minimum 5.0 Mils

NOTE: This system will provide a decorative coating with good exterior durability, color retention, and a high vapor transmission rate. For Semi-Gloss finish, substitute Series 29 Tuf-Cryl for the 2nd coat at 1.5 – 2.0 mils DFT. Apply both the Series 6 & 29 in the same color.

M.2 System No. 66-4 Epoxy-Polyamide (Interior)

Surface Preparation: Surfaces shall be clean and dry. Allow concrete to cure for 28 days.

**DFT-Mils**

<u>1st Coat:</u>	66-Color Hi-Build Epoxoline	3.0 – 5.0
<u>2nd Coat:</u>	66-Color Hi-Build Epoxoline	<u>4.0 – 6.0</u>
		7.0–11.0
	Minimum	9.0 Mils

M.3 System No. 84-1 High Solids Glazed Epoxy (Interior)

Surface Preparation: Surfaces shall be clean and dry. Allow concrete to cure for 28 days.

DFT-Mils

<u>1st Coat:</u>	84-Color Ceramlon II	6.0 – 10.0
<u>2nd Coat:</u>	84-Color Ceramlon II	<u>6.0 – 10.0</u>
		12.0 - 20.0
	Minimum	14.0 Mils

M.4 System No. 113-2 Acrylic Epoxy Semi-Gloss

Surface Preparation: Surface must be clean and dry.

DFT-Mils

<u>1st Coat:</u>	113-Color Tneme-Tufcoat	4.0 – 6.0
<u>2nd Coat:</u>	113-Color Tneme-Tufcoat	<u>4.0 – 6.0</u>
		8.0 –12.0
	Minimum	8.0 Mils

NOTE: Substitute Series 114 Tneme-Tufcoat for gloss finish. Multiple coats may be required if application is by roller.

N. IMMERSION – POTABLE & NON-POTABLE WATER**N.1 System No. 66-4 Epoxy-Polyamide (Non-Potable Water)**

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

DFT-Mils

<u>1st Coat:</u>	66-Color Hi-Build Epoxoline	4.0 – 6.0
<u>2nd Coat:</u>	66-Color Hi-Build Epoxoline	<u>4.0 – 6.0</u>
		8.0 –12.0
	Minimum	10.0 Mils

NOTE: Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler &



Surfacer. First coat should be spray-applied and backrolled.

N.2 System No. 104-5 High Solids Epoxy (Non-Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

	<u>DFT-Mils</u>
<u>1st Coat:</u> 104-1255 H.S. Epoxy Primer	6.0 – 10.0
<u>2nd Coat:</u> 104-Color H.S. Epoxy	<u>6.0 – 10.0</u>
	12.0 - 20.0
Minimum	14.0 Mils

NOTE: Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer. First coat should be spray-applied and backrolled.

N.3 System No. 46-31 Coal Tar-Epoxy (Non-Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

	<u>DFT-Mils</u>
<u>One Coat:</u> 46H-413 Hi-Build Tneme-Tar	14.0 – 20.0

NOTE: May be applied in a two-coat application. Review critical recoat time if utilized. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler & Surfacer.

N.4 System No. 20-2 Epoxy-Polyamide (Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

	<u>DFT-Mils</u>
<u>1st Coat:</u> 20-1255 Pota-Pox	4.0 – 6.0
<u>2nd Coat:</u> 20-15BL Pota-Pox Finish	<u>4.0 – 6.0</u>
	8.0 – 12.0
Minimum	10.0 Mils

NOTE: This system meets American Water Works Association AWWA D 102 Inside System No. 1. Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation



Foundation Standard Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNE MEC Series 63-1500 Filler & Surfacer. (NSF Standard 61 approved). Substitute Series FC20 for low temperature cure or quick recoats.

N.5 System No. N140-2 Epoxy-Polyamidoamine (Potable Water)

Surface Preparation: Allow concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13.

	<u>DFT-Mils</u>
<u>1st Coat:</u> N140-1255 Pota-Pox Plus	6.0 – 8.0
<u>2nd Coat:</u> N140-15BL Pota-Pox Plus	<u>6.0 – 8.0</u>
	12.0-16.0
Minimum	14.0 Mils

NOTE: Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNE MEC Series 63-1500 Filler & Surfacer. (NSF Standard 61 approved). First coat should be sprayed and backrolled.

N.6 System No. 264-1 Elastomeric Polyurethane

Surface Preparation: Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive blast clean per SSPC-SP13 (Surface Preparation of Concrete)

	<u>DFT-Mils</u>
<u>Primer:</u> 20-15BL (Tank White)	5.0 Mils
<u>Coating:</u> 264 Elasto-Shield (Black)	<u>60.0 Mils ±</u>
	65.0 Mils

NOTE: This system is NSF Certified for Potable Water. This flexible liner can be used to rehab tanks with leaks. Multiple passes may be required to achieve the desired thickness that can range from 50-100 mils. See Elasto-Shield Application Guide for detailed instructions.

O. INTERIOR EXPOSURE (NON-IMMERSION) OVER EXISTING COATINGS

O.1 System No. 6-1 Acrylic Emulsion

Surface Preparation: Surface must be clean and dry.

DFT-Mils



<u>1st Coat:</u>	6-Color Tneme-Cryl	2.0 – 3.0
<u>2nd Coat:</u>	6-Color Tneme-Cryl	<u>2.0 – 3.0</u>
		4.0 – 6.0
	Minimum	5.0 Mils

NOTE: If semi-gloss finish is desired, use Series 29 Tuf-Cryl as the 2nd Coat @ 1.5 – 2.0 mils DFT.

O.2 System No. 113-1 Acrylic-Epoxy Semi-Gloss

Surface Preparation: Surface must be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	113-Color Tneme-Tufcoat	2.0 – 3.0
<u>2nd Coat:</u>	113-Color Tneme-Tufcoat	<u>2.0 – 3.0</u>
		4.0 – 6.0
	Minimum	5.0 Mils

NOTE: This system will provide high performance and can be applied directly over existing coatings without lifting. Can be used when low odor is required during application. Specify Series 114 Tneme-Tufcoat for Gloss Finish. This coating can be spray applied in a single coat at 4.0 – 6.0 mils DFT.

P. CONCRETE FLOORS – EPOXY FLOOR COATING

P.1 System No. 205-1 Epoxy-Polyamide

Surface Preparation: Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	205 Terra-Tread FC	3.0 – 5.0
<u>2nd Coat:</u>	205 Terra-Tread FC	<u>3.0 – 5.0</u>
		6.0–10.0
	Minimum	6.0 Mils

NOTE: This system will provide a durable, longwearing coating that bonds tightly to concrete and stands up under heavy foot traffic, frequent cleaning, and spillage of water, oil, grease, or chemical. For floors exposed to the sun, add a 3rd coat of Tnemec Series 291 CRU at 2.0 – 3.0 mils DFT.

NOTE: For a skid resistant finish broadcast 50 mesh dry washed silica sand into the 1st coat.

**P.2 System No. 287-1 Waterborne Epoxy-Amine**

Surface Preparation: Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

	<u>DFT-Mils</u>
<u>1st Coat:</u> 287-Color Enviro-Tread	2.0 – 4.0
<u>2nd Coat:</u> 287-Color Enviro-Tread	<u>2.0 – 4.0</u>
	4.0 – 8.0
Minimum	5.0 Mils

NOTE: For a non-skid finish, add 287-300C skid resistance sand into the first coat. For floors exposed to the sun add a 3rd coat of Tnemec Series 291-CRU at 2.0 – 3.0 mils DFT.

P.3 System No. 291-12 Epoxy/Urethane

Surface Preparation: Allow concrete to cure 28 days. Acid Etch or Brush Off Blast Cleaning per SSPC-SP13.

	<u>DFT-Mils</u>
<u>1st Coat:</u> 66-Color Hi-Build Epoxoline	2.0 – 3.0
<u>2nd Coat:</u> 66-Color Hi-Build Epoxoline	2.0 – 3.0
<u>3rd Coat:</u> 291-Color CRU	<u>2.0 – 3.0</u>
	6.0 – 9.0
Minimum	7.0 Mils

NOTE: This system offers a hard, chemically resistant floor coating with excellent flow properties and color and gloss retention.

P.4 System No. 280-1 High Build Polyamine-Epoxy Glaze Floor

Surface Preparation: Allow concrete to cure 28 days. Abrasive Blast Cleaning (Refer to Installation Guide of manufacturer.)

	<u>DFT-Mils</u>
<u>1st Coat:</u> 201 Epoxoprime	6.0 – 8.0
<u>2nd Coat:</u> 280 Tneme-Glaze	6.0 – 8.0
<u>3rd Coat:</u> 280 Tneme-Glaze	<u>6.0 – 8.0</u>
	18.0 – 24.0
Minimum	18 Mils

Please refer to manufacturer's Installation Guide and Technical Data for proper installation.

**P.5 System No. 237/281 Double Broadcast Flooring (Non-Slip)**

Surface Preparation: Abrasive Blast Cleaning (Refer to Installation Guide of manufacturer.)

	<u>DFT-Mils</u>
<u>1st Coat:</u> 201 Epoxoprime	6.0 – 8.0
<u>2nd Coat:</u> 237 Power-Tread	1/8" (2 cts. @ 1/16" each)
<u>3rd Coat:</u> 280 Tneme-Glaze	<u>8.0 – 12.0</u>
Minimum	1/4" +

Please refer to manufacturer's Installation Guide and Technical Data for proper installation.

P.6 System No. 222/284 Multi-Color Quartz Broadcast Floor and Cove Base

Surface Preparation: Abrasive blast cleaning (Refer to Tnemec Surface Preparation and Installation Guide).

	<u>DFT-Mils</u>
<u>1st Coat:</u> 222 Deco-Tread	1/8" (2 cts. @ 1/16" each)
<u>2nd Coat:</u> 284 Deco-Clear	<u>8.0-10.0</u>
Total	1/8" +

Q. POROUS MASONRY**Q.1 EXTERIOR/INTERIOR EXPOSURE****System No. 180-2 Acrylic Emulsion – Smooth**

Surface Preparation: Surface shall be clean and dry.

	<u>DFT-Mils</u>
<u>Block Filler:</u> 54-562 Modified Epoxy Masonry Filler	80 SF/Gal
<u>1st Coat:</u> 180-Color W.B. Tneme-Crete	4.0 – 8.0
<u>2nd Coat:</u> 180-Color W.B. Tneme-Crete	<u>4.0 – 8.0</u>
	8.0 -16.0*

*Total DFT of topcoats only



NOTE: Also available in Series 181 in a sand finish. The Series 180 has to be spray applied to achieve recommended dry film thickness application; by roller would require additional coats.

Q.2 System No. 6-2 Acrylic Emulsion, Low Sheen

Surface Preparation: Surface shall be clean and dry.

	<u>DFT-Mils</u>
<u>Block Filler:</u> 54-562 Modified Epoxy Masonry Filler	80 SF Gal
<u>1st Coat:</u> 6-Color Theme-Cryl	2.0 – 3.0
<u>2nd Coat:</u> 6-Color Theme-Cryl	<u>2.0 – 3.0</u>
	*4.0 – 6.0

*Total dry film thickness of topcoats only.

NOTE: This system will fill the block and provide a sealed surface. For semi-gloss finish, use Series 29 Tufcryl (SG) for the 2nd coat @ 1.5 – 2.0 mils DFT.

Q.3 System No. 66-15 Epoxy-Polyamide (Interior)

Surface Preparation: Surface shall be clean and dry.

	<u>DFT-Mils</u>
<u>Block Filler:</u> 54-660 Epoxy Masonry Filler	100 SF Gal
<u>1st Coat:</u> 66-Color Hi-Build Epoxoline	4.0 – 6.0
<u>2nd Coat:</u> 66-Color Hi-Build Epoxoline	<u>4.0 – 6.0</u>
	*8.0–12.0

*Total dry film thickness of topcoats only.

NOTE: Block filler is a polyamide epoxy designed for high moisture.

Q.4 System No. 104-6 High Solids Epoxy (Interior Only)

Surface Preparation: Surface to be clean and dry.

	<u>DFT-Mils</u>
<u>1st Coat:</u> 104-Color H.S. Epoxy	6.0 – 10.0
<u>2nd Coat:</u> 104-Color H.S. Epoxy	<u>6.0 – 10.0</u>
	12.0 – 20.0
Minimum	14.0 Mils

NOTE: The surface will be tile-like for easy cleaning and will provide protection against chemical attack, corrosive fumes, and high humidity and



wash down. Spray and backroll first coat to fill porosity.

Q.5 System No. 113-1 Acrylic-Epoxy Semi-Gloss (Interior Only)

Surface Preparation: Surface must be clean and dry.

	<u>DFT-Mils</u>
<u>Block Filler:</u> 54-562 Modified Epoxy Masonry Filler	80 SF/Gal
<u>1st Coat:</u> 113-Color Tneme-Tufcoat	4.0 – 6.0
<u>2nd Coat:</u> 113-Color Tneme-Tufcoat	<u>4.0 – 6.0</u> 8.0 – 12.0

NOTE: Series 113 can be spray applied @ 4.0 – 6.0 mils DFT. Application by brush and roller will require additional coats.

NOTE: Series 113 Tneme-Tufcoat has very low odor and can be used when painting in occupied areas. Specify Series 114 Tneme-Tufcoat for a gloss finish.

Q.6 System No. 156-1 Modified Acrylic Elastomer (Exterior)

Surface Preparation: Surface must be clean and dry.

	<u>DFT-Mils</u>
<u>Block Filler:</u> 54-562 Modified Masonry Filler	80 SF/Gal
<u>1st Coat:</u> 156-Color Enviro-Crete	4.0 – 8.0
<u>2nd Coat:</u> 156-Color Enviro-Crete	<u>4.0 – 8.0</u> 8.0–16.0
Minimum	10.0 Mils
(For 2 nd & 3 rd Coats)	

NOTE: If texture is needed, use 157 Enviro-Crete TX (medium texture). For application over previously applied coatings, use TNEMEC 151 Elasto-Grip at 1.0 – 2.5 mils DFT in place of the 54-562 block filler.

R. GYPSUM WALLBOARD – INTERIOR EXPOSURE

R.1 System No. 113-5 Acrylic-Epoxy

Surface Preparation: Surface must be clean and dry.

DFT-Mils



<u>1st Coat:</u>	151 PVA Sealer	1.0 – 2.0
<u>2nd Coat:</u>	113 H.B. Tneme-Tufcoat	2.0 – 3.0
<u>3rd Coat:</u>	113 H.B. Tneme-Tufcoat	<u>2.0 – 3.0</u>
		5.0 – 8.0
	Minimum	6.0 Mils

NOTE: Series 113 can be spray applied in a single coat at 4.0 – 6.0 mils DFT.

Substitute Series 114 if a gloss finish is desired.

R.2 System No. 66-22 Hi-Build Epoxoline

Surface Preparation: Surface must be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	151 PVA Sealer	1.0 – 2.0
<u>2nd Coat:</u>	66-Color Hi-Build Epoxoline*	<u>4.0 – 6.0</u>
		5.0 – 8.0
	Minimum	5.0 Mils +

NOTE: *Two coats may be required if applied by roller.

R.3 System No. 6-1 Acrylic Emulsion, Low Sheen

(Interior / Exterior Exposure)

Surface Preparation: Surface must be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	6-Color Tneme-Cryl	2.0 – 3.0
<u>2nd Coat:</u>	6-Color Tneme-Cryl	<u>2.0 – 3.0</u>
		4.0 – 6.0
	Minimum	5.0 Mils

NOTE: This system is designed for mild use areas like office walls, laboratory ceilings, stairwells, etc. For semi-gloss finish, use Series 29 Tufcryl at 1.5 – 2.0 mils DFT.

S. WOOD – EXTERIOR/INTERIOR EXPOSURE

S.1 System No. 23-4 Alkyd Semi-Gloss

Surface Preparation: Surface shall be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	36-603 Undercoater	2.5 – 3.5



<u>2nd Coat:</u>	23 Enduratone	1.5 – 3.5
<u>3rd Coat:</u>	23 Enduratone	<u>1.5 – 3.5</u>
		5.5–10.5
	Minimum	6.0 Mils

NOTE: Specify Series 2H Hi-Build Tneme-Gloss for High Gloss finish.

S.2 System No. 6-5 Acrylic Latex

Surface Preparation: Surface shall be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	36 Undercoater	2.0 – 3.5
<u>2nd Coat:</u>	6-Color Tneme-Cryl	2.0 – 3.0
<u>3rd Coat:</u>	6-Color Tneme-Cryl	<u>2.0 – 3.0</u>
		6.0 – 9.5
	Minimum	7.5 Mils

NOTE: Substitute Series 29 Tufcryl for the third coat at 1.5 – 2.0 mils DFT if semi-gloss finish is desired.

T. PVC PIPE – EXTERIOR OR INTERIOR

T.1 System No. 73-23 Epoxy-Polyamide

Surface Preparation: Solvent clean per SSPC-SP1 & Scarify by Brush Blast or Hand Sanding.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	66-Color Hi-Build Epoxoline	2.0 – 3.0
<u>2nd Coat:</u>	73 Endura-Shield	<u>2.0 – 3.0</u>
		4.0 – 6.0
	Minimum	5.0 Mils

U. INSULATED PIPE – INTERIOR EXPOSURE

U.1 System No. 6-1 Acrylic Emulsion, Low Sheen

Surface Preparation: Surface shall be clean and dry.

		<u>DFT-Mils</u>
<u>1st Coat:</u>	6-Color Tneme-Cryl	2.0 – 3.0
<u>2nd Coat:</u>	6-Color Tneme-Cryl	<u>2.0 – 3.0</u>
		4.0 – 6.0
	Minimum	5.0 Mils



NOTE: For semi-gloss finish, use Series 29 Tufcryl for the second coat.

V. HIGH HEAT COATING – EXTERIOR/INTERIOR EXPOSURE

V.1 System No. 39-2 Silicone Aluminum (1200° F Maximum)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning –
1.0 Mil Surface Profile

	<u>DFT-Mils</u>
<u>1st Coat:</u> 39-1261 Silicone Aluminum	1.0 – 1.5
<u>2nd Coat:</u> 39-1261 Silicone Aluminum	<u>1.0 – 1.5</u> 2.0 – 3.0
Minimum	2.0 Mils

NOTE: Coating must be heat cured @ 400°F for 1 hour.

V.2 System No. 39-4 Silicone Aluminum (600° F Maximum)

Surface Preparation: SSPC-SP10 Near White Blast Cleaning –
1.0 Mil Surface Profile

	<u>DFT-Mils</u>
<u>1st Coat:</u> 39-661 Silicone Aluminum	1.0 – 1.5
<u>2nd Coat:</u> 39-661 Silicone Aluminum	<u>1.0 – 1.5</u> 2.0 – 3.0
Minimum	2.0 Mils

NOTE: Coating must be heat cured @ 400°F for 1 hour.

V.3 System No. 90E-92 Inorganic Zinc (750°F Max)

Surface Preparation: SSPC-SP10 Near White Metal Blast Cleaning

	<u>DFT-Mils</u>
<u>Coating:</u> 90E-02 Tneme-Zinc	2.0 – 3.5

NOTE: Coating will have a greenish-gray color but will not require curing at elevated temperatures.

W. SURFACES EXPOSED TO H₂S/H₂SO₄ (SEVERE EXPOSURE/IMMERSION) – CEMENTITIOUS SURFACES

W.1 System No. 120-1 Vinyl Ester (Concrete)

Surface Preparation: Abrasive blast clean per SSPC-SP13 to remove all laitance, fines, and contamination.



	<u>DFT-Mils</u>
<u>1st Coat:</u> 120-5002 Vinester Primer	6.0 – 10.0*
<u>2nd Coat:</u> 120-5003 Vinester F&S	As Required**
<u>3rd Coat:</u> 120-5002 Vinester Primer	12.0 – 18.0
<u>4th Coat:</u> 120-5001 Vinester Topcoat	<u>12.0 – 18.0</u>
	30.0 - 46.0
Minimum	36.0 Mils +

NOTES: *First coat to be applied by roller application or spray applied followed by backrolling.

**All surface voids, cracks, pinholes, and other defects must be filled flush with the adjacent surfaces by putty knife, trowel, float, squeegee, or other suitable method.

X. FERROUS METAL SURFACES

X.1 **System No. 120-2 Vinyl Ester (Steel)**

Surface Preparation: SSPC-SP5 White Metal Blast Cleaning
(3.0 Mil Profile)

	<u>DFT-Mils</u>
<u>1st Coat:</u> 120-5002 Vinester Primer	12.0 – 18.0
<u>2nd Coat:</u> 120-5001 Vinester Topcoat	<u>12.0 – 18.0</u>
	24.0 – 36.0
Minimum	30.0 Mils

NOTE: Application of a stripe coat to all weld seams and plate edges is recommended.

Y. EXTERIOR OF PRESTRESSED CONCRETE TANKS

Y.1 **System No. 156-3 (New Tanks)**

Surface Preparation: Surface to be clean and dry.

	<u>DFT-Mils</u>
<u>1st Coat:</u> 156-Color Envirocrete	4.0 – 6.0
<u>2nd Coat:</u> 156-Color Envirocrete	<u>4.0 – 6.0</u>
	8.0 – 12.0
Minimum	10.0 Mils

**Y.2 System No. 180-3 (New Tanks)**

Surface Preparation: Surface to be clean and dry.

	<u>DFT-Mils</u>
<u>1st Coat:</u> Thoroseal or equal	1/16"
<u>2nd Coat:</u> 180 W.B. Tneme-Crete	2.0 - 4.0
<u>3rd Coat:</u> 180 W.B. Tneme-Crete	<u>2.0 - 4.0</u>
	1/16"+

Y.3 System No. 6-6 (New Tanks)

Surface Preparation: Surfaces to be clean and dry.

	<u>DFT-Mils</u>
<u>1st Coat:</u> Thoroseal or equal	1/16"
<u>2nd Coat:</u> 6-Tneme-Cryl	2.0 - 3.0
<u>3rd Coat:</u> 6 Tneme-Cryl	<u>2.0 - 3.0</u>
	1/16"+

Y.4 System No. 156-4 Existing Tanks (Previously Painted)

Surface Preparation: Remove all dirt, oil, grease, chalk, and loose paint per High Pressure Water Blast (Min 3500 PSI).

	<u>DFT-Mils</u>
<u>1st Coat:</u> 151 Elasto-Grip	1.0 – 2.5
<u>Stripe Coat:</u> Stripe all hairline cracks with a Brushed coat of Series 156 Envirocrete	3.0 – 5.0
<u>Topcoat:</u> 156-Envirocrete	<u>4.0 – 6.0</u>
(Cracks)	8.0 – 13.5
(Other)	5.0 – 8.5

Y.5 System 180-4 Existing Tanks (Previously Painted)

Surface Preparation: Remove all dirt, oil, grease, chalk, and loose paint per High Pressure Water Blast (Min 3500 PSI).

	<u>DFT-Mils</u>
<u>Stripe Coat:</u> 180 W.B. Tneme-Crete Applied by roller to all Visible cracks	2.0 - 4.0
<u>1st Coat:</u> 180 W.B. Tneme-Crete	2.0 - 4.0
<u>2nd Coat:</u> 180 W.B. Tneme-Crete	<u>2.0 - 4.0</u>



4.0 - 8.0

Minimum 5.0 mils (2 coats)

NOTE: May be spray applied in a single coat at 4.0 – 8.0 mils.**Z. SECONDARY CONTAINMENT AREAS****Z.1 System No. 61-4 Epoxy Polyamide (For Fuel Oils)**

Surface Preparation: Surface shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP7 (Brush Off Blast).

DFT-Mils

Primer: 61-5002 Tneme-Liner (Beige) 4.0 – 6.0

Topcoat: 61-5001 Tneme-Liner (Gray) 4.0 – 6.0

8.0 – 12.0

Minimum 10.0 Mils

NOTE: This system will provide excellent resistance to most chemicals including petrochemicals. Use Tnemec Series 63-1500 between coats as a filler and surfacer wherever it is required.

Z.2 System No. 61-1 Amine Epoxy (For Caustics)

Surface Preparation: Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP6 (Brush Off Blast).

DFT-Mils

Primer: 61-5002 Tneme-Liner (Beige) 8.0 – 12.0

Topcoat: 61-5001 Tneme-Liner (Gray) 8.0 – 12.0

16.0 - 24.0

NOTE: This system offers superior chemical resistance to a wide range of chemicals. Use Tnemec Series 63-1500 between coats as a filler and surfacer wherever it is required.

Z.3 System 262-1 Flexible Polyurethane

Surface Preparation: Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP7 (Brush Off Blast).

DFT-Mils

Primer: 66 Hi-Build Epoxoline 5 Mils

Coating: 262 Elasto-Shield (Black) 50 Mils

Total 55



NOTE: Multiple passes may be required to achieve recommended film thickness. See Elasto-Shield Application Guide for additional instructions. This product is only available in black. Repair all cracks, bugholes, and spalled areas with Series 265 Elasto-Shield TG prior to application of Series 262.

Z.4 System No. 120-3 Vinyl Ester (For Acids)

Surface Preparation: Abrasive blast clean per SSPC-SP13.

	<u>DFT-Mils</u>
<u>Filler Surfacers:</u> 120-5003 Vinester F & S	as Required
<u>1st Coat:</u> 120-5002 Vinester Primer	15.0 - 18.0
<u>2nd Coat:</u> 120-5001 Vinester Topcoat	<u>15.0 - 18.0</u> 30.0 - 36.0
	Minimum 30.0 Mils

NOTES: Use 120-5003 Vinester F & S to fill all cracks, bugholes, and other surface voids, and smooth all rough areas.

Z.5 System No. 275 Fiber Reinforced Novolac Epoxy

Surface Preparation: Allow new concrete to cure 28 days. Abrasive blast clean per SSPC-SP13.

Filler Surfacers: Fill all voids with Tnemec Series 201 Epoxoprime mixed with fumed silica.

Prime Coat: Tnemec Series 201 Epoxoprime @ 6.0 – 8.0 mils DFT.

Body Coat: Tnemec Series 275 Stranlok (Fiber Reinforced Novolac Epoxy) applied by spray or trowel at 30-35 mils DFT.

Topcoat: Tnemec Series 282 Tnem-Glaze (Novolac Epoxy) applied at 6.0 – 8.0 mils DFT.

AA. CLEAR WATER REPELLENT FOR CONCRETE, MASONRY & BRICK

AA.1 Silane/Siloxane Sealer (Water Based)

Surface Preparation: Allow new concrete to cure 28 days. Clean surfaces to be sealed by abrasive blasting or waterblasting.

COATING: BRICK, CONCRETE

Chemprobe PRIME A PELL H₂O 125-200 SF/GAL

SPLIT FACED OR POROUS MASONRY

Chemprobe PRIME A PELL H₂O. 65-100 SF/GAL



AA.2 Silane/Siloxane Sealer w/Concrete Stain

Sealer: Chemprobe Prime A Pell H₂O 65-200 SF/Gal

Concrete Stain: Two Coats of Chemprobe 75-200 SF/Gal/Ct
Conformal Stain

BB. MANHOLES, WET WELLS & LIFT STATIONS

BB.1 System No. 120-1 Vinyl Ester

Surface Preparation: Abrasive blast clean to remove all laitance, fines, and contamination.

	<u>DFT-Mils</u>
<u>1st Coat:</u> 120-5002 Vinester Primer	6.0 – 10.0*
<u>2nd Coat:</u> 120-5003 Vinester F&S	As required**
<u>3rd Coat:</u> 120-5002 Vinester Primer	12.0 – 18.0
<u>4th Coat:</u> 120-5001 Vinester Topcoat	<u>12.0 – 18.0</u> 30.0 – 46.0
	Minimum 36.0 Mils +

*First coat to be applied by roller application or spray applied followed by backrolling.

**All surface voids, cracks, pinholes, and other defects must be filled flush with the adjacent surfaces by putty knife, trowel, float, squeegee, or other suitable method.

BB.2 System No. 100-1 Crystalline Waterproofing

Surface Preparation: Surface to be clean and roughened by Brush Blasting, Acid Etching, or High Pressure Water Blasting (3500 PSI) with turbo tips.

1st Coat: XYPEX Concentrate @ (1.5#/SY) – 1/16"±

2nd Coat: XYPEX Modified @ (1.5#/SY) – 1/16"±

NOTE: This system can be applied to concrete that is still wet or hasn't developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure.

**CC. CANAL PIPE CROSSINGS****CC.1 System 90-97 Zinc/Epoxy/Urethane for New Pipe or Pipe Requiring Removal of Existing Coatings**

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

	<u>DFT-Mils</u>
<u>Primer:</u> 90-97 Tneme-Zinc	2.5 – 3.5
<u>2nd Coat:</u> 66-Color Hi-Build Epoxoline	2.0 – 3.0
<u>3rd Coat:</u> 73-Color Endura-Shield	<u>2.0 – 3.0</u>
	6.5 – 9.5
Minimum	8.0 Mils

CC.2 System No. 135-2 High Build, High Gloss Urethane for Marginally Cleaned Surfaces or Topcoating Over Existing Systems

Surface Preparation: High Pressure Water Blast (Min 3500 PSI) or Solvent Clean (SSPC-SP1) and Spot Hand and Power Tool Clean (SSPC-SP2 & 3) or Brush Blast (SSPC-SP7). Existing coatings must be clean, dry, and tightly adhering prior to application of coatings.

	<u>DFT-Mils</u>
<u>Spot Primer:</u> 135 Chembuild	3.0 – 4.0 (Spots)
<u>Tie Coat:</u> 135 Chembuild	3.0 – 4.0
<u>2nd Coat:</u> 73-Color Endura-Shield	<u>2.0 – 3.0</u>
	5.0 – 7.0
Minimum	5.0 Mils

NOTE: A test Patch is always recommended to insure proper adhesion to existing coatings without lifting of existing coatings.

DD. REPAINTING OF METAL BUILDING PANELS**DD.1 Exterior of Metal Building Panels**

Surface Preparation: Pressure clean (3000 PSI) and spot SP2 & 3 Hand and Power Tool Cleaning.

	<u>DFT-Mils</u>
<u>Spot Primer:</u> 135 Chembuild	3.0 – 5.0
<u>1st Coat:</u> 30 Spra-Saf EN	2.0 – 4.0
<u>2nd Coat:</u> 30 Spra-Saf EN	<u>2.0 – 4.0</u>



4.0 – 8.0

Minimum 4.0 Mils

NOTE: Test patch is strongly recommended.**DD.2 Exterior Miscellaneous Metal Trim**

Surface Preparation: Pressure clean (3000 PSI) or solvent clean per SSPC-SP1. Spot SP2 & 3 Hand & Power Tool Cleaning.

DFT-Mils

Spot Primer: 135 Chembuild 2.0 – 4.0

Tie Coat: 135 Chembuild 2.0 – 4.0

Topcoat: 73 Endura-Shield 2.0 – 3.0

Total 4.0 – 7.0

NOTE: Test patch is strongly recommended.

COATING SCHEDULE

SUBSTRATE	SUBSTRATE & SERVICE	SURFACE PREPARATION	COAT [SERIES # (DFT-MILS)]			
			1 st CT	2 nd CT	3 rd CT	4 th CT

END OF SECTION



SECTION 10 14 00 – SIGNAGE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes general specifications for fabricating and installing sign panels and markers, and constructing roadside signs. Section also includes details for solar-powered warning beacon.
- B. Signs and markers must comply with the California MUTCD, California Sign Specifications, and the FHWA publication Standard Highway Signs and Markings. For the California Sign Specifications, go to the Department's Traffic Operations website.
- C. Section includes specifications for constructing roadside signs. Roadside signs include Type N (CA), Type P (CA), and Type R (CA) marker panels.

1.02 DEFINITIONS

- A. background: Dominant sign color.
- B. legend: Letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters that are intended to convey specific meanings on traffic signs.
- C. roadside sign: Traffic sign with 1 or more sign panels attached to a supporting structure consisting of 1 or 2 posts, a signal standard, or a lighting standard.

1.03 SUBMITTALS

- A. Submit a certificate of compliance for:
 - 1. Aluminum sheeting
 - 2. Retroreflective sheeting
 - 3. Screened-process colors
 - 4. Nonreflective, opaque, black film
 - 5. Protective-overlay film
- B. Upon request, submit test samples of sign panels and materials at various stages of production. The samples must be at least 12 by 12 inches and include the background material and legend.
- C. At least 15 days before starting sign fabrication, submit at least 3 copies of your QC plan for sign panels.
- D. The QC plan must include:



1. Contact information for the person responsible for sign QC.
2. Acceptance criteria for incoming raw materials at the fabrication plant.
3. Type, method, and frequency of QC testing at the fabrication plant.
4. Types and brand names of retroreflective sheeting.
5. List of the retroreflective sheeting manufacturer's approved process colors, protective overlay film, and black nonreflective film, including the manufacturer's name and product name for each item.
6. Manufacturer's installation and splicing instructions for the retroreflective sheeting.
7. Manufacturer's instructions for cleaning each product.
8. Method of packaging, transporting, and storing signs.

1.04 QUALITY ASSURANCE

- A. The Department may inspect signs at the fabrication plant or the job site. The Department rejects formed panel signs with holes that are slanted or incorrectly spaced. The Engineer will reject damaged signs, defective signs, and signs with spelling errors before or after installation.
- B. The Department rejects a laminated panel if a 0.010-inch-thick by 1/2-inch-wide feeler gauge can be inserted to a depth of more than 1/2 inch between the extruded aluminum frame and the aluminum sheeting.
- C. If instrumental testing under ASTM D4956 is disputed, the Engineer's visual inspection will determine the color of the retroreflective sheeting, screened process colors, and film.
- D. When delivered to the job site, treated posts must comply with the specified grading requirements and have a moisture content of not more than 25 percent when tested under ASTM D4444 with an authorized moisture meter.

PART 2 – PRODUCTS

2.01 GENERAL

- A. A sign panel must be produced at a fabrication plant.
- B. The sign must be imprinted with the following information:
 1. Phrase Property of the State of California.
 2. Sign fabricator's name.



3. Month and year of fabrication.
 4. Type of retroreflective sheeting.
 5. Sheeting manufacturer's identification and lot number for the retroreflective sheeting.
- C. The sign information must:
1. Be imprinted in 1/4-inch upper-case letters and numerals on the back, lower right of each sign panel such that it will not be blocked by a sign post or mounting frame.
 2. Be imprinted at the fabrication plant by die-stamping on aluminum panels or by an equivalent method for fiberglass-reinforced plastic signs, such as affixing a die-stamped aluminum tag.
 3. Not be painted, screened, inked, or engraved.
 4. Be imprinted such that it does not damage the face of the sign.
- D. For a sign composed of multiple panels, the legend must be placed across joints such that it does not affect the size, shape, spacing, and appearance of the legend on the assembled sign.
- E. For a formed panel sign, the retroreflective sheeting for the background and legend must be wrapped around the interior vertical edges of each panel.
- F. A sign with a protective-overlay film must be marked at the fabrication plant with a 3/8-inch-diameter dot.
- G. The dot must be placed on the lower border of the sign before applying the protective-overlay film. The fabricator determines the application method and exact location of the dot, except that the dot must not be placed on the legend or near bolt holes. The dot must be black if placed on a white border and white if placed on a black border.
- H. The exposed portion of the mounting hardware on the sign face, including rivets used to attach sheeting to framing members, must have a factory- or field-applied finish that closely matches the color of the background and legend of the sign face.
- I. The face of a fabricated sign must be uniform, flat, smooth, and free from defects, scratches, chips, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of sign panels must not have bends, router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over-spray, or aluminum marks.
- J. Protect, transport, and store sign panels fabricated with screened-process colors under the retroreflective sheeting manufacturer's instructions.



- K. Transport sign panels such that the faces of the panels are protected from damage and weather. Ship panels on pallets, in crates, or in tier racks. Ship panels vertically on edge, not stacked horizontally. Place padding and protective materials between the panels as necessary. Keep panels dry during transit.
- L. Do not store sign panels directly on the ground. Keep sign panels dry at all times and store the panels:
 - 1. In a dry environment.
 - 2. On edge vertically, whether indoors or outdoors.
 - 3. In enclosed, climate-controlled trailers or containers in areas of high heat and humidity.
 - 4. Indoors, whenever the panels are stored for more than 30 days.

2.02 ALUMINUM SHEETING

- A. A sign panel must be fabricated from aluminum sheeting of an alloy and temper complying with ASTM B209.
- B. The aluminum sheeting must be pretreated for corrosion resistance as specified in ASTM B449. The surface of the sheeting must be cleaned, deoxidized, and coated with a light, tightly adherent chromate conversion coating free from powdery residue. The conversion coating must be Class 2 with a weight from 10 to 35 mg/sq ft and an average weight of 25 mg/sq ft. After the cleaning and coating process, the aluminum sheeting must be protected from exposure to grease, oils, dust, and contaminants.
- C. The aluminum sheeting must be free from buckles, warps, dents, cockles, burrs, and other defects resulting from fabrication.
- D. The base plate for standard route markers must be die cut.

2.03 RETROREFLECTIVE SHEETING

- A. Retroreflective sheeting used for the background and legend must comply with ASTM D4956 and must be on the Authorized Material List for signing and delineation materials.
- B. Type III, IV, VIII, IX, and XI retroreflective sheeting must have Class 1, 3, or 4 adhesive backing. Type II retroreflective sheeting may have Class 1, 2, 3, or 4 adhesive backing. The adhesive backing must be pressure sensitive and fungus-resistant.
- C. Retroreflective sheeting must be applied to sign panels at the fabrication plant under the retroreflective sheeting manufacturer's instructions without appreciable stretching, tearing, or other damage.



- D. The orientation of the legend must comply with the retroreflective sheeting manufacturer's instructions.
- E. The retroreflective sheeting on a sign panel with a minor dimension of 48 inches or less must be a single, contiguous sheet without splices except for the splices produced during the manufacture of the retroreflective sheeting. A sign panel with a minor dimension greater than 48 inches may have 1 horizontal splice in the retroreflective sheeting, other than the splices produced during the manufacture of the retroreflective sheeting.
- F. Unless the retroreflective sheeting manufacturer's instructions require a different method, splices in the retroreflective sheeting must overlap by at least 1 inch. The retroreflective sheeting on either side of a splice must not exhibit a color difference under incident and reflected light.

2.04 PROCESS COLORS AND FILM

- A. The type of material recommended by the retroreflective sheeting manufacturer must be used for:
 - 1. Screened-process colors.
 - 2. Nonreflective, opaque, black film.
 - 3. Protective-overlay film.
- B. The fabricator must perform all patterns, layouts, and set-ups necessary for the screening process.
- C. The fabricated surface of the applied screened-process color must be flat and smooth.
- D. Colored retroreflective sheeting must be used for the background, except signs with green, red, blue, or brown backgrounds may use reverse-screened-process color on white retroreflective sheeting for the background color.
- E. The coefficient of retroreflection for reverse-screened-process colors used on white retroreflective sheeting must be at least 70 percent of the coefficient of retroreflection specified in ASTM D4956 for the corresponding colored retroreflective sheeting.
- F. The legend must be a black, screened-process color or nonreflective, opaque, black film.
- G. Screened-process colors and nonreflective, opaque, black film must have outdoor weatherability
- H. characteristics equivalent to those specified for retroreflective sheeting in ASTM D4956.



- I. Nonreflective, opaque, black film must be a vinyl or acrylic material.
- J. Cured, screened-process colors must not peel off if transparent cellophane tape with a tensile breaking strength of at least 14 lb/in width measured under ASTM D3759/D3759M is applied over the color and removed in a single, quick motion at a 90-degree angle to the sign's face.

2.05 SINGLE SHEET ALUMINUM PANELS

- A. The aluminum sheeting for framed and unframed panels must be aluminum alloy 6061-T6 or 5052-H38.
- B. A single-sheet aluminum panel must not have a vertical splice in the aluminum sheeting. A panel with a depth greater than 48 inches may have 1 horizontal splice in the sheeting.
- C. For a framed panel, the framing members must be aluminum channel or rectangular aluminum tubing.
- D. The lengths of the framing members must be within $\pm 1/8$ inch of the lengths shown.
- E. Aluminum channels or rectangular aluminum tubing must be welded together using the inert gas-shielded arc welding process and E4043 aluminum-electrode filler wires. The filler diameter must be equal to the wall thickness of the smallest welded channel or tubing.
- F. The aluminum sheeting must be attached to the frame with 3/16-inch-diameter rivets. The rivets must be placed at least 1/2 inch from the web channel edges. The rivets must be made of aluminum alloy 5052 and be anodized or treated with a conversion coating to prevent corrosion.
- G. A fabricated single-sheet, aluminum panel must be within $\pm 1/8$ inch of the dimensions shown. The panel must be flat to within $\pm 1/32$ in/ft of the panel dimensions as measured by a straightedge placed in any direction across the plane of the panel.

2.06 FIBERGLASS-REINFORCED PLASTIC PANELS

- A. A fiberglass-reinforced plastic panel must:
 - 1. Be on the Authorized Material List for signing and delineation materials.
 - 2. Comply with ASTM D3841.
 - 3. Be weather-resistant, Grade II, thermoset polyester laminate.
- B. The plastic must:
 - 1. Be acrylic modified and UV stabilized for outdoor weatherability.



2. Contain additives designed to suppress fire ignition and flame propagation. When tested under ASTM D635, the extent of burning must not exceed 1 inch.
 3. Be stabilized to prevent the release of solvents and monomers. The front and back surfaces of the laminate must be clean and free from contaminants and releasing agents that could interfere with the bonding of the retroreflective sheeting.
- C. The color of the panel must be uniform gray, Munsell color notation N7.5 to N8.5 as specified in ASTM D1535.
- D. The panel must be cut from a single piece of laminate. Mounting bolt holes must be predrilled. Predrilled bolt holes, panel edges, and the front and back surfaces of the panel must be true and smooth. The panel surface must not have visible cracks, pinholes, foreign inclusions, warping, or wrinkles that might affect performance.
- E. The panel must be:
1. At least 0.135 inch thick.
 2. Flat to within $\pm 1/32$ in/ft of the panel dimensions as measured by a straightedge placed in any direction across the plane of the panel.
 3. Within $\pm 1/8$ inch of the dimensions shown.

2.07 LAMINATED PANELS

- A. A laminated panel must have a honeycomb core and an extruded aluminum frame laminated between 2 sheets of aluminum to produce a flat, rigid panel.
- B. The face sheet must be a single contiguous sheet of 0.063-inch-thick aluminum sheeting, alloy 6061-T6 or 5052-H32. The back sheet must be a single, contiguous sheet of 0.040-inch-thick aluminum sheeting, alloy 3003-H14.
- C. The core material must be 0.26 lb/sq ft phenolic-impregnated kraft paper that:
1. Is impregnated with 18 percent phenolic resin.
 2. Has a 1/2-inch honeycomb cell size.
 3. Is fungus resistant under MIL-STD-401B.
- D. The adhesive used to laminate the face and back sheets to the honeycomb core and extruded aluminum frame must produce a bond that is strong, permanent, and resistant to oil and water.
- E. The panel must withstand a wind load of 33 lb/sq ft with a bending safety factor of 1.25 when tested for the simple span lengths shown in the following table:



Panel Type	Nominal Panel Thickness	Simple Span Length
A	1 inch	9'-0"
B	1 inch	9'-0"
	2-1/2 inches	14'-6"
H	2-1/2 inches	14'-6"

- F. The tensile strength of the panel must be at least 40 lb/sq in when tested under ASTM C297 and C481, Cycle B, after aging. Instead of spraying with hot water, the specimen must be immersed in water at 160 degrees F.
- G. An individual laminated panel must not exceed 24 feet in length and 5 feet in depth. An individual panel must be fabricated as a single unit without horizontal and vertical joints, splices, or seams.
- H. Use 2 panels for signs exceeding 5 feet in depth. You may use 3 panels to avoid placing the legend over a horizontal joint if authorized.
- I. Welds are not required on the side of the framing members where the face and back sheets will be placed.
- J. After lamination, 3/16-inch-diameter rivets must be placed at each corner of the perimeter frame through the face and back sheets. The rivets must be made of aluminum alloy 5052 and be anodized or treated with a conversion coating.
- K. Sealant must be placed at the corners of the perimeter frame to prevent water intrusion.
- L. The face of a fabricated panel must be flat to within $\pm 3/32$ in/ft of the panel dimensions as measured by a straightedge placed in any direction across the plane of the panel. Wherever the panels adjoin, the gap between the adjoining edges must not deviate by more than 1/32 inch from a straightedge placed from corner to corner. Nonadjoining edges must not deviate by more than 1/8 inch from a straightedge placed from corner to corner. The face and back sheets must be flush with the perimeter frame. All panel edges must be smooth.
- M. A panel must be from $-1/2$ to $+1/8$ inch of the dimensions shown. The difference in the length between adjoining panels of multiple-panel signs must not be greater than 1/2 inch.

2.08 ROADSIDE LAMINATED PANELS

- A. A laminated panel for a roadside sign must be Type B or Type H.
- B. For a Type B panel:
 - 1. Channel edges must be welded together to form the perimeter frame.



2. Vertical tube spacers must be welded to the frame.
- C. For a Type H panel:
1. Channel edges must be screwed to the tube channel edges with self-tapping hex head stainless steel screws to form the perimeter frame.
 2. Centerline panel tube must be welded to the perimeter frame along the horizontal centerline of the panel. The centerline panel tube must be a single, contiguous extrusion without joints.
 3. Vertical tube spacers must be welded to the perimeter frame and to the centerline panel tube.

2.09 OVERHEAD LAMINATED PANELS

- A. A laminated panel for an overhead sign must be Type A.
- B. An individual panel must not exceed 24 feet in length or 5 feet in depth.
- C. If a panel length is not shown for a sign exceeding 24 feet in length, the Engineer determines the length.
- D. The channel edges must be screwed to the modified H sections with self-tapping hex head stainless steel screws to form the perimeter frame.
- E. Aluminum mounting clamps for A-1 hardware must be cast aluminum alloy with a tensile strength of at least 25 kips/sq in. The installed bolt torque must not exceed 100 in-lb.

2.10 FORMED PANELS

- A. A formed panel must be fabricated from a single, contiguous sheet of 0.063-inch-thick aluminum sheeting, alloy 5052-H32.
- B. Aluminum sheeting must be attached to struts with 3/16-inch-diameter anodized aluminum rivets. The rivets must be placed through the sign face at the spacing shown after applying the background material and legend.
- C. The formed edges must be square. The drilled mounting holes must be straight and perpendicular to the front and back surfaces of the formed edges.
- D. A fabricated formed-panel sign must be within $\pm 1/16$ inch of the dimensions shown and flat to within $\pm 1/8$ in/ft of the panel dimensions in any direction as measured by a straightedge placed in any direction across the plane of the panel.

2.11 METAL POSTS

- A. A mounting for a roadside sign to be installed on a barrier or railing must be fabricated from (1) welded or seamless steel pipe complying with ASTM



A53/A53M, Grade B, and (2) structural steel complying with ASTM A36/A36M.

- B. After fabrication, all metal parts for mounting a roadside sign must be galvanized.

2.12 SIGN PANEL FASTENING AND MOUNTING HARDWARE

- A. Frame assemblies for multiple sign installations must be fabricated from an aluminum alloy or structural steel complying with ASTM A36/A36M. Frames fabricated from structural steel must be hot-dip galvanized after fabrication.
- B. Back braces for a sign must be made of commercial-quality, mild steel and hot-dip galvanized after fabrication.
- C. Straps and saddle brackets for mounting sign panels on lighting standards, sign structure posts, and traffic signal standards must be stainless steel complying with ASTM A167, Type 302B. Theft-proof bolts must be stainless steel with a chromium content of at least 17 percent and a nickel content of at least 8 percent.
- D. Bolts, except theft-proof bolts, lag screws, metal washers, and nuts must be made of commercial-quality steel and hot-dip galvanized after fabrication. Fiber washers must be commercial quality.

2.13 SOLAR-POWERED WARNING BEACON

- A. Solar Powered Warning Beacon acceptable manufacturer: Carmanah, located at 250 Bay Street; Victoria BC, Canada, V9A 3K5; Tel: +1-844-412-8395; Web contact link: <https://carmanah.com/contact/>
1. Substitutions: Substitutions are allowed so long as all other requirements of the specification are met by the substitute bidder and approved by the Contracting Officer.
- B. Mechanical and Electrical
- C. Lights shall be of beacon type or shall repeatedly flash when activated.
- D. Lights shall be activated via sensor
- E. Solar panels and power box compatible with the beacon light shall be provided by manufacturer.
1. Solar panels and power box shall provide the required voltage and current to operate the light.
- F. Mounting pole shall be provided by manufacturer for mounting light, solar equipment, warning sign, and necessary signal connections.



PART 3 – EXECUTION

3.01 GENERAL

- A. Deliver sign panels to the job site with the background and legend permanently affixed to the panels.
- B. Do not chip or bend sign panels.
- C. Immediately replace sign panels exhibiting damage or flaws, including a significant color difference between daytime and nighttime.
- D. Obtain authorization before repairing sign panels at the job site.
- E. Use the following hardware to mount the type of sign panel shown:
 - 1. Lag screws, nuts, bolts, and washers for roadside signs.
 - 2. Braces and wood block spacers for roadside signs.
 - 3. Type A-1 and Type A-2 mounting hardware for overhead laminated-panel signs.
 - 4. Type A-3 mounting hardware for overhead formed-panel signs.
- F. The line between the center of the top of a post and the center of the post at ground level must not deviate from a plumb line by more than 0.02 foot in 10 feet.
- G. Backfill the space around metal posts with minor concrete that contains at least 470 pounds of cementitious material per cubic yard.

3.02 LAMINATED PANELS

- A. For laminated multiple-panel signs, place an H-section closure extrusion in the top channel of the lower panel before mounting the upper panel. When mounted, the bottom channel of the adjoining upper panel must fit together to enclose the H-section closure extrusion for the full length of the panel without gaps.

3.03 SIGN PANEL INSTALLATION

- A. Install lag screws by turning the lag screw into pilot holes using a wrench. Bore the pilot holes with a bit diameter equal to the root diameter of the lag screw thread.

END OF SECTION



SECTION 22 13 33 – PACKAGED STORMWATER LIFT STATIONS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work included under this Section consists of furnishing and installing packaged lift station systems to include precast vaults, submersible pumps, motors, control systems, and related equipment for the three new stormwater lift stations, fully tested, complete, and in operating condition as indicated on the drawings and/or specified herein.
- B. Equipment furnished and installed under this Section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformance with detail drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, as approved by the County.
- C. Related Work Described Elsewhere:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 03 40 00 – Precast Concrete
 - 3. Section 05 50 00 – Miscellaneous Metals
 - 4. Section 09 90 00 - Painting and Coating
 - 5. Section 33 40 00 – Stormwater Utilities

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials – AASHTO
 - 1. HS 20-44 – Bridge Loading Design
- B. American Concrete Institute – ACI
 - 1. 318/318R – Building Code Requirements for Structural Concrete
- C. American National Standards Institute – ANSI
- D. American Society of Mechanical Engineers – ASME
 - 1. A 112.3.1 – Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above and Below Ground
- E. American Society for Testing and Materials – ASTM
 - 1. C 478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections



2. C 890 – Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
 3. C 891 – Standard Practice for Installation of Underground Precast Concrete Utility Structures
 4. C 913 – Standard Specification for Precast Concrete Water and Wastewater Structures
 5. C 923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
 6. C 990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
 7. C 1802 – Standard Specification for Design, Testing, Manufacture, Selection, and Installation of Horizontal Fabricated Metal Access Hatches for Utility, Water, and Wastewater Structures
 8. C 1821 – Standard Practice for Installation of Underground Circular Precast Concrete Manhole Structures
- F. American Water Works Association – AWWA
1. C 110/ A21.10 – Ductile-Iron and Gray-Iron Fittings
 2. C 111/ A21.11 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 3. C 151/ A21.51 – Ductile-Iron Pipe, Centrifugally Cast
 4. C 153/ A21.53 – Ductile-Iron Compact Fittings
- G. National Electrical Manufacturers Association – NEMA
- H. National Fire Protection Association – NFPA
1. 70 – National Electric Code (NEC)

1.03 QUALITY ASSURANCE

- A. Precast Manufacturer Qualifications: NPCA-certified plant with experience and demonstrated capability to produce work specified in this Section.
- B. Unit Responsibility: The pumps, motors, control panels, frames and covers, discharge elbows, and pump guide rail systems shall be supplied by the pump supplier to insure unit compatibility.
- C. Factory Tests: The pump manufacturer shall perform the following tests on each pump before shipment from the factory:



1. Megger the pump for insulation breaks or moisture.
 2. Prior to submergence, the pump shall be momentarily energized dry and be checked for correct rotation.
 3. Pump shall be run for a minimum of 30 minutes in a submerged condition.
 4. Pump shall be removed from test tank, meggered immediately for moisture; oil plug removed for checking lower seal; inspection plug removed for checking of upper seal and possible water intrusion of stator housing.
 5. A written certified test report giving the above information shall be supplied with each pump at the time of shipment.
 6. All end-of-pump cables will then be fitted with a rubber shrink-fit boot to protect the cable prior to electrical installation.
- D. Guaranteed Parts Stock Program: The pump supplier shall have a Guaranteed Parts Stock Program in the State of California. In lieu of a Guaranteed Parts Stock Program, the pump supplier shall provide one set of spare parts for each type and size of pump supplied. These parts shall include at least one (1) set of spare parts as detailed below for each different model of pump supplied on this Contract.
1. Upper Mechanical Seal
 2. Lower Mechanical Seal
 3. Wear Rings
 4. Motor Cable
 5. Cable Entry Washer/Grommet
 6. Complete Set of "O" Rings
 7. Inspection Plug Washers
 8. Impeller Bolt
 9. Impeller Key
 10. Upper Bearing
 11. Lower Bearing

1.04 SUBMITTALS

- A. Shop Drawings and Manufacturer's Literature: For all pumps to be furnished under this Section, the Contractor shall submit shop drawings, including at least



the following, to the County for approval in accordance with the provisions of Section 01 33 00:

1. Manufacturer's literature and illustrations for the pumps, motors, control panels, valves, and appurtenances.
 2. Manufacturer's catalog curves showing pump characteristics of head, discharge, brake horsepower, and efficiency.
 3. Shop drawings including:
 - a. Details of pump and motor assembly, installation layouts and procedures, types of materials used in pump construction.
 - b. Details of all pump and motor accessories with dimensions of major components.
 - c. Layout drawings shall show exact installation, piping, guide rail system, valves, wiring, piping supports and hangers, and foundation details for the pumping units being submitted.
 - d. Placement and manufacturer cut sheets for equipment and personnel access hatch covers, access ladders, access ladder extensions, and drainage.
 - e. Electrical schematic diagrams, control diagrams, and control panel layout and installation drawings.
- B. Operating and Maintenance Instructions: The Contractor shall submit operation and maintenance manuals for the equipment covered by this section.
1. Prepared specifically for the model and type of pump and motors furnished and shall not refer to other models and types of similar equipment.
 2. Include the following, at minimum:
 - a. Equipment function.
 - b. Description
 - c. Normal and limiting operating characteristics.
 - d. Installation instructions (assembly, alignment, and adjustment procedures).
 - e. Operation instructions (normal startup and shutdown procedures, normal operating conditions, and emergency situations).
 - f. Lubrication and maintenance instructions, including a list of at



least three (3) acceptable lubricants in each case.

- g. Troubleshooting guide.
- h. Parts lists with catalog numbers and predicted life of parts subject to wear, and normal delivery times of such parts.
- i. Drawings - cross-sectional view, assembly, and wiring diagrams.
- j. Performance curves from identical units.

C. Factory Representative:

- 1. A factory representative of all major component manufacturers, who has complete knowledge of proper operation and maintenance, shall be provided for one (1) 8-hour day to instruct representatives of the County on proper operation and maintenance.
 - a. County may allow this work to be conducted in conjunction with the inspection of the installation and field acceptance testing as provided under PART 3 of this section.
 - b. If there are difficulties in the operation of the equipment due to the manufacturer's design or fabrication, additional services shall be provided at no additional cost to the County.

D. Certifications: Contractor shall furnish the County with a written certification signed by the manufacturer's representative that the equipment has been properly installed and lubricated, is in accurate alignment, is free from undue stress imposed by piping or mounting bolts, and has been operated under full load conditions, and that satisfactory operation has been obtained.

E. Pre-Cast Concrete Vaults: Contractor is to submit structural calculations, drawings, and details for pre-cast concrete vaults. The entire submittal is to be stamped and signed by a registered engineer in the State of California.

F. Piping Supports and Hangers: Contractor is to submit calculations, drawings, and manufacturer cut sheets for the piping supports and hangers. The calculations are to be stamped and signed by a Professional Engineer licensed in the State of California.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver a complete system ready to install as job progress requires.
- B. Store in a weather-tight building or suitable covering to protect against damage of any nature.
- C. Handle during delivery, storage, and installation in a manner to prevent damage of any nature.



1.06 PUMP WARRANTY

- A. The Pump Manufacturer shall warrant the pumps being supplied to the County against defects in workmanship and materials for a period of five (5) years under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements. In addition, the Manufacturer shall replace certain parts that shall become defective through normal use and wear on a progressive schedule of cost for a period of five (5) years; parts included are the mechanical seal, impeller, pump housing, wear rings, and ball bearings. The warranty shall be in published form and apply to all similar units.
- B. The Pump Manufacturer shall also provide factory-authorized service and parts stock within the State of California or within a 12-hour delivery radius of the installation. The factory-authorized service center's location and the telephone number shall be indicated in the shop drawing submittal and the operation and maintenance manuals.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Fasteners, metal brackets, and other metal components within the wet-well shall be Type 304 stainless steel.
- B. Pump Motor Housings shall be Type 304 stainless steel.
- C. Pump Impeller shall be stainless steel.
- D. Pump casing shall be powder-coated ductile iron.
- E. Ductile-Iron Pipe shall meet AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless flanged ends are indicated. Provide flanged ends within the well and the vault.
- F. Ductile-Iron Fittings shall meet AWWA C110/A21.10, mechanical-joint, ductile-iron or gray-iron standard pattern, or AWWA C153/A21.53, ductile-iron compact pattern.
- G. Glands, Gaskets, and Bolts shall meet AWWA C111/A21.11, ductile-iron or gray-iron glands, rubber gaskets, and steel bolts.
- H. Stainless-Steel Pipe and Fittings shall meet ASME A112.3.1, with socket and spigot end within the submersed portion of the well where indicated on approved Shop Drawings.
- I. Check Valves shall be flanged-swing or ball check valves suitable for use in raw wastewater and equipped with the following:
 - 1. Ball Check Valves shall have a polyurethane ball



- 2. Swing-Type Check Valves shall be lever and spring with a backflow actuator.
- J. Isolation Valves shall be flanged eccentric plug valves.
- K. Air-Vacuum/Air-Release Combination Valves shall be as specified by the pump Manufacturer.
- L. All electrical systems and components (regarding pump motors, cables, and level control system), included as part of the pumping system, shall comply with the National Electric Code Requirements.

2.02 PRECAST STORMWATER SUMP VAULTS

- A. Precast Stormwater Sump Vault: site-assembled, watertight precast concrete wet-well and valve vault, sized as shown on drawings and designed to accommodate all controls, pumps, valves, internal piping, conduit, junction boxes, and access ladder.
- B. Precast Concrete Structures:
 - 1. General Requirements:
 - a. Size as indicated on the drawings, with provision for sealant at joints, meeting ASTM C 913, and designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy traffic, structural loading.
 - b. Reference the Structural Design Criteria and the Geotechnical Design Criteria notes on the drawings for all forces and soil parameters to be used in the structural design of the pre-cast structures.
 - c. Design is to include, but not be limited to:
 - 1) Foundations
 - 2) Walls
 - 3) Top lids with traffic-rated hatches
 - 2. Round Precast Concrete Wells:
 - a. Precast, reinforced concrete in accordance with ASTM C 478.
 - b. Joint Sealant: Bitumen or butyl rubber in accordance with ASTM C 990.
 - c. Flexible Resilient Pipe Connectors: Shall meet ASTM C 923.
 - 3. Precast Concrete Vaults:



- a. Precast, reinforced concrete in accordance with ASTM C 890.
 - b. Resilient Pipe Connectors: Cast or fitted into manhole walls, for each pipe connection in accordance with ASTM C 923.
 - 4. Joint Sealant:
 - a. Bitumen or butyl rubber meeting ASTM C 990.
 - 5. Well and Vault Bituminous Waterproofing:
 - a. Carboline 300M, Xypex, or comparable product acceptable to County.
- C. Precast Concrete Materials and Mix Design:
 - 1. General:
 - a. Precast concrete according to ACI 318/318R.
 - 2. Concrete Mix Design:
 - a. 4,000 psi minimum, with 0.45 maximum water-to-cementitious materials ratio.
- D. Access Doors and Frames:
 - 1. Double-leaf opening with aluminum angle frame hatch with diamond plate, lift assist, bituminous paint, flush lifting handle, 316 stainless steel fasteners, and hold-open arm. When the vault lid is at finish grade level, the double-leaf hatch shall be designed for HS20 traffic loading.
 - 2. Fabricated access hatches, doors, grates, and covers required for equipment or maintenance access into Precast Concrete Vaults shall be designed and fabricated in accordance with ASTM C1802 for the applicable Load Level shown on drawings or specified herein.
 - 3. Fabricated access covers shall be manufactured using aluminum, or steel with slip-resistant material and torsion-assisted assemblies.
- E. Safety Accessories:
 - 1. Access doors shall be equipment with safety chains that protect personnel from fall hazard created by opening the access hatch.

2.03 FABRICATION

- A. Precast Concrete Structures:
 - 1. Precast Wells: ASTM C 478



2. Precast Vaults: ASTM C 890
3. Fabricate structures with continuous joints to provide watertight construction.
4. Prepare valve and meter vaults with factory-installed piping, valves, sleeves, and other required devices.

2.04 EQUIPMENT

A. Pumps:

1. The Contractor shall furnish and install a total of six (6) motor-driven, fully submersible sewerage pumps to meet the general requirements specified in Table 22 13 33-A.
2. Pump Design:
 - a. The design shall be such that pumping units will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts, or other fastening to be removed for this purpose, and no need for personnel to enter the pump well. Each pump shall be fitted with a stainless-steel wire rope of adequate strength and length to permit raising the pump for removal and inspection.
3. Pump Construction:
 - a. The stator casing, oil casing and impeller shall be of stainless-steel construction.
 - b. A wear ring system designed for abrasion resistance shall be installed at the inlet of the pump to provide protection against wear to the impeller.
 - c. The impeller shall be of a single vane, non-clog design capable of passing 3-inch diameter solids, fibrous material, and heavy sludge and constructed with long throughway with no acute turns.
 - d. Each pump shall be provided with a tandem double mechanical seal running in an oil reservoir, composed of one (1) upper and one (1) lower lapped-face seal.
 - 1) Each lapped-face seal shall be comprised of one (1) stationary and (1) rotating tungsten-carbide ring with each pair held in contact by separate springs.
 - 2) The seals shall require neither maintenance nor adjustment and shall be easily replaceable.



- 3) Conventional double mechanical seals with a single or double spring between the rotating faces, requiring constant differential pressure to effect sealing and subject to opening and penetration by pumping forces shall not be considered equal to the tandem seal specified and required.
- e. A sliding guide bracket shall be an integral part of the pumping unit, and the pump casing shall be machined connecting flange to connect with the ductile-iron discharge connection, which shall be bolted to the floor of the pump chamber and so designed as to receive the pump connecting flange without the need of any bolts or nuts.
- f. Sealing of the pumping unit to the discharge connection shall be accomplished by a metal-to-metal contact utilizing a simple linear downward motion of the pump with the entire weight of the pumping unit guided by no less than two (2) stainless steel guide bars; no portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing.
4. Pump Motor:
 - a. The pump motor shall be housed in an air-filled, watertight casing and shall have Class F insulated windings, which shall be moisture resistant.
 - b. The motor shall be provided with a flooded-case sensor, over-temperature sensors set for 125°C, and shall be NEMA Design B.
 - c. Pump motors shall have cooling characteristics suitable to permit continuous operation, in a fully-, partially-, or non-submerged condition and be capable of running continuously in a totally dry condition.
 - d. Pump motors shall be capable of sequential starts as required by the sizing of the sump vault shown on the plans and otherwise specified.
 - e. The cable entrance seal shall be provided by a compression fitting. Cable junction box and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor from any ingress of water or solids through pump top.
 - f. The pump shall not load the motor beyond its nominal (nameplate) rating at any point on the pump curve.
5. Cable:



- a. Pump motor cable shall be suitable for submersible pump applications and the rating shall be permanently embossed on the cable.
- b. Cable sizing shall conform to NEC requirements for the full-load current of the pump motors.

TABLE 22 13 33-A
SUBMERSIBLE PUMP SCHEDULE

Pump Station	Cogeneration Plant Storm Drain Lift Station	Interior Drainage Lift Station	Exterior Drainage Lift Station
No. of Pumps Required	1	2	3
Pump Size, Inches	12-inch	18-inch	18-inch
Vault Outlet Pipe Size, Inches	8	18	18
Maximum Pump Operating Point, Discharge @ TDH Min. Hydraulic Efficiency	1250 GPM @ 12 ft 60%	6100 GPM @ 20.8 ft 45%	6100 GPM @ 20.4 ft 45%
Average Pump Operating Point Min. Hydraulic Efficiency	-- --	5900 GPM @ 23.1 ft 50%	6000 GPM @ 22.9 ft 50%
Minimum Pump Operating Point Min. Hydraulic Efficiency	-- --	5700 GPM @ 26.4 ft 55%	5700 GPM @ 26.3 ft 55%
Max. Motor Size, HP	10	75	75
Voltage, V	480	480	480
Phase	3	3	3
Frequency, Hz.	60	60	60

2.05 STORMWATER LIFT STATION CONTROL PANEL

A. General

1. A lift station control panel shall be provided for each pumping station. The control panel shall respond to a Level Control System and automatically start and stop the pump station as well as sound an alarm and energize an alarm light upon high wet-well levels or a pump fault. For the duplex and triplex pump stations, control panel shall automatically alternate the lead pump.
2. The pump control panel shall be the standard system of the manufacturer as modified for this application. The wet-well levels to be used in operation are as shown on the drawings.



B. Operation Requirements

1. The control panel shall include a main circuit breaker; 15-ampere, 120-volt circuit breakers shall also be provided as required.
2. All pump control operations shall be accomplished by a hydrostatic pressure transducer and multi-level float control system with all control components mounted in one common enclosure.
3. Control switches shall provide means to independently operate each pump manually or automatically.
4. For Duplex and Triplex Lift Stations: When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the “lead” and “lag” pumps after each pumping cycle.
5. The control panel will be provided with BACnet communication to BMS system to read all data and status from pump station. BMS system will also provide an enable bit to operate pump for protecting generator.
6. Solid-state reduced voltage starter will be installed in MCC and hardwired control from control panel to MCC, Control signals are start/stop command, run feedback, and motor overload trip.

C. Level Control System

1. General
 - a. The lift station pumps shall be automatically controlled by use of 4-20 mA hydrostatic pressure transducer mounted to the bottom of the wet well and two (2), 125 VAC, independent, mercury-free, float switches with an adjustable mounting position suspended on a 316 stainless steel float chain.
 - b. Hydrostatic pressure transducer and float switches shall be IP 68 rated, with minimum of 100 feet of integrated, submersible cable.
2. Control Panel
 - a. Indication
 - 1) LEDs/HMI shall be provided for the purpose of indication.
 - 2) A red bar graph shall be provided to indicate level.
 - 3) A separate LED shall be provided for each of the following functions per pump.



- a) Pump running (green)
- b) Pump set to manual mode (green)
- c) Pump set to the off mode (red)
- d) Pump set to the automatic mode (green)
- e) Pump available (green)
- f) Fault (red)
- g) Critical Fault (red)
- h) Delay fail fault (red)
- i) Seal fault (red)
- j) Program Switch set to "ON" (red)
- k) Alternation selected (red)
- l) Three (3) sequence LEDs shall be provided to indicate pump sequence (red)
- m) Miscellaneous LEDs shall be provided for the purpose of programming the unit (red)
- 4) Two (2) LED/HMI shall be provided for each lift station for following level alarms.
 - a) High Sump Water Level (red)
 - b) Low Sump Water Level (red)
- 5) Each lift station shall be provided water level display on HMI. Display shall be single row output with a character height of 1/2-inch.
 - a) Display shall have adjustable contrast and on-demand backlighting.
 - b) Current water level in the sump shall be displayed in two-digit feet (XX) and two-digit inches (YY) above the invert of the wet-well sump as XX – YY

b. Level Sensing

- 1) The unit shall be capable of accepting a 4-20mA analog pressure signal from the hydrostatic pressure transducer and two (2), discrete 125 VAC inputs from two (2)



independent, float switches.

- 2) The unit shall have motor sensor inputs and indicate any irregular inputs.
- 3) In the event of erratic input from the 4-20 mA analog pressure signal, the unit shall engage a programmable timer relay to initiate the next pump in sequence, until either all pumps in given lift station are running or sump level alarms are triggered.

c. Pump Alternating

- 1) The unit shall be able to lead select or automatically alternate some or all of the pumps. Next pump to start will be indicated.

d. Programming

- 1) The pump activation and deactivation points shall be selectable from the switchboard touch screen keypad.
- 2) Pump Alternating: The unit shall be able to lead select or automatically alternate some or all of the pumps.
- 3) Fail-safe Manual Override: When manual pump operation, the unit will automatically return the mode from manual to auto once the normal input-out level is reached. Ability to temporarily override this function will be provided.
- 4) Temporary Reset of Level Alarms: The unit shall be capable of temporarily disabling level alarm outputs.
- 5) Maximum Pump Starts: The device shall be capable of limiting the number of starts per hour for each pump to a settable level.
- 6) Random duty start level: The start delay for the pumps shall be capable of being randomly set over a selectable range of delays.
- 7) Security: Two levels of access will be provided to the front keypad.
- 8) Maximum Number of Pumps: Maximum number of pumps to run simultaneously shall be selectable.
- 9) Pump Disable: The unit shall have the ability to totally de-commission the third pump by deactivating the controls and indication, if required.



- 10) Time delays will prevent two pumps from operating together unnecessarily.
- 11) Peak management: The unit shall be able to store two independent sets of level set points for all pump and alarms, which can be selected via a simple, digital, input enclosure.

e. Time Delays

- 1) Time delays for pump and alarm activation and deactivation should be available. These time delays will be selectable from the front keypad for the activation and deactivation of level set points.
- 2) Inter-pump Delay: The inter-pump delay shall be provided to allow selection of a delay to prevent any pump changing status within a certain period of another pump starting or stopping (except in the case of a fault).
- 3) Minimum pump-off time: The unit shall be capable preventing a pump from automatically turning on should a selectable minimum time off for that pump has not been reached.
- 4) Maximum pump on time: The unit shall be capable of turning any pump off and force a cycle if a pre-selected maximum on-time be reached.

f. Miscellaneous

- 1) Power Supply. The unit shall be powered by 110 VAC, 10-30 VDC, simultaneously.
- 2) DC Supply. In this mode, the unit should monitor main supply using an external relay, so that safety delays are maintained during power restoration.
- 3) Transient Protection. The unit shall have built-in transient protection.
- 4) Removable Terminals. The controller shall have plug-in terminals to simplify exchange.
- 5) Fail-safe Manual Override. When manual pump operation, the unit will automatically return the mode from manual to auto once the normal pump cut-out level is reached. Ability to temporarily override this function will be provided.
- 6) Commissioning. On commissioning, the water level should



be capable of being simulated on the keypad in order that proper system operation can be verified.

D. CONSTRUCTION

1. The electrical control equipment shall be mounted within a NEMA Type 4X dead front enclosure, constructed of not less than 14-gauge Type 304 stainless steel. The enclosure shall be equipped with a door and shall incorporate a removable back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Enclosure shall be equipped with a stainless steel drip lip and 3 point latch. The enclosure shall be a free-standing, double-door design utilizing 12" legs.

E. COMPONENTS

1. A motor branch circuit breakers and solid-state reduced voltage starter shall be furnished for single pump lift station motor. All motor starters shall include motor thermal overload and phase loss protection. All other duplex/triplex pump lift station motor starter will be in MCC
2. A duplex, 15 amp, GFI utility receptacle providing 120 volts, 60 hertz, single phase power shall be mounted inside of the enclosure.

F. OPERATING CONTROLS AND INSTRUMENTS

1. All operating controls and instruments shall be securely mounted on the control compartment door. All controls and instruments shall be clearly labeled to indicate function.
2. A six digit, non-reset elapsed time meter shall be connected to each motor starter to indicate the total running time of each pump in "hours" and "tenth of hours".
3. Control terminal blocks shall be of the screw clamp type, rated 600 volts.
4. Phase monitors: 480 volt, 3-phase stations shall be equipped with a surface mount unit with two (2) form "C" contacts, 10 amp rated, as manufactured by Diversified Electronics.
5. Control wire shall be minimum 18 AWG, U.L. #1015. All control wire shall be routed through plastic wireway with snap on covers and be neatly bundled and tie wrapped to form a neat assembly.
6. Engraved nameplates shall be supplied for marking all components. The labels shall be attached with a 5-mil thick, 3 M type adhesive. No foam tape will be acceptable. The labels shall be uniform in size with 3" minimum letter size.
7. A generator receptacle shall not be required on the control panel since a



standby generator will be located on-site.

8. The panel shall contain a remote alarm terminal strip to monitor high liquid level, pump 1 run, pump 2 run, pump 3 run
9. The control panel shall be equipped with a high-level alarm system consisting of a weatherproof red lexan light and alarm bell. Upon high-level activation, the light will flash, and the bell will sound. The control panel will be equipped with an external alarm silence button to silence the audible alarm; however, the light will remain on until the high-level condition clears.

2.06 ACCESSORIES

A. Pump Access Frame and Guides:

1. The access frames, complete with hinged and hasp-equipped covers where required, stainless steel upper guide holders, and level sensor cable holder, shall be furnished and installed. The frames shall have a safety locking handle for locking in the open position. The covers shall be of checkered plate and designed for 300 lbs./sq. ft. loading.
2. Lower guide holders shall be integral with discharge connection; guide bars shall be Schedule 40 welded Type 304 stainless steel pipe of the size recommended by the pump manufacturer.
3. All material used to fabricate the cover, frame, upper guide holder and cable holder shall be aluminum or stainless steel. All bolts, anchors, hinge pins and other fasteners shall be stainless steel.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All materials and equipment shall be installed as shown on the Drawings and as recommended by the manufacturer.
- B. Additional items of construction, such as wet-well, valve vaults, flanged adapters, thrust blocks, and other items necessary for the complete installation of the system shall conform to specific details on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these Specifications.
- C. Precast concrete structure sections with sealants per ASTM C 891 and ASTM C 1821.

3.02 INSPECTION AND TESTING

- A. Factory Tests: The pump manufacturer shall perform the following tests on each pump prior to shipment. Tests shall be at rated speeds, capacities, heads,



efficiencies, brake horsepower, and such other conditions of head and capacity to establish performance curves.

1. Megger the pump motor and cable for insulation breaks or moisture intrusion.
2. Prior to submergence, run pump dry and check for correct rotation.
3. Pump shall be run continuously for thirty (30) minutes in a submerged condition, with a minimum submergence of ten feet.
4. Pump shall be removed from test tank, meggered immediately for moisture; oil plugs removed for checking lower seal; inspection plug removed for checking upper seal and possible water intrusion of stator housing.

B. Start-up and Demonstration Testing:

1. Materials and equipment shall be tested or inspected as required by the County, and the cost of such work shall be included in the cost of the equipment. Start-up and demonstration testing shall be in accordance the following.
2. Furnish the services of a factory representative for one (1) day who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment.
3. The duties of the factory service representative shall be as follows: After the equipment has been installed but before it is operated by others, the representative shall inspect the completed installation for soundness (no damaged or cracked components), completeness, correctness of setting and alignment, that the pumps are free from stresses imposed by attached piping, and for the adequacy of correctness of packing, sealing, and lubricants. The service representative shall start up the equipment and instruct the County's personnel in proper operation and maintenance procedures. The responsibility of the Contractor with regard to start-up shall be fulfilled when the start-up is complete, the equipment is functioning properly and has been accepted by the County.
4. Field tests shall not be conducted until the entire installation is complete and ready for testing.
5. The Contractor shall submit to the County six (6) copies of a certified report from the factory service representative of the results of the representative's inspections, adjustments, testing, and start-up. The report shall include descriptions of the inspection, adjustments made, and the start-up. The report shall also include a statement that the equipment is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void. Final payment shall not



be made to the Contractor until this report has been submitted to and approved by the County.

6. Pre-final Inspection: Prior to final inspection, the Contractor shall conduct a preliminary pump performance test and pre-final site inspection in the presence of the County or authorized representative. Any deficiencies noted at this time shall be corrected prior to scheduling of the final inspection.
7. Final Inspection: After all pumps have been completely installed and are working under the direction of the manufacturer, the Contractor shall be responsible for conducting the following field acceptance tests and start-up procedures in the presence of the County or authorized representative. The Contractor shall notify the County and the pump manufacturer's representative forty-eight (48) hours prior to start-up. The Contractor shall furnish all labor, piping, equipment, oil, grease, power, water, and materials required to perform the acceptance testing. Field tests shall be performed for all pumps furnished under this Section.

C. Pump Field Testing:

1. Upon completion of all the mechanical work, the Contractor shall conduct testing as specified herein to demonstrate that the equipment performs in accordance with all specifications.
2. The Contractor shall perform initial testing of the equipment to ensure himself that the tests listed in the Demonstration Test paragraph below can be completed.
3. Pump Performance: Prior to acceptance as part of the final inspection, the Contractor shall conduct a field pump performance test. Pumps shall operate according to the operating conditions herein before specified without excessive vibration or overheating. Testing shall be performed using clean water. The Contractor shall utilize County-supplied water to perform the required testing. Pumping rates shall be determined by pumping a calculated volume of water in a specified time interval. Discharge pressure and flow conditions shall be measured and recorded. Water levels during testing shall fall within the pump control levels shown on the Drawings. Amperage draws shall be monitored to determine the effectiveness and efficiency of equipment. The test shall be repeated until satisfactory results are obtained. The test results shall be recorded on the Pump Test Report form included herein.
4. Demonstration Test: If the Contractor is unable to demonstrate to the County that the pumping units perform satisfactorily, the unit shall be rejected. The Contractor shall then remove and replace the defective unit(s) at his own expense. The Contractor shall conduct further tests until written certification is received from the County.



- a. Pumps: Pumps shall deliver the specified discharge pressures and flows at the rated efficiencies specified.
 - b. Motors: Running amperage shall be noted and recorded on each leg of power cord while pump is operating under full load.
 - c. All self-test trip relays shall demonstrate ability to simulate a fault condition. Level control system shall simulate various liquid levels and signal appropriate relays in pump logic controller to perform appropriate call functions as displayed by LED status indicators. All test results shall be recorded on Pump Test Report form, and six (6) copies of the test report for each pump shall be submitted to the County.
 - d. Pumps, when tested, shall operate within 5 percent of the approved, certified head capacity curve.
 - e. Following performance testing, pumps shall be meggered for pump-moisture intrusion.
- D. Operation and Maintenance Procedures: After the equipment has been placed into operation, and all start-up and demonstration testing is complete, the qualified service representative of the pump system supplier shall instruct the County's personnel in the proper operation and maintenance procedures.
- E. The Contractor's attention is directed to the fact that the start-up and demonstration services specified represent an absolute minimum acceptable level of service and are not intended to limit the responsibilities of the Contractor to comply with all requirements of the Contract Documents. The Contractor shall procure, at no additional cost to the County, all services required, including additional or extended trips to the job site by manufacturer's representatives, to comply with said requirements.

END OF SECTION



SECTION 22 14 29 – COLUMN-MOUNTED AXIAL FLOW PUMPS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment, and appurtenances required to install, startup, and commission new column-mounted axial flow sump pump as shown on the Drawings.
- B. General Design:
 - 1. The sump pump specified herein is intended to be identical to the two (2) existing pumps and will be installed an existing spare pump column (can) at the county pump station as indicated on the Drawings.
 - 2. The sump pump will be used to pump raw, untreated storm drainage water containing suspended solids and debris as part of the stormwater drainage system.
- C. Related Work Described Elsewhere:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 22 13 33 – Packaged Stormwater Lift Stations

1.02 QUALITY ASSURANCE

- A. Standards: All electrical equipment and controls shall be Underwriters Laboratories listed and as specified elsewhere and shown on the Drawings.
- B. Equipment Manufacturer:
 - 1. Pump shall be a Flygt Brand Model PL 7050, or modern equivalent model.
 - a. Flygt pumps is distributed by Xylem Fairfield, 790-A Chadbourne Rd, Fairfield, CA 94534, (707) 422-9894.

1.03 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures", the following:
 - 1. Product Data:
 - a. Manufacturer's information required to establish compliance with the Specifications.
 - b. Installation Instructions



c. Operating and maintenance manual

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All equipment shall be delivered in suitable packages, cases or crates, and stored and placed as directed. Each package shall have an identifying mark or a complete list showing contents.

1.05 WARRANTY AND GUARANTEES (SEE GENERAL CONDITIONS FOR WARRANTY REQUIREMENT)

- A. The Pump Manufacturer shall warrant the pumps being supplied to the County against defects in workmanship and materials for a period of five (5) years under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 SUMP PUMP SPECIFICATIONS

- A. Flygt Model PL 7050
1. Product No.: 7050 680 5325
 2. Product Type: S
 3. Curve Code: 700
 4. Propeller Type: B4
 5. Blade Angle: 14 Deg.
 6. Rated Power: 20 kW / 27 HP
 7. Rated Voltage: 460 V, 3-Ph
 8. Frequency: 60 Hz
 9. Speed: 700 RPM
 10. Motor: M35-24-10AC
 11. Duty: Continuous Duty
 12. Original Serial No.: S/N 8732150
 13. Power Cord: 16 meters, 8 AWG/ 3-2-1-GC rated for submersed service.
- B. Pump shall fit in existing spare can (column) as shown on the Drawings.



2.02 CONTROLS

A. General:

1. For pump station controls and instrumentation requirements, see Paragraph 2.05 of Section 22 13 33.
2. Pump to be compatible and in accordance with requirements and standards specified elsewhere and on the Drawings.

PART 3 – EXECUTION

3.01 GENERAL

- A. Inspect and measure the existing pump can (column) and seat for the pump prior to ordering the unit.
- B. Install in accordance with the manufacturer's instructions and recommendations in the locations shown on the Drawings.
- C. Furnish the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.
- D. Supply all anchor bolts, temporary lift equipment, power, water, labor and all other incidentals required for the proposed installation of the pumps.

3.02 INSTALLATION

- A. Install in sump basin as shown on Drawings.
- B. Provide electrical connection as specified and shown on the drawings and in accordance with the requirements of Manufacturer's Installation Manual.

3.03 INSPECTION AND TESTING

- A. After all pumps have been completely installed, and working under the direction of the manufacturer, conduct in the presence of the County, such tests as are necessary to indicate that pump efficiency and discharge conform to the Specifications. Field tests shall include all pumps included in this Section. Supply all electric power, water, labor, equipment, and incidentals required to complete the field test.
- B. If the pump performance does not meet the specifications, take corrective measures, or remove the pump and replace it with a new pump that satisfies the conditions specified.
- C. A four (4) hour operating period for pump commissioning will be required before acceptance.
- D. The components of each lubricating system shall be completely tested by the



Contractor in the presence of the County.

- E. Any component parts that are damaged during testing, or fail to meet the requirements of the specifications shall be replaced, reinstalled, and retested, and no additional expense to the County.

END OF SECTION



SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Control," to design seismic supports and seismic bracing.
- B. Seismic Performance: Electrical systems as described in Division 26 shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified, and the unit will be fully operational after the seismic event."

1.03 DESCRIPTION

- A. Work to be performed under the sections of Division 26 includes all labor, materials, and equipment required to install complete electrical systems as described in these specifications and as shown on the drawings. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.
- B. Before submitting a bid, the Contractor shall examine the drawings and specifications, visit the work site, and be informed of local conditions, all federal, state, and local ordinances, regulations, and all other pertinent items which may affect cost, schedule, and completion of this project.
- C. Drawings accompanying these specifications are a part of these specifications. Drawings are intended to show general arrangement, design, and extent of work and are diagrammatic. Drawings are not intended to show exact locations except where dimensions are shown. Any substantial differences existing between drawings and conditions in the field shall be submitted to the Engineer for consideration before proceeding with work. Electrical work is shown on plans using standard industry symbols.
- D. Before ordering materials or doing work, the Contractor shall verify all measurements pertaining to work scope and assume installation responsibility for complete and fully functional electrical systems.



- E. The electrical work included in all other divisions of this specification and related documents is the responsibility of the contractor performing the Division 26 work unless specifically noted otherwise.

1.04 REFERENCED STANDARDS

- A. Abbreviations of standards organizations referenced in this and other sections are as follows:

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories, Inc.
IBC	International Building Code
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
ISA	Instrument Society of America
NBS	National Bureau of Standards
NEC	National Electric Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
UL	Underwriters Laboratories Inc.

1.05 QUALITY ASSURANCE

- A. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.
- B. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those



indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

- C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, subject to approval by the Engineer, shall apply, and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled. The Contractor shall not modify new equipment in such a way as to nullify the Testing Laboratories label. All equipment and materials shall be used or installed in accordance with any instructions included in the listing by the laboratory.

1.06 REGULATORY REQUIREMENTS

- A. All work and materials are to conform in every detail to applicable rules and requirements of local codes and regulations, the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, and current manufacturing standards (including NEMA) and any additional local modifications enacted by the Local Authority Having Jurisdiction. Contractor shall be responsible for verifying what, if any, local modifications are in place or enacted by the Local Authority Having Jurisdiction.
- B. All work shall be installed in accordance with NECA standards of installation.
- C. All work shall conform, where applicable, to the Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA), Part 1910, "Occupational Safety and Health Standards." This shall include any local or state modifications enacted by the Authority having Jurisdiction.

1.07 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner. Owner may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal Owner schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner at least seven days in advance of proposed interruption of electric service.



2. Indicate method of providing temporary electric service.
 3. Do not proceed with interruption of electric service without Owner's written permission.
- C. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

1.08 OMISSIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call to the attention of the Engineer any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.09 SUBMITTALS

- A. Refer to Division 01 for Submittal requirements.
- B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.
- C. On request, the Contractor shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc., to clarify the intent of construction or operations.
- D. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.
- E. The submittals must be approved before fabrication.
- F. Delegated-Design Submittal: For seismic restraints.
1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where the Project is located, who is responsible for their preparation.
 2. Design Calculations: Calculate requirements for selecting seismic restraints.
 3. Detail fabrication, including anchorages and attachments to structure and to supported MCCs, switches, transfer switches, switchgear, panelboards, switchboards, overcurrent protective devices, transformers,



light fixtures, lighting control panels, enclosed controllers, power distribution units, and enclosed controllers.

- G. Manufacturer Seismic Qualification Certification: Submit certification that MCCs, switches, transfer switches, switchgear, panelboards, switchboards, overcurrent protective devices, transformers, light fixtures, enclosed controllers, and associated accessories, and components will withstand seismic forces defined in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems." Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on an actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.10 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing the proposed rearrangement of work to meet Project conditions, including changes to work specified in other Sections. Obtain written permission from the Engineer before proceeding.
- C. Tools, materials, and equipment shall be confined to areas designated by the Owner.

1.11 WORK SEQUENCE AND SCHEDULING

- A. See the General Conditions of the Contract, Scheduling and Coordination of Work, Time for Completion of the Project, and General Requirements, Mutual Responsibility for additional requirements.

1.12 WORK BY OTHER TRADES

- A. Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this Trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.
- B. Electrical details on drawings for equipment to be provided by others is based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.



1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Refer to Division 01, General Requirements, Operating and Maintenance Instructions for additional requirements.

1.14 TRAINING

- A. Instruct Owner's personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video record all training sessions. Use the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.
- B. The requirement for recording training sessions may be deleted on some projects but not the requirement for the training itself.
- C. Refer to other sections in Division 26 for specific section and equipment training requirements.

1.15 RECORD DRAWINGS

- A. Contractor shall provide drawings to document as-built conditions per Division 01.
- B. A set of prints shall be kept at the job site upon which all changes and deviations from the original design are to be recorded daily. All changes shall be clearly marked. These drawings shall indicate, as a minimum, all changes made to the drawings, changes in circuiting, equipment location, accurate locations of embedded conduit, and all other significant changes and deviations from the original design.
- C. The daily record of changes shall be the responsibility of the Contractor's field representative. No arbitrary mark-ups will be permitted.
- D. The record drawing set shall be made available and may be audited periodically by the Owners' construction representative to ensure the changes are being recorded.
- E. At the completion of the project, the Contractor shall submit the marked-up record drawings to the Owners' construction representative prior to request for final payment.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Reference applicable sections within Division 26.



PART 3 – EXECUTION

3.01 WORK INCLUDED

- A. The scope of work shall include all work, including all labor, materials, and equipment, testing required to install a complete electrical system as indicated in the project Manual. The Project Manual consists of the bidding documents, the contract, specifications, contract drawings, and all subsequent addenda and modifications. The contractor shall furnish and install all necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
- B. All work items shown on the drawings are within the scope of work and shall be provided as indicated. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.
- C. In general, the specifications indicate the requirements and quality for products required and the execution of those products. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.
- D. If there is any discrepancy between the drawings and the specifications, it is the contractor's responsibility to notify the Engineer for resolution, prior to procuring equipment or starting work.
- E. Coordinate and verify all equipment being supplied by the equipment supplier and other trades. Verify equipment size, motor HP, dimensions, locations, etc. as all are subject to change.
- F. Contractor shall verify all door swings and the location of all cabinets, diffusers, HVAC, plumbing, process, and building equipment before installing electrical equipment, fixtures, outlets, and conduit.
- G. The Contractor shall provide all plywood backboards and supports for all electrical equipment as indicated on the drawings and as required or specified.
- H. All permits and inspection fees required to complete the work shall be paid for by the Contractor unless noted otherwise.
- I. All electrical equipment and fixtures shall be installed in complete accordance with the manufacturers' recommendations.
- J. Contractor shall provide all motor connections as shown on the drawings and as specified herein.

3.02 CONCRETE

- A. All concrete work required for the proper installation of electrical equipment including transformer(s), switchboard(s), switchgear and motor control center



pads and other equipment pads shall be provided by the Contractor and shall conform to specifications in Division 03.

3.03 SITE WORK

- A. The Contractor shall provide excavation and backfill for all electrical underground work as indicated on the drawings and as required. The Contractor shall perform this work and provide compaction as specified in Division 02. Finish grading and final restoration shall be by the General Contractor.

3.04 CONFIRMATION OF ELECTRIC SERVICE

- A. Consult with the County Co-Gen facility to verify service information specified herein and shown on drawings before submitting bid.

3.05 PERMITS, FEES, TAXES, INSPECTIONS

- A. Procure all applicable permits and licenses.
- B. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
- C. ELECTRICAL CONTRACTOR to pay all charges for permits or licenses.
- D. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
- E. Pay all charges arising out of required inspections by an authorized body.
- F. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
- G. Where applicable, all fixtures, equipment, and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.

3.06 METERING

- A. Consult with Co-Gen regarding service entrance requirements and metering equipment.
- B. Install metering equipment and empty conduit for metering conductors to meet standards and requirements of Electric Utility.

3.07 SERVICE INSTALLATION

- A. The service installation shall comply with the latest applicable standards of the utility. Refer to the current electrical service installation manuals.
- B. The Contractor shall meet with the electric utility prior to rough-in to review and coordinate the installation of the electrical service and verify existing conditions and specific requirements.



3.08 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for the admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.09 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

3.10 COORDINATION

- A. The Contractor shall cooperate with other trades and the Owner's construction representative in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost, provided such decision is reached prior to actual installation. The Contractor shall check the location of electrical outlets with respect to other installations before installing.
- B. The Contractor shall verify that all devices are compatible with the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panelboards, devices, etc., and recessed or semi-recessed heating units installed in/on architectural surfaces.
- C. Coordinate all work with other trades prior to installation. Any installed work that is not coordinated and that interferes with another trade's work shall be removed or relocated at the installing contractor's expense.

3.11 HOUSEKEEPING AND CLEAN UP

- A. Refer to Division 01, General Requirements, and Cleaning for additional requirements.
- B. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When the job is complete, the Contractor shall remove all tools, excess material, and equipment from the site.

END OF SECTION



SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 – PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Alpha Wire.
 - 2. Belden Inc.
 - 3. Encore Wire Corporation.
 - 4. General Cable Technologies Corporation.
 - 5. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.



- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-THWN-2, and Type XHHW-2.
- D. Conductor sizes shown on drawings are based on 75 °C copper.
- E. All conductors shall be rated 600 volts.
- F. Branch circuit wire sizes not shown on the drawings shall be #12 AWG minimum.
- G. All emergency system wiring shall be installed in raceways separate from other systems.

2.02 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Gardner Bender.
 - 3. Hubbell Power Systems, Inc.
 - 4. Ideal Industries, Inc.
 - 5. Ilsco; a branch of Bardes Corporation.
 - 6. NSi Industries LLC.
 - 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 - 8. Thomas and Betts Corp.
 - 9. 3M; Electrical Markets Division.
 - 10. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
 - 1. Split Bolt Connectors: Not acceptable.
 - 2. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.
 - 3. Spring Wire Connectors: Solderless spring-type pressure connectors with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.



4. All wire connectors used in underground or exterior pull boxes shall be gel-filled twist connectors or a connector designed for damp and wet locations.
5. Mechanical Connectors: Bolted type, tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.
6. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type, and the proper number and location of crimps.

2.03 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 – EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper Stranded conductor.
- B. Branch Circuits: Copper, stranded.

3.02 CONDUCTOR INSULATION AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN-2, single conductors in raceway.

3.03 INSTALLATION OF FEEDERS AND BRANCH CIRCUITS

- A. Feeder and branch circuit routing is shown diagrammatically on the drawings and is approximate unless dimensioned. Route feeders and branch circuits as required to meet project conditions.
- B. All 120- and 277-volt branch circuits shall have a dedicated neutral conductor. The neutral conductor shall be considered a current-carrying conductor for wire derating. The use of multi-wire branch circuits with a common neutral is not



permitted.

- C. All power wiring shall be installed in conduit unless specifically indicated otherwise.
- D. Conceal feeders and branch circuits in finished walls, ceilings, and floors, unless otherwise indicated.
- E. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- F. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- G. Use manufacturer-approved pulling compound or lubricant where necessary; the compound used must not deteriorate the conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- H. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- I. Install exposed feeders and branch circuits parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- J. Support feeders and branch circuits according to Division 26 Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install a conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with an identity number and the location of other end of conductor and identify as spare conductor.



3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.07 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore the original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."

3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Perform an insulation-resistance test, with respect to ground and adjacent conductors, on each conductor of power feeders 100 amperes or greater. Applied potential shall be 1000 volts DC for 600-volt-rated cable. Test duration shall be one minute. Insulating-resistance values should not be less than 50 megohms.
 - 4. Any conductors that fail the above-mentioned tests shall be replaced and those new conductors shall be tested and meet the requirements mentioned above.
- D. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.



- E. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION



SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01 77 00 "Contract Closeout Procedures," Include instructions for periodic testing and inspection of grounding features at test wells based on NFPA 70B.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and if they do not, instructions shall recommend corrective action.
 - b. Include recommended testing intervals.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.



2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning and Grounding.
7. ILSCO.
8. O-Z/Gedney; A Brand of the EGS Electrical Group.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.

2.02 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.03 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus (EGB): Rectangular bars of annealed copper, 1/4 by 2 in cross section, length as indicated on drawings. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V, and shall be Lexan or PVC, impulse tested at 5000 V.



2.04 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.05 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 – EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install stranded conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 30 inches (762 mm) below grade.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.



4. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, conductor from ground rod into manhole through a waterproof sleeve in manhole wall.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.04 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
- D. Metallic Fences: Comply with requirements of IEEE C2.
 1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 3. Barbed Wire: Strands shall be bonded to the grounding conductor.



3.05 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.



2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- G. Ground Ring: Install a grounding conductor, electrically connected to ground rod and to MCC, extending around the perimeter of the MCC.
1. Install copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 2. Bury ground ring not less than 36 inches (914 mm) from building's foundation.

3.06 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Report measured ground resistances that exceed the following values:



1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Manhole Grounds: 10 ohms.
- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION



SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.03 PERFORMANCE REQUIREMENTS

- A. Provide supports for multiple raceways capable of supporting combined weight of supported systems and their contents.
- B. Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.04 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.05 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:



- a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Channel Dimensions: Selected for applicable load criteria.
- B. Supports installed in process or washdown areas shall be schedule 40 ASTM type 316 stainless steel with ASTM type 316 stainless steel welded end-caps and end plates and polished finish. Stainless steel screws, nuts, and bolts shall be ASTM type 316N2-33.
 - C. Stainless steel supports, fittings, and hardware shall be ASTM type 316 with polished finish. Stainless steel screws, nuts, and bolts shall be ASTM type 316N2-33.
 - D. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
 - E. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
 - F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:



- 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used. Plastic-type expansion anchors are unacceptable.
- a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.



PART 3 – EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems, except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in the future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps and single-bolt conduit clamps.
- D. All supports installed outside, exposed to the weather, or inside in wet or damp areas shall utilize corrosion-resistant supports, fittings, hardware, conduit clamps and all accessories.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. The minimum static design load used for strength determination shall be the weight of supported components plus 200 lb. (90 kg).
- C. All electrical fixtures, devices, and equipment shall be securely mounted to building structure and shall not depend upon ceiling or wall surfaces for their support. They shall be incapable of being rotated or displaced.
- D. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray, conduit, or any other surface not a part of the building structure or other structural surface.
- E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and



expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 Spring-tension clamps.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

G. Do not drill or weld structural steel members unless approved by Engineer.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

3.04 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use the same materials as



used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Section 09 90 00 "Painting and Coating" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION



SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Nonmetallic conduits and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Boxes, enclosures, and cabinets.
- B. Related Requirements:
 - 1. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.03 ACTION SUBMITTALS

- A. Product Data: For wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Sustainable Design Submittals:
 - 1. Product Data: For solvents and adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit



groups with common supports.

- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Detailed description of conduit support devices and interconnections on which the certification is based, and their installation requirements.
- D. Source quality-control reports.

1.05 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.06 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Allied Tube & Conduit; a part of Atkore International.
 - c. Electri-Flex Company.



- d. Republic Conduit.
- e. Southwire Company.
- f. Thomas & Betts Corporation; A Member of the ABB Group.
- g. Western Tube and Conduit Corporation.
- h. Wheatland Tube Company.
- 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 3. RMC: Comply with ANSI C80.1 and UL 6.
- 4. IMC: Comply with ANSI C80.6 and UL 1242.
- 5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit or IMC.
 - a. Comply with NEMA RN 1.
 - b. Coating Thickness: 0.040 inch (1 mm), minimum.
- 6. EMT: Comply with ANSI C80.3 and UL 797.
- 7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
 - 1. Comply with NEMA FB 1 and UL 514B.
 - 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203.
 - 5. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Set-screw or compression
 - 6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651 for PVC and type XJ for steel, rated for environmental conditions were installed, and including a flexible external bonding jumper.



7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- C. Joint Compound for IMC, RMC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Allied Tube & Conduit; a part of Atkore International.
 - c. CANTEX, Inc.
 - d. Electri-Flex Company.
 - e. Kraloy
 - f. Lamson & Sessions; Carlon Electrical Products.
 - g. Thomas & Betts Corporation; A Member of the ABB Group.
2. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

B. Nonmetallic Fittings:

1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- ### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB, Electrification Products Division.
 2. B-line; Eaton, Electrical Sector.
 3. Hoffman; nVent.



4. MonoSystems, Inc.
 5. Square D; Schneider Electric USA.
 6. Wiegmann; Hubbell Incorporated, Commercial and Industrial.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type unless otherwise indicated.
- E. Finish: ANSI 61 Gray for steel wireways.

2.04 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Crouse-Hinds, an Eaton business.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. FSR Inc.
 5. Hoffman; a brand of Pentair Equipment Protection.
 6. Hubbell Incorporated.
 7. Kraloy.
 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 9. RACO; Hubbell.
 10. Thomas & Betts Corporation; A Member of the ABB Group.
 11. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, deep-type, ferrous alloy, Type FD, with gasketed cover, threaded hubs.



- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- F. Sheet Metal Pull and Junction Boxes: NEMA OS 1, galvanized steel.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover and stainless-steel cover screws.
 - 1. Flanged-type boxes shall be used where installed flush in the wall.
- H. Box extensions used to accommodate new building finishes shall be of the same material as the recessed box.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- J. Gangable boxes are prohibited.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- L. Cabinets:
 - 1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.



PART 3 – EXECUTION

3.01 RACEWAY SIZING

- A. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to NEC. (Latest Edition). Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the National Electrical Code (to include enlarged conductors due to temperature and quantity derating values), and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.
- B. Minimum (Unless noted otherwise) Raceway Size 3/4-inch (21 mm) trade size.
- C. Minimum Raceway Size Control Conduit: 3/4-inch, unless noted otherwise in documents.
- D. Minimum Raceway Size; Below Grade 5'-0" or less from Building Foundation: 3/4- inch, unless noted otherwise in documents.
- E. Minimum Raceway Size; Below Grade more than 5'-0" from Building Foundation: 3/4-inch, unless noted otherwise in documents.
- F. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

3.02 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: RMC
 - 2. Concealed Conduit, Aboveground: RMC
 - 3. Underground Conduit: Refer to Section 26 05 43.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Physical Damage: RMC Raceway locations include the following:



- a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - b. Mechanical rooms.
 - c. Co-Gen Facility
 - d. Exterior above grade.
4. In slabs above grade: RMC.
 5. In or under slabs on grade: RNC, Type EPC-40-PVC
 6. Concealed in Ceilings, Interior Walls, and Partitions: EMT.
 7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 8. Flexible Metal Conduit (FMC) $\frac{3}{4}$ inch, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire. Flexible metal conduit may be a manufactured, UL-listed $\frac{3}{8}$ -inch flexible metal conduit and fittings with #14 AWG THHN conductors and an insulated ground wire. Maximum length of $\frac{3}{8}$ inch FMC shall be six (6) feet.
 9. Damp or Wet Locations: RMC.
 10. Damp or Wet Locations and subject to Physical Damage: RMC
 11. Process Areas: Plastic Coated Rigid Steel Conduit.
 12. Hazardous Locations: All raceways installed in hazardous locations shall be suitable for locations as defined in the NEC Article 500.
 13. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. Rigid Nonmetallic Conduit: Use PVC fittings, unless otherwise indicated.
 4. Stainless Steel Conduit: Use Stainless Steel fittings, unless otherwise



indicated. Flexible conduit connections from stainless steel boxes shall utilize Ocal-Blue PVC-coated connectors with sealing O-rings.

5. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
6. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.03 BOXES AND ENCLOSURES APPLICATIONS

A. Boxes and Enclosures:

1. NEMA 250, Type 1, except use NEMA 250, Type 3R stainless steel in institutional and commercial kitchens and damp or wet locations.
2. Dirty locations: NEMA 250, Type 12, powder-coated steel.
3. Process Areas: NEMA 250 Type 4X, Plastic Coated Rigid Steel.
4. Hazardous Locations: All boxes and enclosures installed in hazardous locations shall be suitable for locations as defined by NEC Article 500.

3.04 INSTALLATION

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. In general, conduits shall be installed concealed in walls, in finished spaces, and where possible or practical, or as noted otherwise. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical, unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.
- D. Route conduit through roof openings provided for piping and ductwork where possible. If not provided, or routing through provided openings is not possible, rough through jack with pitch pocket. Coordinate roof penetrations with others.
- E. Conduit runs shall be routed as shown on the large-scale drawings. Conduit routing on drawings scaled $\frac{1}{4}" = 1'-0"$ or less shall be considered diagrammatic, unless noted otherwise. The correct routing, when shown diagrammatically shall be chosen by the Contractor based on information provided in the contract documents, in accordance with manufacturer's written instructions, applicable codes, NECA 1, NECA 101, and coordinated with other contractors.



- F. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- G. Do not fasten conduits onto the bottom side of a metal deck roof.
- H. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- I. Complete raceway installation before starting conductor installation.
- J. Install temporary closures to prevent foreign matter from entering raceways.
- K. Unused openings in boxes and fittings shall be plugged with suitable devices rated for the proper environment.
- L. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep the straight legs of offsets parallel, unless otherwise indicated.
- M. Arrange stub-ups so curved portions of bends are not visible above finished slab. Where rigid non-metallic conduit (RNC) conduit is used below grade, in slab, below slab, etc., a transition to rigid galvanized steel or PVC-coated steel conduit shall be installed before conduit exits the earth. The metallic conduit shall extend a minimum of 6" into the surface concealing the non-metallic conduit.
- N. Stub-Ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- O. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction and within 12 inches of enclosures to which it is attached.
- P. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- Q. Conceal conduit within finished walls, and ceilings, unless otherwise indicated. Install conduits parallel or perpendicular to building lines. Conduit runs installed above suspended ceilings shall be properly supported. In no case shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system for conduit supports.
- R. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.



1. Run parallel or banked raceways together on common supports.
 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- S. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- T. Conduit shall not be routed under floor slab unless specifically noted on drawings.
- U. Contractor shall be responsible for all openings required in masonry or exterior walls under this division. A qualified mason at the expense of this contractor shall repair all openings to match existing conditions.

3.05 CONDUIT TERMINATIONS

- A. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- B. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- C. Join raceways with fittings designed and approved for that purpose and make joints tight.
- D. When raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
- E. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- F. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- G. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- H. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand-tight plus 1/4 turn more.



- I. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- J. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- L. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- M. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Conduit extending from interior to exterior of building.
 - 4. Conduit extending into pressurized duct and equipment.
 - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6. Where otherwise required by NFPA 70.
- N. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- O. Expansion fittings shall be installed across expansion joints in structures and concrete construction where such joints are shown on the architectural and structural drawings.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.



- Q. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC in damp or wet locations not subject to severe physical damage.

3.06 BOX INSTALLATION

- A. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- B. Recessed Boxes in Masonry Walls: Saw-cut opening for box in corner of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- C. Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18-inch by 24-inch access doors.
- D. Electrical box locations shown on drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- E. No outlet shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
- F. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.
- G. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.
- H. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- I. Locate boxes so that cover or plate will not span different building finishes.
- J. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- K. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.



- L. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.07 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.08 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION



SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings, including RMC and PVC-coated steel conduit.
 - 2. Rigid nonmetallic duct.
 - 3. Flexible nonmetallic duct.
 - 4. Duct accessories.
 - 5. Precast concrete handholes.
 - 6. Polymer concrete handholes and boxes with polymer concrete cover.
 - 7. Precast manholes.
 - 8. Cast-in-place manholes.
 - 9. Utility structure accessories.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include duct-bank materials, including spacers and miscellaneous components.
 - 2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Include accessories for handholes, and boxes.
 - 4. Include underground-line warning tape.
- B. Shop Drawings:
 - 1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, and elevations, and



fabrication and installation details.

- b. Include duct entry provisions, including locations and duct sizes.
- c. Include cover design.
- d. Include grounding details.
- e. Include dimensioned locations pulling-in and lifting irons.

C. Sustainable Design Submittals:

- 1. Product Data: For adhesives and sealants, indicating VOC content.
- 2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.05 FIELD CONDITIONS

- A. Ground Water: Assume ground-water level is 36 inches (900 mm) below ground surface unless a higher water table is noted on Drawings.

PART 2 – PRODUCTS

2.01 METAL CONDUIT AND FITTINGS

- A. RMC: Comply with ANSI C80.1 and UL 6.
- B. Coated Steel Conduit: PVC-coated RMC.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allied Tube & Conduit: a part of Atkore International.
 - 2. Republic Conduit.
 - 3. Thomas & Betts Corporation: A Member of the ABB Group.
 - 4. Western Tube and Conduit Corporation.



5. Wheatland Tube Company.

2.02 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Underground Plastic Utilities Duct: Type EB-20 PVC RNC, complying with NEMA TC 6 & 8, ASTM F 512, and UL 651, with matching fittings complying with NEMA TC 9 by same manufacturer as duct.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allied Tube and Conduit: a part of Atkore International.
 - 2. CANTEX INC.
 - 3. Kraloy.
 - 4. Lamson & Sessions: Carlong Electrical Products.
 - 5. Thomas & Betts Corporation; A Member of the ABB Group.
- D. Solvents and Adhesives: As recommended by conduit manufacturer.
 - 1. VOC Content: 510 g/L or less for PVC conduit and fittings.

2.03 FLEXIBLE NONMETALLIC DUCTS

- A. HDPE Duct: Type EPEC-80 HDPE, complying with NEMA TC 7 and UL 651A.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARNCO Corp.
 - b. Carlon: a brand of Thomas & Betts Corporation.
 - c. Premier Conduit.
- B. Continuous HDPE: Comply with UL651A
- C. Coilable HDPE: Preassembled with conductors or cables and complying with ASTM D 3485.

2.04 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used and selected to provide minimum duct spacing



indicated while supporting duct during concreting or backfilling.

- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 26 05 53 "Identification for Electrical Systems."

2.05 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Jensen Precast.
 - 2. Oldcastle Precast, Inc.
 - 3. Utility Concrete Products, LLC.
- C. Comply with ASTM C 858 for design and manufacturing processes.
- D. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
- E. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
- F. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.
 - 1. Cover Hinges: Concealed, with hold-open ratchet assembly.
 - 2. Cover Handle: Recessed.
- G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- H. Cover Legend: Molded lettering, as indicated for each service.
- I. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.
- J. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - 1. Extension shall provide increased depth of 12 inches (300 mm).
 - 2. Slab: Same dimensions as bottom of enclosure and arranged to provide closure.



- K. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
 - L. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
 - 1. Center window location.
 - 2. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
 - 3. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
 - 4. Knockout panels shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
 - 5. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.
 - M. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - 1. Type and size shall match fittings to duct to be terminated.
 - 2. Fittings shall align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
 - N. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- 2.06 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER
- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
 - B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armorcast Products Company.
 - 2. Oldcastle Enclosure Solutions.
 - 3. Quazite: Hubbell Power Systems, Inc.



- C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- D. Color: Gray.
- E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- H. Cover Legend: Molded lettering, as indicated for each service.
- I. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.07 PRECAST MANHOLES

- A. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Jensen Precast.
 - 2. Oldcastle Precast, Inc.
 - 3. Utility Concrete Products, LLC.
- C. Comply with ASTM C 858.
- D. Structural Design Loading: Comply with requirements in "Underground Enclosure Application" Article.
- E. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
 - 1. Center window location.
 - 2. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
 - 3. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.



4. Knockout panel shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
 5. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.
- F. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
1. Type and size shall match fittings to duct to be terminated.
 2. Fittings shall align with elevations of approaching duct and be located near interior corners of manholes to facilitate racking of cable.
- G. Ground Rod Sleeve: Provide a 3-inch (75-mm) PVC sleeve in manhole floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the duct entering the structure.
- H. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the groundwater level at grade.

2.08 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.
- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 2. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Engineer if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and



surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

- C. Clear and grub vegetation to be removed and protect vegetation to remain according to Section 31 11 00 "Clearing and Grubbing." Remove and stockpile topsoil for reapplication according to Section 31 11 00 "Site Clearing and Grubbing."

3.02 UNDERGROUND DUCT APPLICATION

- A. Duct for Electrical Feeders 600 V and Less: Type EPC-40-PVC RNC, concrete-encased unless otherwise indicated.
- B. Duct for Electrical Feeders 600 V and Less: Type EPC-80-PVC or Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.
- C. Duct for Electrical Branch Circuits: Type EPC-80-PVC or Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.
- D. Bored Underground Duct: Type EPEC-80-HDPE unless otherwise indicated.
- E. Underground Ducts Crossing Paved Paths, Walks and Driveways, Roadways: Type EPC-40 PVC RNC, encased in reinforced concrete.
- F. Stub-ups: Concrete-encased RMC.

3.03 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-20 structural load rating.
 - 2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
 - 3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
 - 4. Units Subject to Light-Duty Pedestrian Traffic Only: Polymer concrete units, SCTE 77, Tier 8.
 - 5. Cover design load shall not exceed the design load of the handhole or box.
- B. Manholes: Precast concrete.
 - 1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy



or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.

2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating according to AASHTO HB 17.

3.04 EARTHWORK

- A. Excavation and Backfill: Comply with Section 31 23 00 "Stripping and Excavation," but do not use heavy-duty, hydraulic-operated compaction equipment.
- B. Restoration: Replace area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 32 92 23 "Sodding" and Section 32 90 00 "Planting."
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to Section 01 73 29 "Cutting and Patching."

3.05 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down toward manholes and hand-holes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.
- E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so that those of adjacent ducts do not lie in the same plane.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where



environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

- G. End Bell Entrances to Manholes and Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) duct, and vary proportionately for other duct sizes.
1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell, without reducing duct slope and without forming a trap in the line.
 2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight-line direct-buried duct with calculated expansion of more than 3/4 inch (19 mm).
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- H. Terminator Entrances to Manholes and Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches (150 mm) o.c. for 4-inch (100-mm) ducts and vary proportionately for other duct sizes.
1. Begin change from regular spacing to terminator spacing 10 feet (3 m) from the terminator, without reducing duct line slope and without forming a trap in the line.
 2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight-line duct with calculated expansion of more than 3/4 inch (19 mm).
- I. Building Wall Penetrations: Make a transition from underground duct to RMC at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-RMC transition. Install RMC penetrations of building walls as specified in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- J. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- K. Pulling Cord: Install 200-lbf (1000-N) test nylon cord in empty ducts.
- L. Concrete-Encased Ducts and Duct Bank:
1. Excavate trench bottom to provide firm and uniform support for duct.



Prepare trench bottoms as specified in Section 31 23 00 "Stripping and Excavation" for pipes less than 6 inches (150 mm) in nominal diameter.

2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.
3. Depth: Install so top of duct envelope is at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
4. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
5. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
6. Minimum Space between Duct: 3 inches (75 mm) between edge of duct and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and communications ducts.
7. Elbows: Use manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct unless otherwise indicated. Extend encasement throughout length of elbow.
8. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
9. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
10. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inches (50 mm) between duct of like services, and 4 inches (100 mm) between power and communications ducts.
11. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of duct as its temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written instructions or use other specific measures to prevent



expansion-contraction damage.

- b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (15-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.

12. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 03 30 00 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for a duct installation application.

M. Direct-Buried Duct and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 31 23 00 "Stripping and Excavation" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.
3. Depth: Install top of duct at least 36 inches (900 mm) below finished grade unless otherwise indicated.
4. Set elevation of bottom of duct bank below frost line.
5. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
6. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to ducts to prevent movement during backfill. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Install duct with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and communications duct.
8. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
9. After installing first tier of duct, backfill and compact. Start at tie-in point



and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 23 00 "Stripping and Excavation" for installation of backfill materials.

- a. Place minimum 3 inches (75 mm) of sand as a bed for duct. Place sand to a minimum of 6 inches (150 mm) above top level of duct.
- b. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct.

N. Horizontal Directional Drilling

1. Entire drill path shall be accurately surveyed, with entry and exit stakes placed and coordinated with other contractors. If using a magnetic guidance system, entire drill path shall be surveyed for any surface geo-magnetic variations or anomalies.
2. Any utility located within 20 feet of the bore path shall have the exact location physically verified by hand digging or vacuum excavation. Restore inspection holes to original condition after verification.

- O. Underground-Line Warning Tape: Bury conducting underground line specified in Section 26 05 53 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all concrete-encased duct and duct banks and approximately 12 inches (300 mm) below grade. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.06 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below frost line.



- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in asphalt paving or grassy areas and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 03 30 00 "Cast-in-Place Concrete," with a troweled finish.
 - 2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.07 GROUNDING

- A. Ground underground ducts and utility structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.08 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch (300-mm) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
 - 3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.



3.09 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump.
 - 1. Sweep floor, removing dirt and debris.
 - 2. Remove foreign material.

END OF SECTION



SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 – PRODUCTS

2.01 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.



- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.02 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 - 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Carbon steel, Plastic, or Stainless steel.
 - 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop



collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Presealed Systems.

2.04 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.05 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire-rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 – EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.



- b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.
- 2. Use pipe sleeves unless penetration arrangement requires a rectangular sleeved opening.
- 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires a rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.03 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.



- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.04 FIELD QUALITY CONTROL

- A. Inspect installed sleeve and sleeve-seal installations and associated firestopping for damage and faulty work. Replace sleeve and sleeve-seals that are damaged or faulty.

END OF SECTION



SECTION 26 05 48 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Restraint channel bracings.
 - 2. Restraint cables.
 - 3. Seismic-restraint accessories.
 - 4. Mechanical anchor bolts.
 - 5. Adhesive anchor bolts.
- B. Related Requirements:
 - 1. Section 26 05 29 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate the application of each product submitted and compliance with requirements.
- B. Delegated-Design Submittal: For each seismic-restraint device.
 - 1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Design Calculations: Calculate static and dynamic loading caused by



equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints and for designing vibration isolation bases. Design Calculations shall be stamped and signed by a registered engineer in the State of California.

- a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic- and Wind-Restraint Details:

- a. Design Analysis: To support selection and arrangement of seismic and wind restraints, include calculations of combined tensile and shear loads.
- b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
- c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
- d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Electrical components include:

1. Control and monitoring panels.
2. Luminaires.
3. Motor control centers.
4. Panelboards.
5. Transformers.

- B. Qualification Data: For professional engineer.



- C. Welding certificates.
- D. Field quality-control reports.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- E. Comply with NFPA 70.

1.06 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
 - 1. Basic Wind Speed: 103 mph
 - 2. Exposure C
 - 3. Risk Category: III.
 - 4. Wind Importance 1.0
 - 5. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by maximum area of component projected on vertical plane normal to wind direction and 45 degrees either side of normal.



B. Seismic-Restraint Loading:

1. Site Class D.
2. Risk Category III.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): $S_s = 1.608 g$.
4. Design Spectral Response Acceleration at 1.0-Second Period: $S_1 = 0.563 g$

2.02 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.03 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.04 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.05 MECHANICAL ANCHOR BOLTS

- A. Reference Specification Section 05 81 00, "Anchorage in Concrete and Masonry".



2.06 ADHESIVE ANCHOR BOLTS

- A. Reference Specification Section 05 81 00, "Anchorage in Concrete and Masonry".

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 03 30 00 "Cast-in-Place Concrete."
- B. Equipment and Hanger Restraints:
 - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- C. Install cables so they do not bend across edges of adjacent equipment or



building structure.

- D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- F. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.



- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchor-age device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 - 5. Test to 90 percent of rated proof load of device.
- C. Seismic controls will be considered defective if they do not pass tests and in-spections.
- D. Prepare test and inspection reports.

3.06 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION



SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.03 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.04 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating



adhesives, and inks used by label printers, shall comply with UL 969.

1.05 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

1.06 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
 - 1. Black letters on an orange field.
 - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."
- D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized



to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

- F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.
- H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

2.02 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Colors for Cables Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Cables Carrying Circuits at More Than 600 V:
 - 1. Black letters on an orange field.
 - 2. Legend: "DANGER HIGH VOLTAGE WIRING."
- D. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- E. Self-Adhesive Vinyl Tape: Colored, heavy-duty, waterproof, fade-resistant; 2 inches (50 mm) wide; compounded for outdoor use.
- F. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of, and shrinks to fit firmly around the cable it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.

2.03 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and



chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil (0.08-mm) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of, and shrinks to fit firmly around the cable it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
- F. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of the cable it identifies, and to stay in place by gripping action.
- G. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit the diameter of cable it identifies, and to stay in place by gripping action.

2.04 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil (0.08-mm) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of the conductor it identifies, and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit the diameter of conductor it identifies, and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit



identification legend machine printed by thermal transfer or equivalent process.

2.05 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE
3. Inscriptions for Orange-Colored Tapes: CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type ID :

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils (0.125 mm).
3. Foil Core Thickness: 0.35 mil (0.00889 mm).
4. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
5. 3-Inch (75-mm) Tensile According to ASTM D 882: 70 lbf (311.3 N), and 4600 psi (31.7 MPa).

D. Tag: Type IID

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.



2. Overall Thickness: 8 mils (0.2 mm).
3. Foil Core Thickness: 0.35 mil (0.00889 mm).
4. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
5. 3-Inch (75-mm) Tensile According to ASTM D 882: 300 lbf (1334 N), and 12,500 psi (86.1 MPa).

2.06 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 3. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs:
 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 3. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. Warning label and sign shall include, but are not limited to, the following legends:
 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
 3. Install proper arc-flash warning label as required per NEC.

2.07 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for



larger sizes.

1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.08 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive-backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.09 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.



1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one-piece, self-locking.
1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.



- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tightly to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum-rated.
- J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
- K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

- A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-



adhesive vinyl or Snap-around labels. Install labels at 30-foot (10-m) maximum intervals.

- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120 V to ground: Identify with self-adhesive vinyl label or self-adhesive vinyl tape applied in bands. Install labels at 30-foot (10-m) maximum intervals.
- D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels or self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- E. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes, self-adhesive, self-laminating polyester labels or self-adhesive vinyl labels with the conductor designation.
- F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs or Metal-backed, butyrate warning signs.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.



- J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

- a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- b. Outdoor Equipment: Engraved, laminated acrylic or melamine label
- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved or engraved, laminated acrylic or melamine label.
- b. Enclosures and electrical cabinets.
- c. Access doors and panels for concealed electrical items.
- d. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- e. Emergency system boxes and enclosures.
- f. Motor-control centers.
- g. Enclosed switches.
- h. Enclosed circuit breakers.
- i. Enclosed controllers.



- j. Push-button stations.
- k. Contactors.
- l. Monitoring and control equipment.

END OF SECTION



SECTION 26 05 72 - OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.03 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.04 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Short-circuit study input data, including completed computer program input data sheets.
 - 2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified Professional Engineer registered in the State of California.
 - a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval



from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

- b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Short-Circuit Study Software Developer.
2. For Professional Engineer who will perform or directly supervise the short-circuit study.

- B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.06 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with the requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

- B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

- C. Short-Circuit Study Specialist Qualifications: Professional Engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this Professional Engineer. Minimum of five years documented experience performing similar short-circuit studies. Acceptable firms:

1. RESA Power Service.
2. Eaton Electrical Services & Systems.
3. Schneider Electric Engineering Services.
4. No substitutes.

- D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing



indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 – PRODUCTS

2.01 COMPUTER SOFTWARE

- A. Comply with IEEE 399 and IEEE 551.
- B. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.
- D. Acceptable products:
 - 1. SKM PowerTools.
 - 2. EasyPower.
 - 3. ETAP.
 - 4. No substitutes.

2.02 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Cable size and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, and panelboard designations.
 - 6. Utility contributions for three-phase and single line to ground faults at the service.



- D. Comments and recommendations for system improvements, where needed.
- E. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 - 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
 - 3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 - 4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
 - 5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
- F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.
- G. Short-Circuit Study Output:
 - 1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Equivalent impedance.
 - 2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Calculated asymmetrical fault currents:
 - 1) Based on fault-point X/R ratio.



- 2) Based on calculated symmetrical value multiplied by 1.6.
 - 3) Based on calculated symmetrical value multiplied by 2.7.
3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Obtain all data necessary for the conduct of the study.
 1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Architect.
 2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
 3. For existing equipment to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.
- B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or their representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
 1. Product Data for Project's overcurrent protective devices involved in over-current protective device coordination studies. Use equipment



designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.02 SHORT-CIRCUIT STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on the device characteristics supplied by device manufacturer.
- D. The extent of the electrical power system to be studied is indicated on Drawings.
- E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:
 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-



switching configurations and alternate operations that could result in maximum fault conditions.

- G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:
 - 1. Electric utility's supply termination point.
 - 2. Incoming switchgear.
 - 3. Unit substation primary and secondary terminals.
 - 4. Low-voltage switchgear.
 - 5. Motor-control centers.
 - 6. Control panels.
 - 7. Standby generators and automatic transfer switches.
 - 8. Branch circuit panelboards.
 - 9. Disconnect switches.

3.03 ADJUSTING

- A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.04 DEMONSTRATION

- A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION



SECTION 26 05 73 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
 - 1. Study results shall be used to determine coordination of series-rated devices.

1.03 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.04 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Coordination-study input data, including completed computer program input data sheets.
 - 2. Study and equipment evaluation reports.
 - 3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.



- a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Coordination Study Software Developer.
2. For Professional Engineer who will perform study or directly supervise work performed by others.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals include the following:

1. The following parts from the Protective Device Coordination Study Report:
 - a. One-line diagram.
 - b. Protective device coordination study.
 - c. Time-current coordination curves.
2. Power system data.

1.07 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
2. Acceptable software:



- a. SKM PowerTools
 - b. EasyPower
 - c. ETAP
 - d. No Substitutes.
- C. Coordination Study Specialist Qualifications: Professional Engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this Professional Engineer. Professional Engineer shall have minimum of 5 years documented experience performing similar studies. Acceptable firms:
1. RESA Power Services
 2. Eaton Electrical Services & Systems
 3. Schneider Electric Engineering Services
 4. No Substitutes.
- D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 – PRODUCTS

2.01 COMPUTER SOFTWARE DEVELOPERS

- A. Software Developers:
- B. Comply with IEEE 242 and IEEE 399.
- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. The computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
 1. Optional Features:
 - a. Arcing faults.



- b. Simultaneous faults.
- c. Explicit negative sequence.
- d. Mutual coupling in zero sequence.

2.02 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

- A. Executive summary.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Cable size and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, and panelboard designations.
 - 6. Utility contribution for three-phase and single line to ground faults at the service.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 72 "Overcurrent Protective Device Short-Circuit Study."
- F. Protective Device Coordination Study:
 - 1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
 - a. Phase and Ground Relays:
 - 1) Device tag.
 - 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
 - 3) Recommendations on improved relaying systems, if applicable.



- b. Circuit Breakers:
 - 1) Adjustable pickups and time delays (long time, short time, ground).
 - 2) Adjustable time-current characteristic.
 - 3) Adjustable instantaneous pickup.
 - 4) Recommendations on improved trip systems, if applicable.
 - c. Fuses: Show current rating, voltage, and class.
- G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
- 1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
 - 2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
 - 3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
 - 4. Plot the following listed characteristic curves, as applicable:
 - a. Power utility's overcurrent protective device.
 - b. Medium-voltage equipment overcurrent relays.
 - c. Medium- and low-voltage fuses, including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
 - e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
 - f. Cables and conductors damage curves.
 - g. Ground-fault protective devices.
 - h. Motor-starting characteristics and motor damage points.



- i. Generator short-circuit decrement curve and generator damage point.
 - j. The largest feeder circuit breaker in each motor-control center and panelboard.
- 5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault, and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
 - 6. Provide adequate time margins between device characteristics such that selective operation is achieved.
 - 7. Comments and recommendations for system improvements.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
 - 1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.02 PROTECTIVE DEVICE COORDINATION STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
- B. Comply with IEEE 399 for general study procedures.
- C. The study shall be based on the device characteristics supplied by device manufacturer.
- D. The extent of the electrical power system to be studied is indicated on Drawings.
- E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 - 2. Exclude equipment rated 240-V ac or less when supplied by a single



transformer rated less than 125 kVA.

- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Transformer Primary Overcurrent Protective Devices:
 - 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 - 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- H. Motor Protection:
 - 1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
 - 2. Select protection for motors served at voltages more than 600 V according to IEEE 620.
- I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.
- K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.



- L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:
 - 1. Electric utility's supply termination point.
 - 2. Switchgear.
 - 3. Unit substation primary and secondary terminals.
 - 4. Low-voltage switchgear.
 - 5. Motor-control centers.
 - 6. Standby generators and automatic transfer switches.
 - 7. Branch circuit panelboards.
- M. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 - 2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
 - 3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

3.03 LOAD-FLOW AND VOLTAGE-DROP STUDY

- A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
 - 1. Determine load-flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
 - 2. Determine load-flow and voltage drop based on 80 percent of the design capacity of the load buses.
 - 3. Prepare the load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.04 MOTOR-STARTING STUDY

- A. Perform a motor-starting study to analyze the transient effect of the system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of the motor starting on the power system stability.
- B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141, and voltage sags so as not to affect the operation of other utilization



equipment on the system supplying the motor.

3.05 POWER SYSTEM DATA

- A. Obtain all data necessary for the conduct of the overcurrent protective device study.
 - 1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
 - 2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
 - 3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.
- B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be conducted by the engineer or their representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
 - 1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 2. Electrical power utility impedance at the service.
 - 3. Power sources and ties.
 - 4. Short-circuit current at each system bus, three-phase and line-to-ground.
 - 5. Full-load current of all loads.
 - 6. Voltage level at each bus.
 - 7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
 - 8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
 - 9. For circuit breakers and fuses, provide manufacturer and model



designation. List type of breaker, type of trip, and available range of settings, SCCR, current rating, and breaker settings.

10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
17. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on the diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
 - d. Generator thermal-damage curve.
 - e. Ratings, types, and settings of utility company's overcurrent protective devices.
 - f. Special overcurrent protective device settings or types stipulated by utility company.
 - g. Time-current-characteristic curves of devices indicated to be coordinated.
 - h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.



- i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
- j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
- k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.06 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.07 DEMONSTRATION

- A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:
 - 1. Acquaint personnel with the fundamentals of operating the power system in normal and emergency modes.
 - 2. Hand out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
 - 3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION



SECTION 26 05 74 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.03 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.04 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Arc-flash study input data, including completed computer program input data sheets.
 - 2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.



- a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Arc-Flash Study Software Developer.
2. For Professional Engineer who will perform the studies or directly supervise work by others.

- ##### B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.
2. Operation and Maintenance Procedures: Provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.07 QUALITY ASSURANCE

- ##### A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.
- ##### B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
 2. Acceptable products:



- a. SKM PowerTools.
 - b. EasyPower.
 - c. ETAP.
 - d. No substitutes.
- C. Arc-Flash Study Specialist Qualifications: Professional Engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer. Acceptable firms:
 - 1. RESA Power Services.
 - 2. Eaton Electrical Service & Systems.
 - 3. Schneider Electric Engineering Services.
 - 4. No substitutes.
- D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 – PRODUCTS

2.01 COMPUTER SOFTWARE DEVELOPERS

- A. Comply with IEEE 1584 and NFPA 70E.
- B. Analytical features of the device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.02 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary.
- B. Study descriptions, purpose, basis, and scope.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Cable size and lengths.



3. Transformer kilovolt ampere (kVA) and voltage ratings.
 4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, and panelboard designations.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 72 "Overcurrent Protective Device Short-Circuit Study."
- F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 26 05 73 "Overcurrent Protective Device Coordination Study."
- G. Arc-Flash Study Output:
1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- H. Incident Energy and Flash Protection Boundary Calculations:
1. Arcing fault magnitude.
 2. Protective device clearing time.
 3. Duration of arc.
 4. Arc-flash boundary.
 5. Working distance.
 6. Incident energy.



7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.
- I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.03 ARC-FLASH WARNING LABELS

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.
- B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
 1. Location designation.
 2. Nominal voltage.
 3. Flash protection boundary.
 4. Hazard risk category.
 5. Incident energy.
 6. Working distance.
 7. Engineering report number, revision number, and issue date.
- C. Labels shall be machine printed, with no field-applied markings.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.02 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies:
 1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output"



Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 72 "Overcurrent Protective Device Short-Circuit Study."

2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 26 05 73 "Overcurrent Protective Device Coordination Study."
- C. Calculate maximum and minimum contributions of fault-current size.
 1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
 2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
- D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.
- E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.
- F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.
- G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall consider the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
 1. Fault contribution from induction motors should not be considered beyond three to five cycles.
 2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).
- H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:
 1. When the circuit breaker is in a separate enclosure.
 2. When the line terminals of the circuit breaker are separate from the work location.



- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.03 POWER SYSTEM DATA

- A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
 1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Architect.
 2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
 3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be conducted by the engineer or their representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
 1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Obtain electrical power utility impedance at the service.
 3. Power sources and ties.
 4. Short-circuit current at each system bus, three-phase and line-to-ground.
 5. Full-load current of all loads.
 6. Voltage level at each bus.
 7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
 8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
 9. For circuit breakers and fuses, provide manufacturer and model



designation. List type of breaker, type of trip, and available range of settings, SCCR, current rating, and breaker settings.

10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.04 LABELING

- A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:
 1. Motor-control center.
 2. Low-voltage switchboard.
 3. Switchgear.
 4. Medium-voltage switch.
 5. Control panel.

3.05 APPLICATION OF WARNING LABELS

- A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.06 DEMONSTRATION

- A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION



SECTION 26 24 16 - PANELBOARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
 - 3. Detail enclosure types include mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
 - 4. Detail bus configuration, current, and voltage ratings.
 - 5. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Component List.
 - 8. Cable terminal sizes.



9. Break layout drawings with dimensions indicated and nameplate designations.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Seismic Qualification Data: Certificates, for panelboards, overcurrent protective devices, accessories, and components, from manufacturer.
- C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Refer to 01 77 00 "Contract Closeout Procedures" for additional requirements.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.
 2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.
 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from a single source from a single manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.09 FIELD CONDITIONS



A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 120 deg F.
 - b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within specified limits.
2. Altitude not exceeding 6600 feet (2000 m).

1.10 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48 "Seismic Controls for Electrical Systems."
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.
- F. Enclosures: Flush or Surface-mounted (as indicated on Panel Schedules), dead-front cabinets.



1. Rated for environmental conditions at the installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 12.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Non-corrosive Liquids: NEMA 250, Type 12.
 2. Height: 84 inches (2.13 m) maximum.
 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
 5. Finishes:
 - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
 6. All multi-section panelboards shall have the same dimensional back box and cabinet front size.
- G. Incoming Mains: Contractor to Determine Location
- H. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 4. Full-Sized Neutral: Equipped with a full-capacity bonding strap for service



entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

- I. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Terminations shall allow use of 75 °C-rated conductors without derating.
 - 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 - 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 - 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
 - 6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- J. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
 - 1. Percentage of Future Space Capacity: 20 percent unless noted otherwise on drawings
- L. Panelboard Short-Circuit Current Rating: Rated for a series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
 - 1. Panelboards rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
 - 2. Panelboards rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.
- M. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.



1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.03 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Eaton.
 2. ABB Industrial Solutions.
 3. Siemens Industry, Inc., Energy Management Division.
 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: Refer to Panel Schedule.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices: Fused switches.



2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton.
 - 2. ABB Industrial Solutions.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Refer to Panel Schedules.
- D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- F. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current-carrying terminals and bus shall remain concealed.
- G. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.

2.05 ELECTRONIC-GRADE PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. ABB Industrial Solutions.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1; with factory-installed, integral SPD; labeled by an NRTL for compliance with UL 67 and UL 1449 after installing SPD.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.



E. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

F. Buses

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
2. Copper equipment and isolated ground buses.

2.06 SURGE PROTECTIVE DEVICES

A. Where factory- installed, internally mounted surge protective devices are provided in accordance with Section 26 43 13, "Surge Protective Devices," list and label panelboards as a complete assembly including surge protective device.

2.07 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long- and short-time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
4. GFCI Circuit Breakers: Single- and double-pole configurations with



Class A ground-fault protection (6-mA trip).

5. Subfeed Circuit Breakers: Vertically mounted.

6. MCCB Features and Accessories:

- a. Standard frame sizes, trip ratings, and number of poles.
- b. Breaker handle indicates tripped status.
- c. UL listed for reverse connection without restrictive line or load ratings.
- d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
- e. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- f. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
- g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in the "on" position.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

2.08 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify the specific purpose with detail sufficient to distinguish it from all other circuits.

2.09 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent



protective device test, inspection, maintenance, and operation.

- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
 - 1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
 - 2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Comply with mounting and anchoring requirements specified in Section 26 05 48



"Seismic Controls for Electrical Systems."

- G. Mount top of panelboard so that the top-most switch or circuit breaker is not higher than 78" (6' – 6") above finished floor or grade.
- H. Mount panelboard cabinet plumb and rigid without distortion of box.
- I. Mount recessed panelboards with fronts uniformly flush with wall finish and matting with back box.
- J. Mount surface-mounted panelboards to steel slotted supports 5/8 inch (16 mm) in depth. Orient steel slotted supports vertically.
- K. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
 - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- M. Install filler plates in unused spaces.
- N. Stub four 1-inch (25 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- O. Stub four 1-inch (25 mm) empty conduits into raised floor space or below slab not on grade.
- P. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- Q. Mount spare fuse cabinet in accessible location.

3.03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."



- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
- C. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- E. Panelboards will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports, including a certified report that identifies panelboards included. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Overcurrent Protection Device Coordination Study."
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.



3.06 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION



SECTION 26 24 19 - MOTOR-CONTROL CENTERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes MCCs for use with ac circuits rated 600 V and less and having the following factory-installed components:
 - 1. Incoming main lugs and OCPDs.
 - 2. Reduced-voltage, solid-state controllers.
 - 3. Feeder-tap units.
 - 4. Surge Protective Devices (SPD).
 - 5. Instrumentation.
 - 6. Auxiliary devices.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of controller and each type of MCC. Include shipping and operating weights, features, performance, electrical ratings, operating characteristics, and furnished specialties and accessories.

1.04 INFORMATIONAL SUBMITTALS

- A. Standard Drawings: For each MCC, as defined in UL 845.
- B. Production Drawings: For each MCC, as defined in UL 845.
- C. Qualification Data: For qualified testing agency.
- D. Product Certificates: For each MCC, from manufacturer.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.



H. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

I. Warranty: Sample of special warranty.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For MCCs, all installed devices, and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 77 00 "Contract Closeout," include the following:

1. Manufacturer's Record Drawings: As defined in UL 845. In addition to requirements specified in UL 845, include field modifications and field-assigned wiring identification incorporated during construction by manufacturer, Contractor, or both.
2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
3. Manufacturer's written instructions for setting field-adjustable overload relays.
4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage, solid-state controllers.
5. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
6. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic



contactor installed.

1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain MCCs and controllers of a single type from single source from single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.
- E. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver MCCs in shipping splits of lengths that can be moved past obstructions in delivery paths.
- B. Handle MCCs according to the following:
 - 1. NEMA ICS 2.3, "Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers Rated Not More Than 600 Volts."
 - 2. NECA 402, "Recommended Practice for Installing and Maintaining Motor Control Centers."
- C. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside MCCs; install temporary electric heating, with at least 250 W per vertical section.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
 - 2. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).



3. Humidity: Less than 95 percent (noncondensing).
 4. Altitude: Exceeding 6600 feet (2000 m), or 3300 feet (1000 m) if MCC includes solid-state devices.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for MCCs, including clearances between MCCs and adjacent surfaces and other items.

1.10 COORDINATION

- A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.
- B. Coordinate features of MCCs, installed units, and accessory devices with remote pilot devices and control circuits to which they connect.
- C. Coordinate features, accessories, and functions of each MCC, each controller, and each installed unit with ratings and characteristics of supply circuits, motors, required control sequences, and duty cycle of motors and loads.

1.11 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. ABB; Control Products.
 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 3. General Electric Company; GE Industrial Systems.
 4. Rockwell Automation, Inc.; Allen-Bradley Brand.
 5. Siemens Energy & Automation, Inc.; Power Distribution.
 6. Square D; a brand of Schneider Electric.
- B. General Requirements for MCCs: Comply with NEMA ICS 18 and UL 845.

2.02 FUNCTIONAL FEATURES



- A. Description: Modular arrangement of main units, controller units, control devices, feeder-tap units, instruments, metering, auxiliary devices, and other items mounted in vertical sections of MCC.
- B. Controller Units: Combination controller units.
 - 1. Install units up to and including Size 3 on drawout mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.
 - 2. Equip units in Type B and Type C MCCs with pull-apart terminal strips for external control connections.
- C. Feeder-Tap Units: Through 225-A rating shall have drawout mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.
- D. Future Units: Compartments fully bused and equipped with guide rails or equivalent, ready for insertion of drawout units.
- E. Spare Units: Installed in compartments indicated "spare."

2.03 INCOMING MAINS

- A. Incoming Mains Location: bottom.
- B. Main Lugs Only: Conductor connectors suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
- C. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.



- b. Long- and short-time pickup levels.
 - c. Long- and short-time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 - 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 - 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
 - 6. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
 - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - d. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 - e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 to 75 percent of rated voltage.
 - f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - g. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
- D. Insulated-Case Circuit Breaker: 100 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.
 - 1. Fixed circuit-breaker mounting.
 - 2. Two-step, stored-energy closing.
 - 3. Standard-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time adjustments.



- c. Ground-fault pickup level, time delay, and I^2t response.
4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
5. Remote trip indication and control.
6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. Control Voltage: 120-V ac.

2.04 COMBINATION CONTROLLERS

A. Reduced-Voltage, Solid-State Controllers:

1. General Requirements for Reduced-Voltage, Solid-State Controllers: Comply with UL 508.
2. Reduced-Voltage, Solid-State Controllers: An integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and keypad, bypass contactor, and overload relay; suitable for use with NEMA MG 1, Design B, polyphase, medium-induction motors.

B. Disconnecting Means and OCPDs:

1. Fusible Disconnecting Means:
 - a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J fuses.
 - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - c. Auxiliary Contacts: NO/NC, arranged to activate before switch blades open.
2. MCP Disconnecting Means:
 - a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
 - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
 - d. NO alarm contact that operates only when MCP has tripped.



- e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.
- 3. MCCB Disconnecting Means:
 - a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
 - b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
 - e. NO alarm contact that operates only when MCCB has tripped.
- 4. Molded-Case Switch Disconnecting Means:
 - a. UL 489, NEMA AB 1, and NEMA AB 3, with in-line fuse block for Class J or L power fuses (depending on ampere rating), providing an interrupting capacity to comply with available fault currents; MCCB with fixed, high-set instantaneous trip only.
 - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - c. Auxiliary contacts "a" and "b" arranged to activate with molded-case switch handle.
 - d. NO alarm contact that operates only when molded-case switch has tripped.
- C. Overload Relays:
 - 1. Melting-Alloy Overload Relays:
 - a. Inverse-time-current characteristic.
 - b. Class 10 tripping characteristic.
 - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - 2. Bimetallic Overload Relays:



- a. Inverse-time-current characteristic.
- b. Class 10 tripping characteristic.
- c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
- d. Ambient compensated.
- e. Automatic resetting.
- 3. Solid-State Overload Relays:
 - a. Switch or dial selectable for motor running overload protection.
 - b. Sensors in each phase.
 - c. Class 10 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
 - e. Analog communication module.
- 4. NC and NO isolated overload alarm contact.
- 5. External overload reset push button.
- D. Control Power:
 - 1. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with control power source of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
 - a. CPT Spare Capacity: 200 VA.

2.05 SURGE PROTECTIVE DEVICES

- A. Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, wired-in, solid-state, parallel-connected, modular with field-replaceable modules type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the MCC short-circuit rating, and with the following features and accessories:
 - 1. Fuses, rated at 200-kA interrupting capacity.
 - 2. Fabrication using bolted compression lugs for internal wiring.



3. Integral disconnect switch.
 4. Redundant suppression circuits.
 5. Redundant replaceable modules.
 6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 7. LED indicator lights for power and protection status.
 8. Audible alarm, with silencing switch, to indicate when protection has failed.
 9. Form-C contacts rated at 5 A and 250-V ac, one NO and one NC, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
 10. Six-digit, transient-event counter set to totalize transient surges.
- B. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.
- C. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
- D. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 -V, three-phase, four-wire circuits shall be as follows:
1. Line to Neutral: 800 V for 480Y/277
 2. Line to Ground: 800 V for 480Y/277.
 3. Neutral to Ground: 800 V for 480Y/277.
- E. Protection modes and UL 1449 SVR for 240-, 480-, or 600-V, three-phase, three-wire, delta circuits shall be as follows:
1. Line to Line: 2000 V for 480 V.
 2. Line to Ground: 1500 V for 480 V.

2.06 INSTRUMENTATION

- A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:
1. PTs: IEEE C57.13; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
 2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; wound type;



single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.

3. CPTs: Dry type, mounted in separate compartments for units larger than 3 kVA.
 4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.
- B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
1. Listed or recognized by a nationally recognized testing laboratory.
 2. Inputs from sensors or 5-A current-transformer secondaries, and potential terminals rated to 600 V.
 3. Switch-selectable digital display of the following values with the indicated maximum accuracy tolerances:
 - a. Phase Currents, Each Phase: Plus or minus 1 percent.
 - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
 - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
 - d. Three-Phase Real Power (Megawatts): Plus or minus 2 percent.
 - e. Three-Phase Reactive Power (Megavars): Plus or minus 2 percent.
 - f. Power Factor: Plus or minus 2 percent.
 - g. Frequency: Plus or minus 0.5 percent.
 - h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
 - i. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.
 - j. Contact devices to operate remote impulse-totalizing demand meter.
 4. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.
- C. Ammeters, Voltmeters, and Power-Factor Meters: ANSI C39.1.



1. Meters: 4-inch (100-mm) diameter or 6 inches (150 mm) square, flush or semiflush, with antiparallax 250-degree scale and external zero adjustment.
 2. Voltmeters: Cover an expanded-scale range of nominal voltage plus 10 percent.
- D. Instrument Switches: Rotary type with off position.
1. Voltmeter Switches: Permit reading of all phase-to-phase voltages and phase-to-neutral voltages where a neutral is included.
 2. Ammeter Switches: Permit reading of current in each phase and maintain current-transformer secondaries in a closed-circuit condition at all times.
- E. Feeder Ammeters: 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale. Meter and transfer device with off position, located on overcurrent device door for feeder circuits, unless otherwise indicated.
- F. Watt-Hour Meters and Wattmeters:
1. Comply with ANSI C12.1.
 2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
 3. Suitable for connection to three- and four-wire circuits.
 4. Potential indicating lamps.
 5. Adjustments for light and full load, phase balance, and power factor.
 6. Four-dial clock register.
 7. Integral demand indicator.
 8. Contact devices to operate remote impulse-totalizing demand meter.
 9. Ratchets to prevent reverse rotation.
 10. Removable meter with drawout test plug.
 11. Semiflush mounted case with matching cover.
 12. Appropriate multiplier tag.
- G. Impulse-Totalizing Demand Meter:
1. Comply with ANSI C12.1.
 2. Suitable for use with MCC watt-hour meter, including two-circuit totalizing



relay.

3. Cyclometer.
4. Four-dial, totalizing kilowatt-hour register.
5. Positive chart drive mechanism.
6. Capillary pen holding a minimum of one month's ink supply.
7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.

2.07 MCC CONTROL POWER

- A. Control Circuits: 120/240-VAC, supplied through secondary panelboard from CPT.

2.08 ENCLOSURES

- A. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.
 1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point
 2. Space-Heater Power Source: Transformer, factory installed in MCC.
- B. Outdoor Enclosures: Type 3R, non-walk-in aisle.
 1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
 2. Enclosure: Downward, rearward sloping roof; for each section, with provisions for padlocking.
 3. Doors: Personnel door at each end of aisle, minimum width of 30 inches (762 mm) opening outwards; with panic hardware and provisions for padlocking.
 4. Accessories: Fluorescent lighting fixtures, ceiling-mounted; wired to a three-way light switch at each end of aisle; GFCI duplex receptacle; emergency battery pack lighting fixture installed on wall of aisle midway between personnel doors.
 5. Walk-in Aisle Heating and Ventilating:
 - a. Factory-installed electric unit heater(s), wall or ceiling mounted, with integral thermostat and disconnect, and with capacities to maintain motor control center interior temperature of 40 deg F (5 deg C) with outside design temperature of 104 deg F (40 deg C).



- b. Factory-installed exhaust fan with capacities to maintain motor control center interior temperature of 100 deg F (38 deg C) with outside design temperature of 23 deg F (minus 5 deg C)
 - c. Ventilating openings complete with replaceable fiberglass air filters.
 - d. Thermostat: Single stage; wired to control heat and exhaust fan.
- 6. Power for Space Heaters, Ventilation, Lighting, and Receptacle: Include CPT and panelboard within the motor control center. Supply voltage shall be 480 VAC.
- C. Compartments: Modular; individual lift-off doors with concealed hinges and quick-captive screw fasteners. Interlocks on units requiring disconnecting means in the off position before door can be opened or closed, except by operating a permissive release device.
- D. Interchangeability: Compartments constructed to allow for removal of units without opening adjacent doors, disconnecting adjacent compartments, or disturbing operation of other units in MCC; same size compartments to permit interchangeability and ready rearrangement of units, such as replacing three single units with a unit requiring three spaces, without cutting or welding.
- E. Wiring Spaces:
 - 1. Vertical wireways in each vertical section for vertical wiring to each unit compartment; supports to hold wiring in place.
 - 2. Horizontal wireways in bottom and top of each vertical section for horizontal wiring between vertical sections; supports to hold wiring in place.

2.09 AUXILIARY DEVICES

- A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
 - 1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty, type.
 - a. Push Buttons: Shrouded types; momentary contact unless otherwise indicated.
 - b. Pilot Lights: LED types; push to test.
 - c. Selector Switches: Rotary type.
 - 2. Elapsed-Time Meters: Heavy duty with digital readout in hours; resettable.



3. Meters: Panel type, 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale and plus or minus 2 percent accuracy with selector switches having an off position.
- B. Reversible NC/NO contactor auxiliary contact(s).
- C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
- D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.
- E. Space heaters, with NC auxiliary contacts, to mitigate condensation in enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.
- F. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.
- G. Cover gaskets for Type 1 enclosures.
- H. Terminals for connecting power factor correction capacitors to the [load side of overload relays.

2.10 CHARACTERISTICS AND RATINGS

- A. Wiring: NEMA ICS 18, Class I-S, Type A, Type B, for starters above Size 3, Type B-D, for starter Size 3 and below.
- B. Control and Load Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.
- C. Nominal System Voltage: 480Y/277 V, three-phase, four-wire.
- D. Short-Circuit Current Rating for Each Unit: Fully rated; 42 kA.
- E. Short-Circuit Current Rating of MCC: Fully rated with its main overcurrent device; 42 kA.
- F. Environmental Ratings:
 1. Ambient Temperature Rating: Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F (40 deg C), with an average value not exceeding 95 deg F (35 deg C) over a 24-hour period.
 2. Ambient Storage Temperature Rating: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C)
 3. Humidity Rating: Less than 95 percent (noncondensing).



4. Altitude Rating: Not exceeding 6600 feet (2000 m), or 3300 feet (1000 m) if MCC includes solid-state devices.
- G. Horizontal and Vertical Bus Bracing (Short-Circuit Current Rating): Match MCC short-circuit current rating.
- H. Main Horizontal and Equipment Ground Buses: Uniform capacity for entire length of MCC's main and vertical sections. Provide for future extensions from both ends.
- I. Vertical Phase and Equipment Ground Buses: Uniform capacity for entire usable height of vertical sections, except for sections incorporating single units.
- J. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, tin plated.
- K. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
- L. Ground Bus: Minimum size required by UL 845, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit equipment grounding conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
- M. Front-Connected, Front-Accessible MCCs:
 1. Main Devices: Drawout mounted.
 2. Controller Units: Drawout and fixed mounted.
 3. Feeder-Tap Units: Drawout and fixed mounted.
 4. Sections front and rear aligned.
- N. Owner Metering Compartment: A separate customer metering compartment and section with front hinged door, metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks.
- O. Bus Transition and Incoming Pull Sections: Matched and aligned with basic MCC.
- P. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of unit.
- Q. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual



bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

- R. Fungus Proofing: Permanent fungicidal treatment for OCPDs and other components including instruments and instrument transformers.

2.11 SOURCE QUALITY CONTROL

- A. MCC Testing: Inspect and test MCCs according to requirements in NEMA ICS 18.
- B. MCCs will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas and surfaces to receive MCCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
- B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Coordinate layout and installation of MCCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Floor-Mounting Controllers: Install MCCs on 4-inch (100-mm) nominal thickness concrete base. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.



4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Seismic Bracing: Comply with requirements specified in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in each fusible switch.
- F. Install fuses in control circuits if not factory installed.
- G. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- I. Comply with NECA 1.

3.03 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for identification of MCC, MCC components, and control wiring.
 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label MCC and each cubicle with engraved nameplate.
 3. Label each enclosure-mounted control and pilot device.
 4. Mark up a set of manufacturer's connection wiring diagrams with field-assigned wiring identifications and return to manufacturer for inclusion in Record Drawings.
- B. Operating Instructions: Frame printed operating instructions for MCCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of MCCs.

3.04 CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers and remote devices and facility's BAS and facility's central-control system.
- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic-control selection devices where applicable.



1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches within enclosed controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.05 CONNECTIONS

- A. Comply with requirements for installation of conduit in Section 26 05 33 "Raceways and Boxes for Electrical Systems." Drawings indicate general arrangement of conduit, fittings, and specialties.
- B. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:
 1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- E. Tests and Inspections:
 1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment]
 2. Test insulation resistance for each enclosed controller element, component, connecting motor supply, feeder, and control circuits.
 3. Test continuity of each circuit.



4. Verify that voltages at controller locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager before starting the motor(s).
 5. Test each motor for proper phase rotation.
 6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multipole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multipole enclosed controller 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
 10. Mark up a set of manufacturer's drawings with all field modifications incorporated during construction and return to manufacturer for inclusion in Record Drawings.
- F. Enclosed controllers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.07 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.



3.08 ADJUSTING

- A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and over-load-relay pickup and trip ranges.
- B. Adjust overload relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.
- C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor name-plate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager before increasing settings.
- D. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage, solid-state controllers.
- E. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Overcurrent Protective Device Coordination Study."

3.09 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.
- B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage, solid-state controllers.

END OF SECTION



SECTION 26 43 13 - SURGE PROTECTION DEVICES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, I-nominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.04 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special warranty.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For SPDs to include in maintenance manuals.

1.06 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.



- B. Comply with NFPA 70.
- C. Comply with UL 1449.
- D. MCOV of the SPD shall be the nominal system voltage.

2.02 SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ABB France.
 - 2. Advanced Protection Technologies Inc. (APT).
 - 3. Eaton Corporation.
 - 4. Emerson Electric Co.
 - 5. GE Zenith Controls.
 - 6. LEA International; Protection Technology Group.
 - 7. Leviton Manufacturing Co., Inc.
 - 8. PowerLogics, Inc.
 - 9. Schneider Electric Industries SAS.
 - 10. Siemens Industry, Inc.
- B. SPDs: Comply with UL 1449, **Type 1**.
- C. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, **Type 1**.
 - 1. SPDs with the following features and accessories:
 - a. Integral disconnect switch.
 - b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
 - c. Indicator light display for protection status.
 - d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
 - e. Surge counter.



- D. Comply with UL 1283.
- E. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than **200 kA**. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- F. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 1200 V for 480Y/277 V.
 - 2. Line to Ground: 1200 V for 480Y/277 V.
 - 3. Line to Line: 2000 V for 480Y/277 V.
- G. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 700 V.
 - 2. Line to Ground: **700 V**.
 - 3. Line to Line: 1000 V.
- H. SCCR: Equal to or exceeding **200 kA**.
- I. I-nominal Rating: 20 kA.

2.03 CONDUCTORS AND CABLES

- A. Power Wiring: Same size as SPD leads, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than **No. 18** AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than **No. 18** AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.



- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Wiring:
 - 1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 - 2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.02 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
 - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
 - 2. Inspect anchorage, alignment, grounding, and clearances.
 - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.03 STARTUP SERVICE

- A. Complete startup checks according to manufacturer's written instructions.
- B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
- C. Energize SPDs after power system has been energized, stabilized, and tested.

3.04 DEMONSTRATION

- A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION



SECTION 26 50 00 – EXTERIOR LIGHTING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior luminaires.

B. Related Requirements:

1. Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" specifies wiring connections installed by this Section.
2. Section 26 05 29 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.
3. Section 26 05 53 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
4. Section 26 05 48 "Seismic Controls for Electrical Systems" specifies seismic requirements for electrical equipment.
5. Section 26 50 00A "Solar Powered CWBF" specifies beacon light warning system for storm-wall.

1.02 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lumens and accessories.
 - a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
6. Photoelectric relays.



7. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

1.03 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires to include in emergency, operation, and maintenance manuals.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Glass and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.05 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with IEEE C2, "National Electrical Safety Code."

1.06 WARRANTY

- A. Contractor shall warrant the materials being supplied to the County against defects under normal use, operation, and service. Refer to Division 00 and Division 01 of the contract documents for warranty and guarantee requirements.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.
 1. Philips Pureforms.
 2. Lithonia Lighting; Acuity Lighting Group, Inc.



3. Cree Edge Series.
4. Equivalent subject to Engineer's approval.

2.02 LED LUMINAIRES

- A. LED luminaires shall provide a continuous and controllable light source. LED luminaire lumen output will be in accordance with the specifications and shall not depreciate more than 20% after 10,000 hours of use. Rated lumen output for LED luminaires to operate in ambient temperature of minus 4°F to 122°F). Luminaires to have minimum life of 100,000 hours.
- B. All LEDs used in the LED luminaires will be of high brightness and proven quality. All LEDs shall be driven digitally with pulse width modulation control to prolong life and maintain consistency of lumen output.
- C. All connections to luminaires will be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- D. Fuse Protections: All power supply outputs will be either fuse-protected or PTC-protected as per Class 2 UL listing. All luminaires will have built-in fuse protection. All power supplies will provide for knockouts for conduit connections or clamp-style connection for the low-voltage wiring.

2.03 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating and free of light leakage under operating conditions. Doors shall be removable for cleaning or replacing lenses.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.



- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and factory-tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

2.04 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

- A. Comply with UL 773 or UL 773A.
- B. Contact Relays: Factory-mounted, single-throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
 - 1. Relay with locking-type receptacle shall comply with ANSI C136.10.
 - 2. Adjustable window slide for adjusting on-off set points.

PART 3 – EXECUTION

3.01 LUMINAIRE INSTALLATION

- A. Fasten luminaire to indicated structural supports.
- B. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
- C. Mounting Requirements
 - 1. Mounting Hardware: Pole-mounted bracket. Rectangular or Round arm.
 - 2. Mounting Height: 22 feet.
 - 3. Roadway Pole: Arm-mounted.



4. Finishes:
 - a. Enclosure: Black or Dark Bronze finish.
 - b. Reflector: Aluminum.
5. Visible variations in metal finishes outside range of approved are unacceptable in adjoining components.

3.02 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 1. Verify operation of photoelectric controls.

END OF SECTION



SECTION 26 50 00A – SOLAR POWERED CONNECTED WARNING BEACON FLASHER (CWBF)

PART 1 – GENERAL

1.01 SUMMARY

- A. A Connected Warning Beacon Flasher System (CWBF) shall be used to increase safety by warning drivers of automatic storm-wall deployment. Solar panels shall be available with top-of-pole or side-of-pole configurations. The Power Module houses the charge controller, flash controller, DC relay, and batteries. The CWBF shall conform to all provisions of the MUTCD, or MUTCDC, where applicable. The CWBF shall be pre-wired to the maximum extent possible.

1.02 QUALITY ASSURANCE

- A. The Manufacturer shall provide a 3-year Limited Warranty. Batteries shall be covered by a 1-year warranty.
- B. The Manufacturer shall be ISO 9001 certified.
- C. Acceptable manufacturer: Carmanah Technologies Inc. or equivalent, subject to approval.
- D. Acceptable model: R247-MX solar Connected Warning Beacon Flasher or equivalent, subject to approval.

PART 2 – PRODUCTS

2.01 MECHANICAL AND ELECTRICAL

- A. The CWBF shall be modular without a centralized controller. Adding other Flasher Modules or accessories shall not necessitate a change in system configuration. A solar simulation shall be provided to verify any additional load that can be supported by the CWBF for reliable year-round operation.
- B. CWBF shall be equipped with an integrated 5-amp DC power supply or relay supplied by manufacturer and provide fault protection against short circuits.
- C. CWBF wiring shall be available off-the-shelf and non-proprietary. All wiring shall be terminated to the power module circuit board.
- D. CWBF Power Module circuit board shall be conformally coated.
- E. CWBF shall be capable of accepting magnetic contact as input for flash control. Relays shall be used in conjunction with CWBF as necessary.
- F. Self-contained and cabinet Power Modules shall be rated to a minimum of NEMA 3R.
- G. Fasteners shall be stainless steel.



2.02 MOUNTING

- A. CWBF shall come from manufacturer with compatible mounting pole or post and shall be capable of mounting standard traffic signs.
- B. Standard mounting options shall not require specialized tools for installation.
- C. Lowest point of configuration shall be a minimum of 3.5' above ground.

2.03 SOLAR CHARGE CONTROLLER

- A. The solar charge controller shall use maximum power point tracking (MPPT).
- B. Charge controller shall be provided by the CWBF manufacturer and feature 3-stage charging with temperature-compensation to prevent battery overcharging in hot weather. Charge controller shall not be an external module or device.
- C. Charge controller shall be reverse polarity protected on the battery and solar inputs.
- D. Charge controller shall be field replaceable.

2.04 POWER MODULES

- A. The Solar Power Module shall be constructed from a minimum 14-gauge aluminum and use an integrated solar panel. No external control cabinet or battery cabinet shall be required.
- B. Module shall not exceed 18.3" in height from the bottom of the adapter fitting to the top of the solar panel. The depth of the module shall not exceed 5.8".
- C. Access to the interior of the module shall be provided by a lid that is hinged on the right edge and is fitted with a foam gasket. The lid shall have an integrated padlockable latch for use with lock shackles up to 1/4".
- D. Module shall have exposed spring-loaded push button terminal blocks for final electrical connections.
- E. Module shall be affixed to the top of pole or side of pole.
- F. The overall module weight without batteries shall not exceed 11 lb. (5 kg) for a 30 W solar panel or 14 lb. (6.4 kg) for a 50 W solar panel.
- G. Module shall be unfinished aluminum or powder coated.

2.05 SOLAR PANEL

- A. Module shall include one 18 V solar panel rated at least 30 Nominal voltage of the solar panel shall be 12 V. Electrical connections on the back of the solar panel shall be contained within an IP65 enclosure that prevents accidental contact with either of the power leads.



- B. Module shall be supplied with a fixed tilt angle of 45 degrees and shall have the ability to be oriented toward the equator with no additional mounting hardware.

2.06 BATTERIES

- A. Module shall include up to two 18 Ah, 12 V nominal sealed valve-regulated AGM lead-acid maintenance-free batteries. Each battery shall be equipped with a 15 A mini blade fuse.
- B. Batteries, in conjunction with recommended CWBF performance, shall be designed for a demonstrable service life of 5 years.
- C. The operating temperature range of the battery shall be -40° to 140°F (-40° to 60°C).
- D. Batteries shall have quick connections to facilitate installation and be readily available from multiple suppliers and non-proprietary.
- E. Individual batteries shall be supported and separated by standoffs.

2.07 FLASHER MODULES

- A. Each CWBF shall come with a minimum of one LED beacon.
- B. The LED beacons shall conform to the Standard of the Manual of Uniform Traffic Control Devices (MUTCD) 2009 with May 2012 Revisions 1 and 2 or TAC guidelines within the MUTCD.
- C. LED beacon shall only require an input of 12 VDC nominal for operation and shall contain its own active electronics, including an LED driver and flasher. LED beacon shall operate out-of-the-box with applicable flash pattern, daytime intensity, and nighttime intensity settings. Configuration switch shall be available to adjust between unison and alternating flash patterns.
- D. Module shall have exposed spring-loaded push button terminal blocks for final electrical connections.
- E. The CWBF shall be capable of driving beacons at ITE-compliant intensities if solar conditions and programming configuration permit.
- F. LED beacon shall be a minimum of 8" in diameter. Lens shall be yellow or red in color.
- G. LED beacon optics shall be premium, UV-resistant polycarbonate.

2.08 SIGNAL HOUSING

- A. The signal housing shall meet the equipment standard of the Institute of Transportation Engineers (ITE) Vehicle Traffic Control Signal Heads (VTCSH) Chapter 2.



- B. The signal head's bracket assembly shall be constructed such that the signal head can be removed easily in the field.
- C. The signal housing must be able to rotate independently from the Power Module or bracket for lens alignment.
- D. Signal housing shall be rated to a minimum of NEMA 3R.
- E. Signal heads shall be capable of being mounted to a post or pole using a separate bracket assembly to facilitate mounting multiple beacons in either vertical, horizontal, or back-to-back (bi-directional) arrangements. Self-contained Power Modules shall also be capable of direct attachment to the top of a signal head.

PART 3 – EXECUTION

3.01 OPERATION

- A. The CWBF shall be configured to operate when signal is received from automatic storm-wall. CWBF shall flash when the storm wall is partially or fully activated. CWBF shall continue to operate until wall is manually reset.
- B. CWBF shall have low-voltage disconnect (LVD) protection to aid in preventing fully discharging the batteries. When in LVD the beacon shall not flash.

3.02 CONFIGURATION

- A. The CWBF shall contain a button to activate a multi-colored status LED for on-site troubleshooting. Status LED shall be capable of displaying:
 - 1. No fault detected.
 - 2. System is charging via solar panel.
 - 3. Fault detected.
 - 4. System is in low-voltage disconnect (LVD).
- B. The CWBF shall determine dusk and dawn times based on location and time of year. Day or night status shall be used for the beacon to apply daytime or nighttime intensity values.
- C. CWBF beacon shall flash using an MUTCD-compliant flash pattern at a rate of not less than 50 or more than 60 times per minute. The illuminated period of each flash shall not be less than one-half and not more than two-thirds of the total cycle.
- D. CWBF shall provide configurable daytime and nighttime intensity settings ranging from 10% to 100% of factory defaults.



3.03 OPTIONS

- A. CWBF shall be equipped with external weather-proof box, including harnessing, for manual activation. Box shall include a toggle switch for continuous activation or beacon off.

3.04 SOLAR SIMULATIONS

- A. Detailed solar simulations shall be provided as evidence that the system is capable of the claimed performance at a specific location. Solar simulations shall be composed of three calculations: Energy Balance, Array-to-Load Ratio (ALR), and Autonomy. The manufacturer or bidder shall provide a detailed analysis of these three calculations in a "Solar Power Report" (SPR).
- B. Monthly average sunlight, night length and temperature data for a specific, declared location shall be from recognized public sources such as the NASA Atmospheric Sciences Data Center.

3.05 ENERGY BALANCE

- A. During a normal 24-hour cycle of operation, a system shall take energy in from the sun and consume energy through the flashing of the beacon and general quiescent power draw. Energy Balance refers to the evaluation of these energy values to determine overall system sustainability and resistance to variances in sunlight and activation load.
- B. Energy Balance calculations comparing Energy-In and Energy-Out shall be performed for the worst month of the year, where "worst month" is determined by the lowest value of Energy-In divided by Energy-Out.

3.06 ENERGY-IN

- A. Energy-In is the total amount of sunlight energy in watt-hours available to the system over a 24-hour period. Energy-In is available to operate the beacon, charge the batteries, or both. Energy-In shall be determined as follows:
 - 1. $\text{Insolation} * \text{Panel Wattage} * \text{shading} * \text{Charging Efficiency} * \text{Battery Charge Acceptance}$
- B. The energy from the solar panel shall be based on available solar radiation at the installation location for the panel's inclination angle. The solar radiation (insolation) values used shall be for the worst month of the calendar year.
- C. Shading from nearby trees, buildings, or other structures unique to a particular location are to be factored-in, and the calculations shall clearly show and justify the de-rating of the solar panel energy input. A photograph showing the sun's path and obstructions it encounters shall be included.
- D. Batteries shall be returned to full or close to full charge by sunset at the end of each day.



3.07 ENERGY-OUT

- A. Energy-Out is the total amount of energy in watt-hours consumed by the system in a 24-hour period of normal operation.
- B. Energy-Out is the sum of quiescent and operating loads, measured in watt-hours, in all circuitry over 24 hours, including:
 - 1. Controller quiescent draw during and between flashes.
 - 2. Wireless quiescent draw calculated over 24 hours.
 - 3. Operating load of beacon at rated intensity per activation. The number of beacons and their electrical voltage, current, and power when lit shall be clearly indicated.
 - 4. Energy adjustments due to LED drive circuit efficiency.
 - 5. The simulations shall clearly detail the flash pattern being used and calculate the duty cycle of the pattern.
 - 6. Calculations shall assume 24-hour continuous flashing unless otherwise noted.

3.08 ARRAY-TO-LOAD RATIO

- A. System Array-to-Load ratio (ALR) shall be calculated as daily available Energy-In divided by daily Energy-Out, as defined above.
- B. Solar simulations shall be calculated demonstrating a minimum ALR of 1.2:1.

3.09 AUTONOMY

- A. CWBF shall be able to operate normally in the absence of solar charging for a minimum of 7 consecutive days.

END OF SECTION



SECTION 27 51 23 – INTERCOMMUNICATIONS AND PROGRAMMING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Materials, equipment fabrication, installation, and tests in conformity with applicable Codes and authorities having jurisdiction for the following:
 - 1. Expand the existing Solano County Jail Intercommunications (IC) System as shown on Drawings.
 - 2. Complete systems are defined as all conduit, raceways, cables, backboxes, intercom stations, etc., needed to achieve a complete and functional system. Also included are all required power supplies, terminal strips, mounts, housings, and interfaces to equipment furnished by others.
 - 3. Coordinate with supplier of gate installer, and other subcontractors to assure proper mounting.
 - 4. Interface new intercom stations as shown on drawings.
 - 5. Provide two-way voice communications between each designated location and its related control station. Each location shall have a dedicated talk path.
 - 6. Station selection to be initiated from touchscreen control panels specified in Section 28 52 13. Provide voice-over-IP, push-to-talk, intercom master speakers and microphones as shown on Drawings.
 - 7. Provide installation, testing, and adjustment for all equipment.
 - 8. Provide written documentation and instructions for system as installed.
 - 9. Provide training to the Owner in the operation, adjustment, servicing, and repair of this system.
- B. Refer to Division 1 and Section 280000 for Submittal, Substitution, and Guarantee requirements.

1.02 RELATED SECTIONS

- A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.



B. Related Sections:

1. Section 28 05 13: Conductors and Cables for Electronic Safety and Security
2. Section 28 05 53: Identification for Electronic Safety and Security
3. Section 28 20 00: Electronic Surveillance
4. Section 28 52 13: Detention Interfaces to Connected Systems
5. Section 28 52 13.15: Computer Based Detention Monitoring and Control Systems

PART 2 - PRODUCTS

2.01 SYSTEM SPECIFICATIONS

- A. Manufacturer's catalog and system numbers of equipment listed in this specification indicate type, quality, and functions of the equipment required, and represent the minimum acceptable standards. The intercom system components shall be manufactured by Harding Instruments, no equal to comply with Solano County standards.

2.02 WIRE AND CABLE

- A. Contractor shall follow the manufacturers' recommendation for cabling. Wire and cable sizes, number of conductors, shielding, or other data listed in this specification or shown on Drawings are a guide to the correct product required to achieve a working system and represent minimum acceptable equipment.
- B. Cables are to be shielded as necessary to preclude any outside noise or interference from entering the cable and degrading system performance.
- C. Cable shall be West Penn, Belden or Mohawk.
- D. Administrator Software
- E. Touchscreen Intercom Master Stations
1. Desktop master station shall be Harding Instruments model TMM-641.
- F. Intercom Call Station
1. Wall-mounted intercom call stations shall be Harding Instruments ICE-320.



2.03 UNINTERRUPTABLE POWER

- A. Provide a minimum of 1 hour UPS battery backup for intercom system equipment. Refer to Section 285200, Part 2.6.

PART 3 - EXECUTION

3.01 REQUIREMENTS

- A. Refer to Section 28 00 00, for requirements regarding As-Built Drawings, Training, Tests and Reports, and Warranty.
- B. Talk paths shall be clear and free of electrical interference or noise. Route cable and conduit clear of power wiring, equipment, or other potential sources of electrical noise.
- C. Adjust volume and gain levels for optimum performance with no audio feedback.

3.02 INSTALLATION

- A. Where possible, flush mount intercom stations.
- B. Where surface mount stations are required, pay particular attention to anchoring requirements as shown on drawings.
- C. The faceplate on surface mounted intercom stations shall not overlap the edge of the back box.

END OF SECTION



SECTION 28 00 00 – ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes general administrative and procedural requirements for Sections defined in Part 1.5 below, and is intended to supplement, not supersede, the requirements specified in Division 1
- B. The Contractor shall be responsible for coordinating the installation of all systems specified in Sections referenced in Part 1.5 below. Contractor shall meet the following minimum qualifications:
 - 1. Possess all applicable Contractor's licenses.
 - 2. Provide with bid a list of five locations in which the contractor has successfully installed similar systems by the same equipment manufacturers. Include location, date of installation, person to contact, and telephone number for each referenced project.

1.02 RELATED SECTIONS

- A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
- B. Related Sections:
 - 1. Section 27 51 23: Intercommunications and Program Systems
 - 2. Section 28 05 13: Conductors and Cables for Electronic Safety and Security
 - 3. Section 28 05 53: Identification for Electronic Safety and Security
 - 4. Section 28 10 00: Access Control
 - 5. Section 28 20 00: Electronic Surveillance
 - 6. Section 28 52 00: Detention Security Systems
 - 7. Section 28 52 13: Detention Interfaces to Connected Systems
 - 8. Section 28 52 13.11: Detention Interfaces to Security Detention, Alarm, and Monitoring Systems

1.03 REFERENCES

- A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest



edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.

- B. Codes: Perform work in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. California Electric Code (CEC).
2. California Building Code (CBC).
3. California Fire Code (CFC).
4. California Mechanical Code (CMC).
5. National, State and any other binding building and fire codes.
6. FCC Regulations:
 - a. Part 15 – Radio Frequency Devices & Radiation Limits
7. Underwriter's Laboratories (UL): Applicable listing and ratings.
 - a. UL 294: Access Control System Units
 - b. UL 1076: Proprietary Burglar Alarm Units and Systems
8. Electronic Industry Association (EIA) testing standards
9. Americans with Disabilities Act (ADA)
10. American Standard Code for Information Interchange (ACSI)
11. American Society for Testing and Materials (ATSM)
12. National Electrical Manufacturers' Association (NEMA)
13. National Fire Protection Association (NFPA)

- C. Make a copy of each document readily available during construction for reference by field personnel.

1.04 DEFINITIONS

- A. In addition to those Definitions of Division 1, the following list of terms as used in this specification shall be defined as follows:

1. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories.



2. "Install": To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, all parts, items, or equipment supplied by contractor. Installation shall be complete and ready for regular operation.
3. "Provide": To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation.
4. "Connect": To install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
5. "As directed": As directed or instructed by the Architect.
6. "Cabling": A combination of all cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling].
7. "VSS": Video Surveillance System

1.05 SYSTEM DESCRIPTION

A. Overview

1. Intercommunications (IC) (Section 27 51 23)
 - a. Expand the existing Solano County Justice Center digital intercom system.
 - b. Connect new intercoms to the existing intercom control equipment.
 - c. Provide a Voice over Internet Protocol (VoIP) intercom master station at each Operator Touchscreen Control Location.
 - d. The new operator Graphic Control Workstations in each control location shall display and identify incoming calls from intercom remote stations.
 - e. It shall be possible to initiate calls from either master or remote stations. The master station controls the talk path.
 - f. Automatic camera call-up switching and display on control workstation monitors upon intercom activation shall be controlled by Programmable Logic Controller system specified in Section 28 52 00 and Graphic Control Software specified in Section 28 52 13.



2. Access Control and Alarm Monitoring System (Section 281300)
 - a. Expand the existing County-wide access control system to monitor card readers, door position switches and other security devices located as shown on the Drawings.
 - b. Contractor shall program the system to permit card holders access to entry gates as authorized by location, time zone, and other parameters as determined by the Owner.
 - c. The access control system shall control electric gate locks and other devices as shown on the Drawings.
 - d. It shall be possible to manually lock or unlock any door locking devices connected to the access control system by means of keyboard commands.
 - e. Display alarm signals and provide control interface to custom monitoring stations, as specified and shown on Drawings. Provide inputs and outputs to the Control Panel and to field devices.
3. Electronic Surveillance (Section 28 20 00)
 - a. Provide new IP cameras and new video workstations to expand the existing Video Surveillance System.
 - b. Provide all cables, fiber, backboxes, color cameras, enclosures, Network Video Recorders/Servers, networking equipment, software, and programming needed to achieve a complete and functional system.
 - c. Provide automatic camera call-up upon activation of alarm detection, associated intercom activation, video motion detection, or input from other security or building systems in a manner that matches the existing controls schema.
 - d. Provide installation, testing, adjustment, and all necessary system programming for all equipment.
 - e. Provide written documentation and instructions for system as installed.
 - f. Provide training to the Owner in the operation, adjustment, servicing, and repair of this system.



4. Detention Interfaces to Connected Systems (Section 28 52 13)
 - a. Connect new vehicle and pedestrian gate control and monitor points to existing PLC-based door control system.
 - b. Provide new touchscreen control workstations in Dispatch and Central Control as shown on the drawings.
 - c. Each Graphic Control workstation shall consist of an under desk-mounted client workstation PC with video display.
 - d. Touchscreen-based operator control panels shall display and control intercom stations, monitor and control doors, and perform other functions as described in the specifications and on the drawings.
5. Detention Interfaces to Security Detention, Alarm, and Monitoring Systems (Section 28 52 13.15)
 - a. Activate the existing site parking area graphic user interface touchscreen slides for the new touchscreen-based operator graphic control panels specified in Section 28 52 13.

B. Drawings

1. Layout: Follow the general layout shown on the Drawings except where other work may conflict with the Drawings.
2. Accuracy: The Drawings show a diagrammatic representation of the system within the constraints of the symbology applied.
3. The Drawings do not fully represent the entire installation for the Security System. Drawings indicate the layout and location of control components, as well as location of security devices, i.e. intercoms, door locks and contacts, cameras, etc. The Drawings do not show all conduits, wire and cabling between every system component, equipment, device, etc.
4. Provide detailed point-to-point diagrams that allow the Contractor to achieve desired results using their own procedures and methods. Submit AutoCAD shop drawings to the Architect for review and approval prior to installation.
5. Obtain shop drawings of other related systems that require integration and coordinate means and methods to complete the system as described and specified in these sections.

1.06 SUBMITTALS



- A. General: Submit required submittal(s) in accordance with General Conditions of the Contract, and Division 1 Submittal Procedures Section 01 33 00
- B. Cover Letter: Include a cover letter stating that the submittal is in full compliance with the requirements of the Contract Documents. List in full the items and data submitted, signed (and stamped, if applicable) by the person who prepared the submittal. Failure to comply with this requirement shall constitute grounds for rejection of submittal.
- C. Submittal Description: Product Data
 - 1. General: Product data submittals must be approved by the Architect prior to release of order for equipment and prior to installation.
 - 2. Quantity: As noted in Division 1 (minimum of four).
 - 3. Format:
 - a. Provide each product data submittal in a 3-ring binder with front cover and spine clear pockets for insertion of the submittal information.
 - b. Clearly label the cover and the spine of each submittal with the following information:
 - 1) Client Name (e.g., "Solano County").
 - 2) Project Number and Contract Number.
 - 3) Project Name and Address (e.g., "Solano County Justice Center").
 - 4) Contractor's Submittal Number.
 - 5) Submittal Title (e.g., "Product Data Submittal For Electronic Surveillance").
 - 6) Specification Section Number (e.g., "Section 28 20 00").
 - 7) Date of Submittal. Format: <month> <day>, <year> (e.g., "January 1, 2023").
 - 8) Contractor Name.
 - c. Include a Table Of Contents at the beginning of the submittal that lists materials by article and paragraph number found in the section and in the order outlined in the specification (e.g., "2.03-b Door Lock").



- d. Include tabbed separators for improved navigation through the submittal.
 - e. Delivery dates for all equipment.
 - 4. Content:
 - a. Product Information:
 - 1) Include product data consisting of manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary). This data shall clearly describe the product's characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color & finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements.
 - 2) Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories, which are included and those which are excluded.
 - 3) Include delivery dates for equipment.
- D. Submittal Description: Shop Drawings
 - 1. General: The Architect must approve shop drawings prior to release of order for equipment and prior to installation.
 - 2. Quantity & Media: Furnish quantity and on media specified in Division 1.
 - 3. Content:
 - a. Floor Plans:
 - 1) Floor and site plans showing the locations of all devices and door furniture associated with each door locations (ex: contacts, rex locks, card readers) and cable routing paths with cable type and quantity called out. Prepare cable schedule if required to simplify sheet plan notation
 - 2) Provide termination information for each device on the plans or in a schedule that identifies the physical connections to the equipment panels. Include the panel address, and the termination point ID that is consistent and reflective of the programming fields.
 - b. Point-to-Point Diagrams: Include all wiring, points of connection and interconnecting devices.



- 1) Include all miscellaneous control relays.
 - 2) Include all devices connected to the system.
 - 3) Identify all conductors on the point-to-point diagrams with the same tag as the installed conductor.
 - c. Block Diagram/Riser Diagram: Show the system components and all conduit and wire types and sizes between them including all cabling interface between termination hardware.
 - d. Installation Details: Include installation details for all devices.
 - e. Calculations:
 - 1) Battery calculations for all batteries.
 - 2) Voltage-drop calculations for all lock circuits and fire alarm Notification Appliance Circuits.
- E. Submittal Description: Labeling Sample
1. Quantity & Media: Furnish quantity indicated in Division 1.
 2. Submit two sets of physical product samples for review and comment by Architect prior to the installation of equipment:
 3. Content:
 - a. Provide panel label
 - b. Provide cable label on a cut length of cable.
- F. Submittal Description: As-Built Drawings
1. Quantity & Media: Submit four sets of As-Built drawings.
 2. Upon receipt of the Architect's review comments, make corrections and furnish the following record drawings:
 - a. One USB Stick.
 - b. One 11x17 set in the Record Documents Manual.
 - c. Drawings become Owner's property and shall maintain all ownership rights.
 3. Format:
 - a. Prepare As-Built drawings using AutoCAD *.dwg format.



- b. All system components (devices, cable routes, etc.) and text shall be plotted at a sufficient line weight to stand out against background information.

4. Content:

- a. Fully represent actual installed conditions and incorporate all revisions made during the course of construction.
- b. Include drawings submitted as part of the Shop Drawing package, plus any additional information required to accurately document installed conditions.
- c. Device addresses & IP address information.
- d. Floor plans shall show:
- e. Locations and identifiers of all devices.
- f. Size, quantity, location, and routes of all pathways (such as cable trays, conduits, J-hangers, and other cable support devices).
- g. Equipment room floor plans scaled at 1/2"=1'-0" showing exact placement of all equipment cabinets/frames, rack bays, and other equipment.
- h. Wall elevations scaled at 1"=1'-0" showing exact placement of all security system hardware.
- i. Installation details.

G. Submittal Description: Operation and Maintenance Manuals

- 1. Quantity: Furnish four O & M Manuals.
- 2. Format:
 - a. Furnish each O & M Manual in a white, 3-ring binder with front cover and spine clear pockets for insertion of the project information.
 - b. Clearly label the cover of each O & M Manual with the following information:
 - 1) Client Name.
 - 2) Project and Contract Numbers.
 - 3) Project Name and Address.



- 4) Manual Name (e.g., “Operation and Maintenance Manual for Video Management System).
 - 5) Date of Submittal. Format: <month> <day>, <year> (e.g., “January 1, 2023”).
 - 6) Contractor Name.
- c. Include a Table Of Contents at the beginning that lists the contents.
- d. Include tabbed separators for improved navigation through the manual.
3. Content:
 - a. Functional Design Manual: Includes a detailed explanation of the operation of the system.
4. Hardware Manual which includes:
 - a. Pictorial parts list and part numbers.
 - b. Pictorial and schematic electrical drawings of wiring systems, including devices, control panels, instrumentation and annunciators.
 - c. Telephone numbers for the authorized parts and service distributors.
 - d. Include all service bulletins.
5. Operator’s Manual which fully explains all procedures and instructions for the operation of the system and includes:
 - a. System start up and shut down procedures.
 - b. Use of system.
 - c. Equipment recovery and restart procedures.
6. Maintenance Manual which includes:
 - a. Instructions for routine maintenance listed for each component, and a multi-page summary of all components’ routine maintenance requirements.
 - b. Detailed instructions for repair of the security system.



- c. A summary of the TCP/IP address used and which system component they are associated with. Include the gateway address, subnet mask, DNS server, and host name information.
 - d. Manufacturer's warranty certificates.
- 7. Record Drawings Manual: 11"x17" prints of Record Drawings, as described above.
- H. Resubmittals: Include a cover letter listing the action taken and revisions made to each product submittal in response to Submittal Review Comments. Resubmittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.
- I. Submittals must be complete. Architect reserves the right to reject any submittals determined to be incomplete.

1.07 QUALITY ASSURANCE

- A. All equipment supplied shall be listed by a nationally recognized test laboratory where applicable.
- B. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- C. All items of a given type shall be the products of the same manufacturer.
- D. All items shall be of the latest technology; no discontinued models or products are acceptable.
- E. The manufacturer, or their Authorized Representative, shall confirm that within 300 miles of the project site there is an established agency which:
 - 1. Stocks a full compliment of parts
 - 2. Offers service during normal working hours as well as emergency service on all equipment to be furnished
 - 3. Will supply parts and service without delay and at reasonable cost.
 - 4. Contractor shall be capable of performing service or maintenance work on these specified or accepted systems. Contractor shall be factory-certified where such certification is available.



1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Do not deliver products to the site until protected storage space is available. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.
2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels (name of the manufacturer, product name, type, grade, UL classification, etc.) intact.
3. Replace materials damaged during shipping at no cost to the Owner.

B. Storage

1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.
2. Comply with manufacturer's requirements for each product. Comply with recommended procedures, precautions or remedies as described in the Material Safety Data Sheets (MSDS) as applicable.
3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
4. Storage outdoors covered by rainproof material is not acceptable.
5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling

1. Handle in accordance with manufacturer's written instructions.
2. Damaged equipment shall not be installed.
3. Replace damaged equipment at no cost to the Owner.
4. Handle with care to prevent internal component damage, breakage, denting, and scoring.

1.09 SUBSTITUTIONS

- A. All materials and equipment shall conform to these specifications. No substitute materials may be used, unless previously accepted in writing by the Architect.
- B. Manufacturers listed as acceptable are normally engaged in the type of work specified. The listing of equipment part numbers or types of systems by specific



manufacturers is to establish the performance quality, type, and parameters of the equipment and material specified. The equipment shall be as specified or equal products.

1.10 WARRANTY

- A. Installation, equipment, and all parts and labor are guaranteed by Contractor and manufacturer for one year from written notification of acceptance by the Architect.
- B. The installing Contractor shall provide, upon notification of a problem, a field service technician to correct the problem within 24 hours of notification.
- C. At least 60 days prior to expiration of guarantee, provide maintenance contract proposals for a second year of service for each system to Architect.
- D. Warranty shall be extended as described in 3.6 H, below.

PART 2 - PRODUCTS

2.01 SECURITY SYSTEM PRODUCTS

- A. Refer to individual Security System sub-sections for product details.

2.02 SPARE PARTS

- A. Prior to completion of the job, provide spare parts to Owner as detailed in each System sub-section.

PART 3 - EXECUTION

3.01 REQUIREMENTS

- A. Systems shall be complete and operational in all respects.
- B. Contractor shall provide all conduit, conductors, etc. for all building Systems. All wiring shall be in conduit unless shown otherwise on the drawings.
- C. Wiring and conduit shown on drawings represents a minimum requirement. Contractor shall furnish and install all wiring and conduit recommended by submitted system manufacturers' for optimum system performance at no additional cost to the Owner.
- D. Connect power to Systems as required.
- E. All equipment, junction boxes, terminal cans, etc. shall be installed utilizing tamper proof mounting hardware. Provide a minimum of 2 driver bits or hand tools for each type of security fastener provided.



- F. Provide seismic restraint for all equipment, including equipment racks, consoles, etc. Refer to Division 26 for seismic restraint requirements.
- G. Refer to individual Security System sub-sections for additional installation requirements.

3.02 PRE-INSTALLATION TEST

- A. Prior to the replacement or demolition of any existing equipment, perform a complete pre-installation systems test of all devices associated with the security electronics system in the presence of the Owner and Architect. Document deficiencies of all devices that are included in this system upgrade and submit this list to the Architect for review. The Architect shall determine on a device-by-device basis whether the corrective action for deficient equipment will be undertaken by the Contractor as additional work under this contract, or by the Owner.
- B. As a part of the pre-installation testing, the contractor shall include the cleaning of any obstructions inserted between the speaker grille and the interior speaker cones for all facility intercoms.

3.03 TRAINING

- A. As a part of this contract, provide training as described herein and detailed under each System sub-section.
- B. Training shall be by engineers or technicians highly skilled in the systems and certified by manufacturer as qualified to train in each system.
- C. Training shall be conducted at dates and times directed by the Architect. Initial training shall be provided for the security director and consultant. Upon their approval, a second training session shall be provided for security officers. An additional training session for officers shall be provided within the first year after system acceptance. Provide specific training sessions for Owner's maintenance personnel. After-hours training shall be provided at no additional cost if requested by the Owner. All training shall be video recorded by the contractor and provided to the Owner on DVD media in MPEG-4, AVI, or DVD movie format.
- D. Verification of completion of training is required by the Architect prior to release of retention compensation.

3.04 AS-BUILT DRAWINGS

- A. Maintain a complete set of prints of shop drawings of the work forming a part of the Security Systems. As work is installed, carefully draw on prints, in colored pencil, correct location of work including depth of underground runs, if any, with dimensions from permanent walls, walks, etc. Wiring diagrams and details shall be included.



- B. Upon completion of the project, transfer this information to reproducible drawings and electronics drawing files in AutoCAD format, and submit to the Architect.
- C. As-built drawings shall be provided one (1) PDF electronic file, to the Architect. Provide One (1) complete full-size printed set to remain on the job site in folders secured inside the electronic racks.

3.05 PROGRAMMING

- A. Provide initial programming for all applicable systems. Programming shall include, but not be limited to:
 - 1. English-language description of each alarm and PLC function.
 - 2. Operator Touchscreen Control Panel design and programming.
 - 3. Custom audio message recording and programming.
- B. Submit to the Architect for Architect's review proposed programming, including device names and descriptions, timings, sequence of operations, sample audio messages, etc.
- C. Upon Architect's request, each system shall be reprogrammed by the Contractor one time during the warranty period at no additional cost.
- D. At system acceptance, the Owner shall retain Ownership of all installed software and custom software programming installed as a part of this project
- E. After system acceptance, provide the Owner with all copies of installation software and software manuals for every software program installed on the system.
- F. Provide the following copies of the software programming installed for this project on a USB stick or similar portable data storage device to the Owner:
 - 1. One complete copy of the full software development environment (source code with remark statements) for the operator interface software installed on each touchscreen-based graphic control panel.
 - 2. One complete copy of the final, uncompiled PLC software programming, with programming, for each PLC location.
 - 3. A software backup of the intercom system runtime programming.
 - 4. A software backup copy of the video surveillance system runtime programming.

3.06 ACCEPTANCE TESTING AND REPORTS

- A. There are two distinct types of tests for which the Contractor is responsible:



1. The first type is the Pre-functional Performance Test. These tests ensure that all equipment, wiring, and systems are installed in accordance with the Specifications, Drawings, and Manufacturers' requirements.
 2. The second type of test is the Functional Performance Test. These tests ensure that all equipment and systems operate in accordance with design intent. These are dynamic tests, and test the systems through all possible modes of operation.
- B. Provide written testing plan describing proposed duration and schedule for performing pre-functional performance test and functional performance test in spreadsheet format listing each and every device, cable/wire, and software point to be tested. Submit within Sixty (60) days of Notice to Proceed for project the testing plans for approval prior to commissioning and acceptance testing.
- C. Perform systems tests using personnel who have attended a manufacturer's training school for installation and testing of the systems as described above. Perform testing with the test instruments as required by the manufacturer; testing by means other than the manufacturer's procedures will not be acceptable unless agreed to by the Owner, Architect, and manufacturer.
- D. Upon completion of the installation of the Security Systems, the contractor shall perform 100% testing and submit pre-functional reports including, but not limited to, the following information in spreadsheet format:
1. A complete list of all equipment installed, including serial numbers of major components and warranties.
 2. Certification that all equipment is properly installed and functional, and conforms with contract Specifications and drawings.
 3. Test reports of all inputs and outputs, devices, and equipment.
 4. Test technician's name, company, and dates of test.
- E. Following review of the test report by the Architect, the contractor shall perform a functional test of all Security System equipment in the presence of the Owner and Architect. Test shall include performance tests of each device, switch, control unit, power supply, battery standby unit, monitor panel, controller, printer, and all other equipment and material required by the contract.
- F. At a minimum, perform tests to demonstrate that:
1. All systems are free from grounding and open circuits.
 2. Each alarm-initiating device consistently functions as specified and produces the specified alarm actions.



3. An abnormal condition of any circuit or device required to be electrically supervised will result in activating the specified trouble or tamper alarm signal.
 4. Systems operate properly during and while on emergency generator power.
 5. Alarm signals are audible at the monitor.
 6. The system is operable under specified trouble conditions.
 7. All software functions properly as specified, and all equipment is fully programmed. The contractor shall be responsible for programming system English-language descriptors as specified by the Architect.
 8. System as-built drawings correspond with actual installation.
- G. Sixty (60) days prior to expiration of warranty, Contractor shall retest all systems as described above, and submit a test report of findings. All items covered by warranty shall be corrected immediately. Warranty remains in effect until the Contractor corrects 100% of defective items.
- H. Provide all software and current files, printed ladder-logic files, and access codes for all programmable equipment. Provide specific 1-on-1 training to Marin County Maintenance department on the implementation of these software files.

END OF SECTION



SECTION 28 05 13 – CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.01 SUMMARY

- A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working security system installation, as described in these specifications.
- B. Section Includes:
 - 1. Wiring and cable
- C. Related Sections:
 - 1. Consult other Divisions; determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
 - 2. Section 27 51 23: Intercommunications and Program Systems
 - 3. Section 28 00 00: Electronic Safety and Security
 - 4. Section 28 05 53: Identification for Electronic Safety and Security
 - 5. Section 28 10 00: Access Control
 - 6. Section 28 20 00: Electronic Surveillance
 - 7. Section 28 52 13: Detention Interfaces to Connected Systems
 - 8. Section 28 52 13.15: Detention Interfaces to Security Detention, Alarm, and Monitoring

1.02 SYSTEM DESCRIPTION

- A. Backbone Cabling
 - 1. The Backbone Cabling includes twisted pair and fiber cabling.
- B. Horizontal Cabling
 - 1. The Horizontal Cabling, in general, consists of multiple 4-pair CAT6A UTP cables to each outlet. Refer to the Drawings for specific requirements.
- C. Testing of a completed Telecommunications Cabling System, including:



1. Procedures Submittals
2. Equipment Submittals
3. Testing Requirements:
4. Record Documents, including test reports.
5. Fiber optic passive link segment(s). Refer to Table 28 05 13-1.1:

Table 28 05 13-1.1: Tests For Fiber Optic Passive Link Segments

Subsystem	Type	Test	Direction	Wavelength
Backbone	Multimode	Characterization	Both	850nm and 1300nm
Backbone	Singlemode	Characterization	Both	1310nm and 1550nm
Backbone	Multimode	Passive Link Ins. Loss	One	850nm and 1300nm
Backbone	Singlemode	Passive Link Ins. Loss	One	1310nm and 1550nm

6. Multipair/UTP cabling. Refer to Table 28 05 13-1.2:

Table 28 05 13-1.2: Tests For Multipair/UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Backbone	Riser	Wire map & length	-	-
Horizontal	CAT6	Category 6	Permanent Link	Per TIA/EIA-568-B.2-1

1.03 SUBMITTALS

- A. Submit in accordance with the requirements of Section 28 00 00: Electronic Safety and Security, the following items:
- B. Preconstruction Submittal Requirements:
 1. Testing Procedures Submittal, describing step-by-step procedures used by the field technicians.
 2. Product Submittal, including cut sheets of testing equipment to be used (note all software/firmware versions as applicable) and certificate of last calibration.
 3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for other Sections.
- C. Closeout Submittal Requirements:
 1. Record Documents.
- D. Submittal Description: Record Documents



1. Test Reports: Record documents submittal shall include test reports showing the following information:
 - a. Title Page, including:
 - b. Client Name
 - c. Project Name
 - d. Project Address
 - e. General Contractor name / Telecommunications Installer name
 - f. Date of Submittal
 - g. Individual tabs which break down the test results by building, and then by telecommunications room
 - h. All Backbone Fiber Optic "Post Installation" Passive Link Attenuation test results (utilize the forms provided in Part 4 of this specification for documentation of test results if the tester used does not have data storage capabilities) and Fiber Optic OTDR test results.
 - i. All Backbone UTP test results
 - j. All Horizontal cable test results, per cable
2. Furnish all test results electronically in their native data format and an exported Microsoft Excel compatible format.
 - a. Include all necessary software to allow viewing and printing of individual test results.

PART 2 - PRODUCTS

2.01 WIRE AND CABLE

A. General

1. Provide all conduit required for installation. All security electronics system wiring shall be in conduit
2. Do not share conduits with fire alarm or telecommunications systems.
3. Provide required wire and cable sized to allow for voltage drop on long runs and effectively shielded as required to allow the routing of 12 & 24V power and audio signal cable in the same conduit without interference or signal noise.



4. Cable installed outdoors or in underground conduit shall contain a PVC or Polyethylene jacket, flooded to prevent water intrusion.
5. Cables installed outdoors or in underground conduit that transition into the building shall contain a plenum-rated (type CMP) jacket and contain water block material to prevent water intrusion.
6. Cables installed indoors shall contain a plenum rated jacket (type CMP).
7. Manufacturers:
 - a. Westpenn
 - b. Belden
 - c. Commscope

2.02 SURFACE RACEWAYS FOR COMMUNICATION SYSTEMS

A. Performance and Design Requirements:

1. Raceway shall meet UL requirements for crush resistance to 300 lb (136 kg) distributed load.
2. Raceway shall have a UL/CSA rating of 600 volts safe operating range.
3. Raceway shall exceed all mechanical and environmental requirements of UL 5A, and shall be UL Listed and CSA certified.

B. Raceway, Non-Metallic:

1. Raceway material shall be a UV-stabilized polyvinyl chloride (PVC) compound, with UL94-V0 flammability rating.

C. Raceway, Metal:

1. Metal raceway, cover, surface boxes, shall be a formed steel construction with a thickness of .040 inch (1 mm), and zinc plated. Related fittings shall be galvanized on all surfaces.

D. Raceway, Aluminum:

1. Raceway base and cover shall be an extruded aluminum construction with satin anodized finish on all surfaces.
2. Extruded raceway base and cover shall be made of 6063-T5 aluminum alloy, with a nominal wall thickness of .080 inch (2 mm).



2.03 RACKS, FRAMES AND ENCLOSURES

A. Racks and Frames:

1. Communications racks shall be UL LISTED 7N69.
2. Product: Design shall be a structural aluminum construction, having two 3-inches (76 mm) wide vertical rail channels with a two-piece angle base and two top angle frame members. Rack shall consist of: (2) vertical rails, (2) base angles, (1) assembly hardware kit, (2) top angles, and (20) #12-24 dog point machine screws for panel mounting. As manufactured by Quest Manufacturing.
 - a. "C" Channel Vertical Cable Organizers and covers as scheduled.
 - b. "Z" Channel Vertical Cable Organizers and covers as scheduled.
 - c. Cable Routing Gates as scheduled.

2.04 TERMINATION BLOCKS AND PATCH PANELS

A. Category 6 Termination Performance and Design Requirements:

1. Category 6-110 termination shall meet or exceed Category 6 transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA-568-C.2.
2. 6-110 termination shall be UL LISTED 1863.
3. 6-110 termination shall exceed IEEE 802.3af DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.
4. 6-110 termination shall error free Gigabit Ethernet performance to IEEE 802.3ab.
5. 6-110 termination shall meet or exceed the 4-connector channel performance requirements of Category 6, per the ANSI/TIA/EIA-568-C.2.
6. Product: 110 Blocks, Category 6 as manufactured by Siemon.
7. Product: 110 Blocks, Wall Mount, Category 6 as manufactured by Hubbell-Premise, Inc.



2.05 ETHERNET COPPER NETWORK CABLING

- A. Category 6A station cable. 4-pair unshielded twisted pair (UTP). 23 AWG. Cable to meet the performance characteristics of Category 6A to 450 MHz. UL Listed CMP. Jacket color: Purple. General Cable model Genspeed 6000.
- B. Category 6A cable installed in underground applications shall be listed for outdoor use and shall implement gell-filled construction to prevent moisture mitigation in underground and wet applications

2.06 FACEPLATES AND CONNECTORS

- A. Faceplates: Faceplates shall be constructed of high impact, UL94 V-0 rated thermoplastic. Faceplates shall be UL LISTED 1863 and CSA certified.
 - 1. Product: Rear-Loading as manufactured by Hubbell-Premise, Inc.
 - 2. Product: Front-Loading as manufactured by Hubbell-Premise, Inc.
 - 3. Product: Angled as manufactured by Hubbell-Premise, Inc.
 - 4. Product: Frames, 106 Duplex as manufactured by Hubbell-Premise, Inc.
 - 5. Product: Frames, Style Line as manufactured by Hubbell-Premise, Inc.
 - 6. Product: Modular Furniture as manufactured by Hubbell-Premise, Inc.
 - 7. Product: Surface Housings as manufactured by Hubbell-Premise, Inc.
 - 8. Product: Surface Boxes as manufactured by Hubbell-Premise, Inc.
 - 9. Product: Tamper-Resistant as manufactured by Hubbell-Premise, Inc.
 - 10. Product: AMO Housings as manufactured by Hubbell-Premise, Inc.
 - 11. Product: OFPPL Housings as manufactured by Hubbell-Premise, Inc.

2.07 PATCH CORDS, STATION CORDS AND CROSS CONNECT WIRES

- A. Category 6A:
 - 1. Design Requirements:
 - a. Cable shall be Plenum rated.
 - b. Plug dimensions and function shall comply with FCC 47, Part 68.5.
 - c. Patch cords shall have a snag-less feature, integral to the strain relief boot on each end. Strain relief boot shall be over-molded



PVC, flush with the plug exterior, and color matched to the cable jacket.

- d. Category 6A patch cords shall be backward compatible with existing Category 3 and Category 5 cabling systems for fit, form, and function.

2. Performance Requirements:

- a. Category 6A patch cords shall be channel performance balanced with category 6 jacks, patch panels, and punch-down blocks.
- b. Modular plug shall be rated for 750 insertions.
- c. Category 6A patch cords shall meet or exceed Category 6A component transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA-568-C.2 standard.
- d. Patch cords shall exceed IEEE 802.3 DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.
- e. Category 6A patch cords shall meet or exceed the 4-connector channel transmission performance requirements of Category 6A, per ANSI/TIA/EIA-568-C.2 standard.
- f. The 4-connector channel test configuration shall utilize Category 6A patch panels, blocks, and jacks, with Category 6A patch cords, all from the same manufacturer, with qualified Category 6A cable.

2.08 FIBER OPTIC CABLING

A. Application:

- 1. Cable shall be suitable for indoor installation, between floors in vertical riser system, under access flooring, and through overhead ceiling space (in cable tray, conduit, & hangers).
- 2. Cable shall exhibit stable performance in a building environment. The optical transmission performance of the fiber shall not be significantly affected by environmental fluctuations, installation, or aging.
- 3. Materials used in the cable shall not emit hydrogen in quantities that will increase attenuation.

B. Single Mode fiber strands shall meet or exceed the following geometry criteria:

- 1. Core diameter = ≥ 4 m radius of curvature.
- 2. Cladding diameter = $125\ \mu\text{m}$, $\pm 0.7\ \mu\text{m}$.



3. Core/Cladding Concentricity = $\leq 0.5 \mu\text{m}$.
 4. Cladding Non-Circularity = $\leq 0.7\%$.
- C. Single Mode fiber strands shall meet or exceed the following performance criteria:
1. Numerical Aperture = 1310nm: 0.14.
 2. Effective Group Index of Refraction = 1310nm:1.4670; 1550nm:1.4677.
 3. Fatigue Resistance Parameter = 20.
 4. Coating Strip Force = Dry: 0.6lbs (3N).
 5. Rayleigh Backscatter Coefficient (for 1ns Pulse Width) = 1310nm:-77dB; 1550nm:-82dB
- D. Manufacturer: Corning "ZBL" series cables, or equal.

2.09 TERMINATION EQUIPMENT

- A. Twisted Pair Cabling Patch Panel
1. Patch panel. 48-port. 19-inch rack mountable. 2U. Category 6A. Panduit model CPP48WBL.
- B. Fiber Optic Patch Panels
1. Passive fiber optic physical equipment and apparatus used in interconnecting and cross-connecting fiber optic cables shall possess a minimum fire resistant rating of UL94V-1.
 2. The equipment, apparatus, and material for fiber optic equipment and apparatus shall conform to existing OSHA Health and Safety Laws. The equipment and apparatus shall have provision for the application of safety labels such as laser identification or warning labels as required by system considerations.
 3. Fiber optic patch panel shall be a fully assembled rack-mounted fiber optic enclosed housing for protecting, storing and organizing the termination of the fiber cable and all fiber strands at each end of the cable. The patch panel shall include an integrated patching facility.
 4. "Fully assembled" shall include all required installation & mounting components, and include accessories such as connector panels, coupling adapters, etc. for a complete installation.
 5. The fiber patch panel must:



- a. Provide means of strain relief and support of the specified cables.
 - b. Contain slack storage facilities for fiber slack.
 - c. Provide patch cord management.
6. Manufacturer: Uniprise (by CommScope)
- a. #RFE-FXG-EMT/1U; 1U fiber shelf, accepts 4 adapter plates
 - b. #SFA-LC06-BL; adapter plate – 6 simplex LC singlemode adapters, blue

2.10 FIBER OPTIC CONNECTORS

A. Multimode Fiber Optic Connectors – LC Type

1. Materials:
 - a. Ferrule: ceramic (zirconia or alumina) with pre-radiused finish/face.
 - b. Connector housing: plastic.
2. Connector shall have an integral strain relief feature, including a bend limiting rear boot.
3. Connectors shall be aqua.
4. Connectors shall be installable via either epoxy or anaerobic method.
5. Manufacturer: Corning Cable Systems, or equal.
 - a. #95-200-99; LC connector, Single Mode.

2.11 LABELS

A. Labels for Backbone ISP Cables

1. General: Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer. Labels shall be adhesive backed and have a self-laminating feature.
2. Printable Area: 2" x 0.5", minimum.
3. Color: White.
4. Manufacturer: Panduit, or equal.
 - a. #LJSL7-Y3-1; laser/ink jet labels for cable diameters 0.16"-0.32", white



- b. #LJSL8-Y3-1; laser/ink jet labels for cable diameters 0.31"-0.69", white
- c. #LJSL19-Y3-1; laser/ink jet labels for cable diameters 0.31"-1.42", white

2.12 TESTING EQUIPMENT

A. Fiber Optic Light Source

- 1. All connection interfaces shall be factory installed. No field-configurable adapters will be allowed at the light source.
- 2. Wavelengths output shall be continuous.
- 3. The light sources may contain internal lenses, pigtails, and modal conditioners, provided they meet the launch conditions as described in "Post-Installation" Passive Link Attenuation Testing Procedures. Refer to PART 3 – EXECUTION of this Section.
- 4. Equipment shall be factory-calibrated within 12 months of testing date.
- 5. Equipment:
 - a. Agilent Technologies WireScope 350 test set
 - 1) #450-1070 Fiber SmartProbe testing adapter, multimode 850nm.
 - 2) #450-1080 Fiber SmartProbe testing adapter, multimode 1300nm.
 - 3) #450-2020 Fiber SmartProbe testing adapter, singlemode 1310nm.
 - 4) ScopeData management software (version 5.20 or higher).
 - b. Corning Cable Systems
 - 1) #OS-301 light source
 - 2) #OS-302 light source
 - 3) #OS-100D light source
 - c. Fluke Networks DSP-4300 test set
 - 1) #DSP-4300; "CableAnalyzer" test kit, loaded with firmware version 3.0.4.



- 2) #DSP-FTA420S; 'Multimode' fiber testing adapter, LED-based (850nm, 1300nm).
- 3) #DSP-FTA430S; 'Singlemode' fiber testing adapter, LASER-based (1310nm, 1550nm).
- 4) #DSP-FTA440S; 'Gigabit' fiber testing adapter, VCSEL-based (multimode @ 850nm and singlemode @ 1310nm).
- 5) LinkWare; "LinkWare" management software (latest version).

d. Laser Precision #5150 test set

B. Fiber Optic Power Meter

1. The power meter for testing must be capable of measuring relative or absolute power, and must be independent of modal distributions.
2. All power meters used must be calibrated and traceable to the National Bureau of Standards.
3. All power meters used shall have the following performance:
 - a. Dynamic range of 0dBm to -40dBm, minimum.
 - b. Accuracy of +/- 0.2dB.
4. Equipment shall be factory-calibrated within 12 months of testing date.
5. Equipment:
 - a. Agilent Technologies WireScope 350 test set
 - 1) #450-1070 Fiber SmartProbe testing adapter, multimode 850nm.
 - 2) #450-1080 Fiber SmartProbe testing adapter, multimode 1300nm.
 - 3) #450-2020 Fiber SmartProbe testing adapter, singlemode 1310nm.
 - 4) ScopeData management software (version 5.20).
 - b. Corning Cable Systems
 - 1) #OTS-210 power meter, with data storage capacity.
 - 2) #OTS-310 power meter, with data storage capacity.



- c. Laser Precision #5025 test set

C. Fiber Optic Test Cords

1. Single mode Fiber Optic Test Cord

- a. The fiber of the single mode test cord(s) shall have the core diameter and numerical aperture nominally equal to that of the multimode fiber optic passive link.
- b. The length of test cords used for insertion loss testing shall be between 1m and 5m.
- c. The connectors of the test cords shall be compatible with the connector types of the light source and the power meter.
 - 1) The connector of the test cords shall be that which the light source accepts.
- d. The connectors shall exhibit less than or equal to 0.5dB loss per connection at 1310nm, as measured per FOTP-171 D2.

D. Category 6A Horizontal Cable Tester

- 1. Equipment shall meet TIA/EIA-568B.2 Addendum 1 requirements for Level III accuracy.
- 2. Test Standards (minimum): TIA Category 6A (per TIA/EIA-568B.2 Addendum 1); ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-T, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5
- 3. Areas of Test Measurement (minimum): Wire Map; Length; Insertion Loss; Near End Crosstalk (NEXT) loss, at both master unit and remote unit; Power Sum NEXT (PSNEXT) loss, at both master unit and remote unit; Equal Level Far End Crosstalk (ELFEXT), at both master unit and remote unit; Power Sum ELFEXT, at both master unit and remote unit; Return Loss (RL), at both master unit and remote unit; Propagation Delay and Delay Skew; Attenuation-to-Crosstalk Ratio (ACR), at both master unit and remote unit; Power Sum ACR (PSACR), at both master unit and remote unit; Characteristic Impedance; DC Loop Resistance.
- 4. Equipment: Agilent Technologies
 - a. #N2600A-100; "WireScope 350" test kit (main unit, remote unit, CAT6 permanent link probe, CAT6 channel probe, accessories), loaded with firmware version 3.1.1.
 - b. "ScopeData Pro" reporting and documentation software latest version.



5. Equipment: Fluke Networks

- a. #DTX-1200 or #DTX-1800; "DTX CableAnalyzer" test kit (main unit, remote unit, CAT6 permanent link adapters, CAT6 channel adapters, accessories), loaded with latest version of firmware.
- b. #DSP-4300; "CableAnalyzer" test kit (main unit, remote unit, CAT6 permanent link adapters, CAT6 channel adapters, accessories), loaded with firmware version 3.0.4.
- c. "LinkWare" reporting and documentation software (version 1.1 or higher)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Identify all wire and cable clearly with permanent labels wrapped about the full circumference within one (1) inch of each connection. Indicate the number designated on the associated field or shop drawings or run sheet, as applies. Assign wire or cable designations consistently throughout a given system; i.e., each wire or cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations. Additionally, provide labels where wire and cable first enter and exit from conduit, junction or distribution boxes; labels shall be located within six (6) inches of the point of exit. Labels shall be by Brady, Thomas and Betts, or equal.
- B. Secure all wire and cable run vertically in conduit for continuous distances greater than thirty (30) feet at the vertical run terminations. Non-coaxial cables shall be secured by screw-flange nylon cable ties or similar approved devices, Thomas and Betts or equal. Symmetrical clamping devices with split, circular or other wire conforming, nonmetallic bushings shall be provided for all other cables.
- C. All wire and cable shall be continuous and splice-free for the entire length of run between designated connections or terminations.
- D. Make all connections to screw-type barrier strips on panels and with insulated crimp-type spade lugs when appropriate. Size all lugs properly to assure high electrical integrity, i.e., low resistance connections.
- E. Lace, tie or harness wire or cable as required herein, and in accordance with accepted professional practice. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections; no wire or cable shall be supported by a connection point.
- F. Wiring for shielding certain conductors from others or routing in separate raceways, shall be as recommended by the manufacturer's current requirements.



- G. All wiring shall be installed in a continuous steel conduit system and shall be of the size recommended by the equipment supplier.
- H. Provide all necessary tie wires.
- I. Label all cables at both ends of a run and within all pull and junction boxes using machine generated wrap-around labels.
- J. Follow manufacturers recommended guidelines for installation.

3.02 BACKBONE FIBER OPTIC CHARACTERIZATION TESTING

- A. Test fiber optic passive links per "Base Bid Requirements" in Part 1 of this Section.
- B. Precautions
 - 1. Adhere to the equipment manufacturer's instructions during testing activities.
 - 2. Prior to any testing activity or any measurements taken, complete the following activities:
 - a. Ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for however long it takes to bring the test equipment to reach room temp).
 - b. Clean all launch cords and system cords (if applicable) connectors and all adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
 - 3. Do not power off OTDR's light source during testing activity.
 - 4. Do not remove launch cord from the OTDR's light source at any time (unless the testing is complete or the equipment is being put away for the evening, or during trouble shooting).
 - 5. Do not bend the launch cord smaller than 20 times the cord diameter during testing activities (this may induce loss into the cord reducing the accuracy of the measurement).
 - 6. Fully charge power source before each day's testing activity, if applicable.
- C. "Post-Installation" Characterization Testing Procedures
 - 1. Equipment settings / measurement parameters:
 - a. Index of Refraction: match cable-under-test fiber parameters; default settings as follows:



Singlemode	SYSTIMAX	1.466 @ 1310nm	1.467 @ 1550nm
	Corning SMF-28	1.4675 @ 1310nm	1.4681 @ 1550nm

b. Pulse Width: multimode: 20ns; singlemode: 50 ns.

Singlemode 10 ns for cable lengths up to 2,000 meters
 50 ns for cable lengths from 2,000 meters to 20
 kilometers

c. Backscatter:

d. Multimode: -67dB @ 850nm, -74dB @ 1300nm;

e. Singlemode: -74dB @ 1310nm and 1550nm

f. Event Threshold: 0.05dB for both multimode and singlemode

g. Reflection Threshold:

h. Multimode: -45dB

i. Singlemode: -60dB

j. Fiber Break/End-Of-Fiber: 3dB for both multimode and
singlemode

2. Waveform: The waveform shall be real-time/normal density.

3. Obtain measurements using a 'launch' cord connected to the test
instrument and the cable-under-test.

a. The fiber of the launch cord shall match the fiber of the cable-
under-test in physical and performance parameters (such as type,
core/cladding size, index of refraction, refractive profile). The fiber
of the launch cord should match the fiber of the cable-under-test in
manufacturer and product.

b. The length of the launch cord shall be between 25 meters and 100
meters.

4. Review the results of each test and bring to the attention of the Architect
all fibers that do not meet the manufacturer's allowed loss for splices and
connectors, or fibers that do not meet the length of the overall cable
length.



D. Record Documents:

1. Test reports shall match the cable and fiber IDs as labeled in the field – i.e., the ID on the cable label/fiber port label shall be the same as what is associated with the electronic and printed test record.
2. The units for distance measurements (i.e., the “X” axis of the graph) shown on the print of the test measurements shall be feet.
3. For the traces, the x- and y-axis scales of a given cabling link shall be identical. Preferably, all reports shall be printed with identical scales on both x- and y-axis.
4. The launch cord must be shown in the trace of the printed test report.
5. Measurements shall carry a precision through one significant decimal place (minimum).
6. Each test report shall contain the following information (not necessarily in this order):
 - a. Project name
 - b. General Contractor name / Telecommunications Installer name
 - c. Cable identifier, fiber number, and fiber type (e.g., “multimode”)
 - d. Measurement direction
 - e. Date measurement was obtained
 - f. Operator (name and company)
 - g. Test equipment model and serial number(s)
 - h. Set up parameters (minimum - pulse width, refractive index, event threshold.)
 - i. Wavelength
 - j. OTDR trace
 - k. Length of fiber
 - l. Overall link loss
7. For each passive cabling link, include either a schematic graphic or narrative accurately describing the test set up as a preface to the test reports. In other words, show the launch cord with length, expected events with distances, etc. This information will eliminate many questions the Architect will have while reviewing the reports.



3.03 BACKBONE FIBER OPTIC PASSIVE LINK INSERTION LOSS TESTING

- A. Test fiber optic passive links per “Base Bid Requirements” in Part 1 of this Section.
- B. Launch Conditions:
 - 1. For passive link insertion loss testing for multimode fibers, the modal launch condition from the light source shall be characterized as Category 1 per OFSTP-14.
 - 2. For passive link insertion loss testing of singlemode fibers:
 - a. Use the launch conditions, as described in FOTP-78.
 - b. Employ a method to remove high-order propagating modes, as described in FOTP-77.
- C. Test Methods:
 - 1. The passive link insertion loss testing of multimode fibers shall be performed according to “Test Method B: One Jumper Reference”, per OFSTP-14, for ‘permanent’ links, and shall be performed according to “Test Method C: Three Jumper Reference”, per OFSTP-14, for ‘channel’ links.
 - 2. The passive link insertion loss testing of singlemode fibers shall be performed according to “Test Method A.1: One Jumper Measurement”, per OFSTP-7.
- D. Precautions
 - 1. Adhere to the equipment manufacturer’s instructions during testing activities.
 - 2. Prior to any testing activity or any measurements taken:
 - a. Ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
 - b. Power on the light source and power meter for at least 5 minutes.
 - c. Clean all test cords & system cords (if applicable) connectors and all adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
 - 3. Do not power off light source or the power meter during testing activity.



4. Do not remove Test Cord #1 from the light source at any time (unless the testing is complete or the equipment is being put away for the evening).
5. Do not bend the test cords smaller than 20 times the cord diameter (this may induce loss into the cord reducing the accuracy of the measurement).
6. Fully charge power sources before each day's testing activity.

E. Passive Link Insertion Loss Testing Procedures

1. Test Equipment Set Up

- a. Follow the test equipment manufacturer's initial adjustment and set up instructions.
- b. If the power meter has a Relative Power Measurement Mode, select this mode.
- c. If the meter can display power levels in dBm, select this unit of measurement to simplify subsequent calculations.
- d. Set the light source and power meter to the same wavelength.

2. Test Cord Performance Verification

- a. Connect Test Cord #1 between the light source and the power meter.
- b. The value displayed on the power meter is the reference power (Pref) measurement. If the power meter has a relative power measurement mode, enter this reference power measurement (Pref) value into the meter. If it does not, hand-write Pref onto the record documents for future reference.
- c. Disconnect Test Cord #1 from the power meter. Do not disconnect Test Cord #1 from the light source.
- d. Connect the 'open' end of Test Cord #1 to an adapter (of matching connector type). Connect one end of Test Cord #2 to the adapter and the other end of Test Cord #2 to the power meter.
- e. The value displayed on the power meter is the power measurement (Psum). If the power meter is in Relative Power Measurement Mode, the meter reading represents the test cord #2 connection attenuation. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the connection attenuation:



- f. If Psum and Pref are in the same logarithmic units (dBm, dBu, etc): Connection Attenuation (dB) = $|P_{sum} - P_{ref}|$
- g. If Psum and Pref are in watts: Connection Attenuation (dB) = $|10 \times \log_{10} [P_{sum}/P_{ref}]|$.
- h. The measured connection attenuation must be less than or equal to the value found in Table 3 (below).
- i. Flip the ends of Test Cord #2 so that the end connected to the power meter is now connected to the adapter, and the end connected to the adapter is now connected to the power meter.
- j. The meter reading is the reversed Power Measurement (Psum). Perform the proper calculations if not using Relative Power Measurement Mode.
- k. Verify that both connection attenuation measurements are less than or equal to the value found in the following table:

	LC Cord	Mini-Connector Cord
Multimode (50/125)	0.50 dB Max	0.20 dB Max
Singlemode	0.55 dB Max	0.30 dB Max

- l. If both measurements are found to be less than or equal to the values found in Table 1, test cord #1 is acceptable for testing purposes. Unacceptable attenuation measurements may be attributable to test cord # or test cord #2. Examine each cord with a portable microscope and clean, polish, or replace if necessary.
 - m. Repeat this test procedure from the beginning reversing the test cords in order to verify the performance of test cord #2.
3. Determine the Launch Category of the Light Source
- a. The launch category of a light source can be determined by measuring its Coupled Power Ratio (CPR). The CPR is a measurement of the modal power distribution launched into a multimode fiber. A light source that launches a higher percentage of its power into the higher order modes of a multimode fiber produces a more over-filled condition and is classified as a lower Category than a light source that launches more of its power into just the lower order modes producing an under-filled condition. Under-filled conditions result in lower link attenuation, while over-filled conditions produce higher attenuation. Therefore, adjusting



the acceptable link attenuation to compensate for a light source's launch characteristics increases the accuracy of the test procedure.

- b. Provide two test cords, one multimode (Test Cord #1) and one singlemode (Test Cord #2). Both cords shall be directly terminated on connectors that are compatible with the light source and power meter.
- c. The fiber of the multimode test cord shall have the core diameter and numerical aperture nominally equal to those of the permanent link.
- d. The fiber of the singlemode test cord shall contain Class IVa singlemode fiber, with a mode field diameter of 5.0um +/- 0.5um for 850nm tests and 9.0um +/- 1.0um for 1300nm tests.
- e. Connect test cord #1 between the light source and the power meter. Avoid placing bends in the cord that are less than 4 inches in diameter.
- f. The meter reading is the Reference Power Measurement (Pref). If the power meter has a Relative Power Measurement Mode, enter the Reference Power Measurement (Pref) value into the meter. If it does not, hand-write Pref for future reference.
- g. Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.
- h. Connect test cord #2 between the power meter and test cord #1, using an appropriate adapter between the test cords.
- i. Test cord #2, the singlemode cord, shall include a high order mode filter. This can be accomplished by twice wrapping the cord around a 1.2" diameter (30-mm) mandrel.
- j. The meter reading is the Power Measurement (Psum). If the power meter is in Relative Power Measurement Mode, the meter reading represents the CPR. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the CPR:
- k. If Psum and Pref are in the same logarithmic units (dBm, dBu, etc): $CPR (dB) = | Psum - Pref |$



- I. If Psum and Pref are in watts: $CPR (dB) = 10 \times \log_{10} [P_{sum}/P_{ref}]$

Coupled Power Ratio (CPR) in dB, for 50/125um Fiber:

	Cat-1 Overfilled	Cat-2	Cat-3	Cat-4	Cat-5 Underfilled
850nm source	20 – 24	16 – 19.9	11 – 15.9	7 – 10.9	0 – 5.9
1300nm source	16 – 21	12 – 15.9	8 – 11.9	4 – 7.9	0 – 3.9

4. Multimode Insertion Loss Measurement

- After setting up the test equipment, verifying the performance of the test cords, and determining the light source's CPR, the insertion loss of the passive link segments can be measured.
- Connect test cord #1 between the light source and the power meter.
- The meter reading is the Reference Power Measurement (Pref). If the power meter has a Relative Power Measurement Mode, enter the Reference Power Measurement (Pref) value into the meter. If it does not, hand-write Pref for future reference and to be included in the Record Documents.
- Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.
- Connect test cord #1 to the passive link segment 'input'.
- At the opposite end of the passive link segment, connect test cord #2 to the link segment 'input' and the power meter.
- The meter reading is the Power Measurement (Psum). If the power meter is in Relative Power Measurement Mode, the meter reading represents the insertion loss. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the insertion loss:
 - If Psum and Pref are in the same logarithmic units (dBm, dBu, etc): $Link\ Segment\ Attenuation\ (dB) = P_{sum} - P_{ref}$
 - If Psum and Pref are in watts: $Link\ Segment\ Attenuation\ (dB) = 10 \times \log_{10} [P_{sum}/P_{ref}]$
- Record Psum for inclusion into the Record Documents. Refer to Records in PART 3 – EXECUTION of this Section for all of the information to record.



5. Acceptable Measurement Values

- a. Any cabling links failing to meet the criteria described in this specification shall be removed and replaced, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
- b. The general insertion loss equation for any link segment is as follows:
- c. $\text{Insertion loss} = \text{<cable loss>} + \text{<connection loss>} + \text{<splice loss>} + \text{<CPR adjustment>}$.
- d. Note: A connection is defined as the joint made by two mating fibers terminated with remateable connectors (e.g., ST, SC, etc).
- e. 50/125 μm Multimode Insertion Loss Coefficients
- f. $\text{Cable Loss} = \text{Cable Length (km)} \times (3.0 \text{ dB/km @ } 850\text{-nm or } 1.0 \text{ dB/km @ } 1300\text{-nm})$.
- g. $\text{Connection Loss (ST or SC Connectors)} = (\text{Connections} \times 0.4 \text{ dB}) + 0.42 \text{ dB}$.
- h. $\text{Connection Loss (Other mini-connectors)} = (\text{Connections} \times 0.2 \text{ dB}) + 0.24 \text{ dB}$
- i. $\text{Splice Loss} = \text{Splices} \times (0.05 \text{ dB for fusion or } 0.10 \text{ dB for mechanical})$.
- j. CPR Adjustment = See following table:

	Cat-1	Cat-2	Cat-3	Cat-4	Cat-5
Links with LC Connectors	+0.50	0.00	-0.25	-0.50	-0.75
Links with mini-connectors	+0.25	0.00	-0.10	-0.20	-0.30

- k. Singlemode Insertion Loss Coefficients
- l. $\text{Cable Loss} = \text{Cable Length (km)} \times (0.50 \text{ dB/km @ } 1310\text{-nm or } 0.50 \text{ dB/km @ } 1550\text{-nm})$
- m. $\text{Connection Loss (ST or SC Connectors)} = (\text{Connections} \times 0.44 \text{ dB}) + 0.42 \text{ dB}$
- n. $\text{Connection Loss (Other mini-connectors)} = (\text{Connections} \times 0.24 \text{ dB}) + 0.24 \text{ dB}$



- o. Splice Loss = Splices x (0.07 dB for fusion or 0.15 dB for mechanical)
- p. CPR Adjustment = Not applicable for singlemode.

F. Record Documents:

1. All cable and fiber IDs of the test reports shall match the IDs as labeled in the field – i.e., the ID on the cable label/fiber port label shall be the same as what is entered into the stored test result in the power meter.
2. Measurements shall carry a precision through one significant decimal place (minimum).
3. Each test report shall contain the following information (not necessarily in this order):
 - a. Project name and address
 - b. General Contractor name / Telecommunications Installer name
 - c. Operator's name(s)
 - d. Date of measurement
 - e. Test equipment - manufacturer, model, and serial number
 - f. Cable identifier, fiber and fiber type
 - g. Measurement direction
 - h. Wavelength
 - i. Measured loss values

3.04 HORIZONTAL CATEGORY 6A TESTING PROCEDURES

A. Precautions

1. Adhere to the equipment manufacturer's instructions during all testing.
2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
3. Fully charge power sources before each day's testing activity.

**B. Test Equipment Set Up**

1. Set up the tester to perform a full Category 6A test, as a Permanent Link configuration.
2. If the tester has the capability, set the cable type as product specific setting. If not, set as generic Category 6A.
3. Set the tester to save the full test results (all test points, graphs, etc.).
4. Save the test results with the associated cable link identifier.
5. Calibrate the test set per the manufacturer's instructions.

C. Acceptable Test Result Measurements

1. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.
2. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
3. Any cabling links failing to meet the criteria described in this specification shall be removed and replaced, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
4. Minimum measurement requirements:

Wire Map	All pairs of the cabling link shall be continuous and terminated correctly at both ends. No exceptions shall be accepted.
Length	The maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration shall be 94 meters, including test cords.
Insertion Loss	The acceptable insertion loss measurements for any Category 6 cabling link shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss	The acceptable worst pair-to-pair NEXT loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Power Sum NEXT Loss	The acceptable power sum PS-NEXT loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Worst Pair-to-Pair ELFEXT and FEXT Loss	The acceptable worst pair-to-pair ELFEXT and loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.



Power Sum ELFEXT and FEXT Loss	The acceptable PS-ELFEXT and loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Return Loss	The acceptable return loss measurements for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Propagation Delay and Delay Skew	The acceptable propagation delay and delay skew measurements for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.

D. Record Documents

1. For each Horizontal Category 6A test measurement, record the following information:
 - a. Project name and address
 - b. General Contractor name / Telecommunications Installer name
 - c. Operator's name(s)
 - d. Date of measurement
 - e. Ambient temperature
 - f. Test equipment - manufacturer, model, and serial number
 - g. Cable identifier
 - h. Overall test result
 - i. Measured values of minimum requirements

END OF SECTION



SECTION 28 05 53 – IDENTIFICATION FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.01 SUMMARY

- A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working security system installation, as described in these specifications.

1.02 SECTION INCLUDES

- A. Labeling

1.03 RELATED SECTIONS

- A. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
 - 1. Section 27 51 23: Intercommunications and Program Systems
 - 2. Section 28 00 00: Electronic Safety and Security
 - 3. Section 28 05 13: Conductors and Cables for Electronic Safety and Security
 - 4. Section 28 10 00: Access Control
 - 5. Section 28 20 00: Electronic Surveillance
 - 6. Section 28 31 21: Area and Perimeter Intrusion Detection
 - 7. Section 28 52 13: Detention Interfaces to Connected Systems
 - 8. Section 28 52 13.15: Detention Interfaces to Security Detention, Alarm, and Monitoring Systems

1.04 SUBMITTALS

- A. Submit in accordance with the requirements of Section 28 00 00: Electronic Safety and Security, the following items:
 - 1. Product Data
 - 2. Label Samples: Submit the following for review and comment prior to the and installation of equipment:
 - a. Enclosure labels.



- b. Wire and cable labeling detail for all termination points
- c. Include physical samples of each labeling material.

PART 2 - PRODUCTS

2.01 LABELS

- A. Phenolic two-tone for exterior mounting on Enclosures. White lettering on black background.

2.02 WIRE AND CABLE LABELS

- A. Provide self-laminating adhesive laser labels.
- B. Labels shall be machine printable with a laser printer.
- C. Text Attributes:
 - 1. Black
 - 2. 1/8" high, minimum, or #12 font size
 - 3. Font: Verdana preferred, SansSerif, or Arial acceptable
 - 4. Printable area: 1.0" X .375" and 1.0" X 0.50".
 - 5. Cable size: 0.16 – 0.32" OD
 - 6. Color: White
- D. Manufacturer:
 - 1. Brady wire marking labels WML-211-295 and WML-311-292.
 - 2. Thomas and Betts

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Label all wiring and equipment.
- B. Identify wire and cable clearly with permanent labels wrapped about the full circumference within one (1) inch of each connection. Indicate the number designated on the associated field or shop drawings or run sheet, as applies. Assign wire or cable designations consistently throughout a given system; i.e., each wire or cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations. Additionally, provide labels where wire and cable first enter and exit from conduit, junction or distribution boxes; labels shall be located within six (6) inches of the point of exit.



- C. Label all cables at both ends of a run and within all pull and junction boxes using machine generated wrap-around labels.
- D. Label Boxes, Panels, and Enclosures
- E. Write the destination for every conduit entering a door junction box, security enclosure, or wireway using a black permanent ink marker next to the conduit inside the box.
- F. Install approved labels on the outside of each security and relay termination enclosures.

3.02 LABELING

- A. General Requirements
- B. Physically label all of the security system components. The components include, but are not limited to, the following:
 - 1. Enclosures
 - 2. Cables (both ends)
 - 3. Terminal blocks
 - 4. Relays
 - 5. Patch panels, and the termination positions within the patch panels.
- C. The ends of all cables must be permanently marked with machine-generated or stenciled (not handwritten) wrap around labels with a self-laminating feature, according to current practice and as approved by Architect before installation.
- D. Components, such as racks and patch panels, must be permanently marked with machine-generated labels, according to current practices and as approved by the Architect before installation.
- E. Labels shall coincide with device id's use on the record drawings.
- F. Equipment Enclosures
 - 1. Label all Enclosures, alarm monitoring, and powers supply enclosures associated with the security system with an adhesive backed phenolic label. Use 12-point text.
 - 2. Labels shall be represented in and match the security system record drawings.
- G. Security Devices



1. Label all equipment associated with the security system with a permanent machine generated, laminated, label. Use 12-point text with a clear background. Use white or black lettering depending upon the color of the device.
2. Label device in a concealed location with the system point number and address.
3. Label power supply batteries with the month and year they were installed.

H. Wire and Cable

1. Label all wire and cable associated with the security system with permanent machine generated, laminated, labels. Use 12-point, black text on a white label.
2. All wire and cable labels shall be clearly visible without the need to remove wire management or any other obstructions.

I. Cable Label Format

1. Obtain label format document from Architect.

END OF SECTION



SECTION 28 10 00 – ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Materials, equipment fabrication, installation, and tests in conformity with applicable Codes and authorities having jurisdiction for the following:
1. Expand the existing County-wide Access Control Alarm System.
 2. System is defined as all conduit, raceways, cables, backboxes, card readers, cards, controllers, printers, alarm contacts, glass break detectors, programming, software, licenses, and upgrades needed to achieve a complete and functional system. Also included are all required power supplies, power filtering, mounts, housings, equipment stand, and interfaces to equipment furnished by others.
 3. Program system to allow access with the presentation of a valid access card. A door contact shall indicate to the system that a door has been opened and closed and a Request to Exit device will indicate egress. Program system to detect a forced or held door and indicate in several ways the condition of the door. Program system to record and store all events, and provide a means to review an event log that has unlimited storage capacity.
 4. All card reader gates installed on this project shall interface with the detention Programmable logic controller and the access control system. The Programmable Logic Controller shall have the highest level of control and monitoring for these gates.
 5. Provide proximity card readers.
 6. Provide card reader controllers and other equipment as described in these requirements.
 7. Establish system communication with the Access Control System Server and panels via the LAN/WAN network.
 8. Provide required interface relays, materials, and cabling to other control systems as shown on the drawings.
 9. Provide installation, testing, adjustment, and initial programming for all equipment.
 10. Provide written documentation and instructions for system as installed.
 11. Provide training to Solano County Sheriff's Department in the operation, adjustment, servicing, and repair of this system.



- B. Refer to Section 280000 for Submittal, Substitution, and Warranty requirements.

1.02 RELATED SECTIONS

- A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.

- B. Related Sections:

- 1. Section 280000: Electronic Safety and Security

PART 2 - PRODUCTS

2.01 ACCESS CONTROL PRODUCTS

- A. System Specifications

- 1. Manufacturer's catalog and system numbers of equipment listed in this specification indicate type, quality, and functions of the equipment required, and represent the minimum acceptable standards. Provide all compatible parts for the submitted system.
 - 2. Access Control System Equipment shall be Honeywell WIN-PAK, no equal, to connect to the existing Solano County Honeywell WIN-PAK system, software version 4.8.

- B. Client workstations

- 1. Install Client workstation software, and client license, on up to 3 Client PC's as directed by the Owner. The workstations shall be loaded and configured to communicate to the Security Server or security database via a network connection over the Owner's LAN/WAN. Coordinate with the Owner and the IT representative for the location of and access to the workstation.
 - 2. For Alternate #2 (Security) provide all additional Client Workstation Software Licenses required.

- C. Card Readers

- 1. Card Readers shall be HID Multiclass readers with OSDP encryption.
 - 2. Manufacturer



- a. HID
- 3. Model
 - a. 920PTNNEK00000
 - b. 921PTNNEK00000
 - c. 910PTNNEK00000

D. Access Control Panels

- 1. Access Control equipment shall be manufactured by Honeywell, no equal to comply with County standard.
 - a. Access Control Panel equipment shall be Honeywell WIN-PAK PRO4200.
 - b. Enclosures shall be Honeywell PRO22ENC1.
 - c. Intelligent Controllers shall be Honeywell PR42IC.
 - d. Reader Modules shall be Honeywell PRO42R1 or PRO42R2.
 - e. Input Modules shall be Honeywell 42IN.
 - f. Output Modules shall be Honeywell 42OUT.
- 2. Access Panel Controllers, I/O boards, and new power supplies for DC locks shall be provided with battery back-up sufficient to maintain full operation of monitoring functions for a minimum of 4 hours, plus a minimum of 25 lock activations in the event of power failure. Provide complete with input, outputs, and sufficient power for 8 reader-controlled doors.
- 3. Provide interfacing relays between Access Controller Panel (ACP) outputs and locks being controlled. Install diode noise suppression on all relay coils and lock coils.
- 4. Provide sufficient input boards to accept all monitored points and an additional 10% spare capacity on the Access Control System.
- 5. Provide sufficient output boards to accept all outputs and an additional 10% spare capacity on the Access Control System.
- 6. Provide reed tamper switches on each equipment cabinet.
- 7. Include input points to connect AC power fail and low battery conditions from power supplies to ACMS system.



E. Door Position Sensors

1. Provide GRI 4402-A surface mount alarm contact on gate frames and surface magnets on gate leafs at locations shown on the Drawings.
 - a. Contact shall consist of 1 SPDT contacts in one switch.
 - b. Contact shall have an alarm gap distance of no more than 3 inches.
 - c. Door contacts shall be wired normally closed with a 5-state supervision resistor installed at the End-of-Line device.
 - d. Contact color shall be provided in silver.
2. Provide GRI 4402-A surface mount alarm contact GRI #8297 right-angle mounting bracket, or other bracket on sliding doors at locations shown on the Drawings.
 - a. Contact shall consist of 1 SPDT contacts in one switch.
 - b. Contact shall have an alarm gap distance of no more than 3 inches.
 - c. Door contacts shall be wired normally closed with a 5-state supervision resistor installed at the End-of-Line device.
 - d. Contact color shall be provided in silver.
 - e. Pairs of doors shall have alarm contacts on each door leaf and the alarm contacts will be wired in a series circuit.

F. Lock Power Supplies

1. Provide 24VDC power supplies for all electrically controlled door locks. Where supplies are provided as part of the hardware group, coordinate the installation with Electrical Work in Division 16 and connect these supplies to the ACMS system and local electric lock.
2. Size all power supplies to permit simultaneous continuous-duty activation of all door locks, with an additional minimum 30% capacity on each supply. Calculate voltage drop to locks and size lock control wiring to provide proper lock operation. Provide battery back-up sufficient for 25 activations for each DC lock powered.
3. Provide interfacing relays between Access Control Panel (ACP) and outputs and locks being controlled. Install noise suppression diodes on all locks as close as possible to the lock and at the control relay coil. Mount



all interface relays and noise suppression devices within J-boxes and or power supply equipment enclosures.

4. Provide U.L. listed power supply with fire alarm system interface for automatic unlocking of upon activation of building fire alarm. Coordinate and provide connection to building fire alarm system. Provide individual control of fail safe/fail secure operation of each lock relay based on lock requirements and fire input alarm signals to power supply.
5. Lock power supplies shall be Life Safety Power, or approved equal.

PART 3 - EXECUTION

3.01 REQUIREMENTS

- A. Refer to Section 280000, for requirements regarding As-Built Drawings, Training, Tests and Reports, and Warranty.
- B. Special coordination is required with the Owner regarding programming requirements. Meet with the Owner's representatives and submit proposed labels for all input and output points for Owner review and comment. Software labels shall be consistent between various integrated systems, including Access Control and Video Surveillance System.
- C. Provide a minimum of 8 hours of scheduled training for the equipment furnished under this Section, including programming, operation, service, and maintenance.
- D. Provide software and data interface including programming to Video Surveillance System control equipment camera call-up upon alarm activation.

END OF SECTION



SECTION 28 20 00 – ELECTRONIC SURVEILLANCE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Materials, equipment fabrication, installation, and tests in conformity with applicable Codes and authorities having jurisdiction for the following:
 - 1. Expand the Existing Video Surveillance System.
 - 2. Provide all conduit, raceways, cables, backboxes, etc. needed to achieve a complete and functional system. Also include all required interfaces to required system equipment.
 - 3. Provide installation, testing, adjustment, and initial system programming for all equipment.
 - 4. Provide written documentation and instructions for system as installed.
 - 5. Provide training to the Owner in the operation, adjustment, servicing, and repair of this system.
- B. Refer to Division 1 and Section 28 00 00 for Submittal, Substitution, and Guarantee requirements.

1.02 RELATED SECTIONS

- A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
- B. Related Sections:
 - 1. Section 27 51 23: Intercommunications and Program Systems
 - 2. Section 28 05 13: Conductors and Cables for Electronic Safety and Security
 - 3. Section 28 05 53: Identification for Electronic Safety and Security
 - 4. Section 28 52 13: Detention Interfaces to Connected Systems
 - 5. Section 28 52 13.15: Detention Interfaces to Security Detention, Alarm, and Monitoring Systems



PART 2 - PRODUCTS

2.01 SYSTEM SPECIFICATIONS

- A. Manufacturer's catalog and system numbers of equipment listed in this specification indicate type, quality, and functions of the equipment required, and represent the minimum acceptable standards. Camera equipment shall be manufactured by Axis, no equal, to comply with County Standard. Computer servers and workstations shall be Dell rack-mount or pre-approved equal.
- B. Manufacturer's catalog and system numbers of equipment listed in this specification indicate type, quality, and functions of the equipment required, and represent the minimum acceptable standards.

2.02 FIBER, WIRE, AND CABLE

- A. Follow the manufacturers' recommendation for cabling. Wire and cable sizes, number of conductors, shielding, or other data listed in this specification or shown on Drawings are a guide to the correct product required to achieve a working system and represent minimum acceptable equipment.
- B. Wiring shall be grouped and harnessed to facilitate access to all equipment, as well as maintenance and replacement of equipment.
- C. Cameras shall communicate via Cat-6A cabling connected to PoE network switches.
- D. All cable shall be labeled at origin and termination, referencing to a master legend schedule shown on submittal drawings. Labeling shall be noted on submittal drawings and Record Drawings.
- E. New cabling shall be sized and installed according to National Electric Code requirements and meet industry standards for CAT6A data infrastructure.
- F. Cables are to be shielded as necessary and as shown on Drawings to preclude any outside noise or interference from entering the cable and degrading system performance.
- G. Any cabling or raceway exposed to weather shall be rated for that use.

2.03 VIDEO CLIENT WORKSTATION

- A. Provide Video Client workstations, software, and client license, at locations shown on the Drawings. The workstations shall be configured to communicate to the Network Video Recorder via a network connection over the Video Surveillance System LAN/WAN. Coordinate with the Owner and the IT representative access password to the workstation.
- B. Configure video client workstations for dual monitor display.



- C. Provide each video workstation with two (2) 22" LED displays.
 - 1. LED displays shall be 1920 x 1080 resolution minimum.
 - 2. Coordinate mounting of LED displays in existing casework with the Architect and Owner.
- D. Video client workstations shall be under-desk-mounted at each location. Ensure sufficient airflow is accessible to the workstation power supply fan to prevent workstation overheating.
- E. At existing workstation locations, install viewing software and configure for functionality with new Video Surveillance System.

2.04 MONITOR MOUNTS

- A. Monitor mounts for monitors at each control location shall be Cotytech model DM-CDSA5-G dual monitor mount with grommet mount, or approved equal. Monitor mounts shall provide a minimum of 15" of extension adjustment, 105 degrees of tilt adjustment, and be rated by the manufacturer for at least 150% of the weight of the video display monitor. Provide one (1) monitor mount for each two monitor locations in Control Room.

2.05 COLOR IP CAMERAS.

- A. Provide POE/IP color fixed cameras with integrated lens at locations shown on the Drawings.
 - 1. Outdoor 360° multi-sensor camera shall meet or exceed Axis P3719-PLE specifications.
 - 2. Secure all cameras and housings as appropriate to structural requirements and construction conditions. Utilize tamperproof-mounting hardware.
 - 3. Cameras shall be vandal-resistant.
 - 4. Camera housings installed in ceilings shall have attachments to building structure independent of ceiling, fire sprinkler, conduit, or other system supports.
 - 5. Cameras installed at outdoor locations shall have proper weather proofing with fans and heaters.
- B. Replace or adjust lenses at no cost to Owner if necessary to obtain proper field of view.
- C. Provide various focal lengths with auto iris lenses where required.
- D. Provide color corrected lens with glass optics.



E. Coordinate the installation of cameras with the Owner and Owner's Representative for desired views.

F. Cameras shall support H.265 video format.

2.06 NETWORK POWER OVER ETHERNET SWITCH

A. Provide Cisco 9300 PoE+ Network Switch

B. Provide Layer 2/3 managed Power over Ethernet+ (PoE+) Gigabit Ethernet switch.

C. Provide forty eight (48) Gigabit Ethernet ports.

D. Provide a minimum of two (2) SFP fiber-optic ports.

2.07 VIDEO PATCH PANELS

A. Provide video patch panels at locations shown on drawings and where required to organize existing and new Video Surveillance System cabling.

B. Shall be Bi-tronics, Sprint, or approved equal.

C. Supply with a minimum of 10% spare ports.

2.08 UNINTERRUPTABLE POWER SUPPLY

A. Provide a minimum of 1 hour UPS battery backup for video surveillance system equipment, including NVRs and network switches.

B. Each UPS shall be monitored via the detention security network.

2.09 EQUIPMENT RACKS AND ENCLOSURES

A. Floor-Mount Equipment Cabinet

1. Racks and enclosures shall be transmitter style, welded construction, of 16-gauge CRS. Provide adjustable mounting angles of 11-gauge CRS, tapped for 10-32 screws. Mounting angles shall be installed so that all operating controls are within the rack.

2. Furnish locking louvered doors on all racks and enclosures. Doors shall be keyed alike.

3. Finish shall be iron phosphate prime with enamel finish. Submit colors for Architect selection.

4. Provide one Wiremold Series 3000 vertical receptacle strip in the back of each rack. Strip shall accept as many circuits as necessary for



equipment in rack (minimum of two). Install a switch for each circuit and a minimum of two spare duplex receptacles in each rack.

5. Provide top and bottom ventilation louvers on sides and doors.
6. Provide blowers for temperature control.
7. Provide seismic restraint on all racks and enclosures as required by building code.
8. Racks shall be 77 rack units in height.
9. Provide a minimum of 25% empty space with blank panels in equipment racks and enclosures.
10. Racks shall be complete with all components, including frames, doors, side panels, locks, adjustable mounting rails, etc.
11. Racks shall be Middle Atlantic, or approved equal.

B. Wall-Mount Equipment Cabinet

1. EIA compliant 19" swinging wall cabinet shall be Middle Atlantic Products model #CWR-18-32SDz, or equal. Overall dimensions shall be 26" W x 35" H x 32" D, with a useable depth of 30".
2. Weight capacity shall be 200 lbs.
3. Center section and back pan shall be 16-gauge steel, phosphate pre-treated and finished in a black textured powder coat. Rackrail shall be constructed of 11-gauge steel with tapped 12-24 mounting holes in universal EIA spacing with black powder coat finish.
4. Rack shall include 4 D-Rings for enhanced cable management.
5. Rack shall have 1/2", 2" and 3" electrical knockouts on the top and bottom of the back pan.
6. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either left or right opening. Large opening on back pan shall have a 12-1/2" x 12-1/2" cutout for electrical pull-box.

2.10 SYSTEM INTEGRATION

- A. Video Surveillance system control components shall be rack mounted at locations as shown on the drawings
- B. Video Surveillance system shall be fully programmed by the Contractor according to the requirements of this specification, schedules, and Drawings. Modifications by the Architect to camera names, numbers, camera sequencing,



etc. made during the submittal process shall be incorporated at no additional cost.

- C. Provide and connect all inputs and outputs, relay contacts, interfaces, etc. as required between the detention door control and monitoring system and the camera system to accomplish system operation as specified.

PART 3 - EXECUTION

3.01 REQUIREMENTS

- A. Refer to Section 28 00 00, for requirements regarding As-Built Drawings, Training, Tests and Reports, and Warranty.
- B. Provide a minimum of 20 hours of training for this system.
- C. Coordinate installation with casework. Assure that all cabling to adjustable display monitors is neatly bundled and carefully routed to permit full movement of monitors without entangling cable.

END OF SECTION



SECTION 28 52 13 DETENTION INTERFACES TO CONNECTED SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Design; materials; equipment fabrication; installation including all raceways, conduit, and wiring; and tests in conformity with applicable Codes and authorities having jurisdiction for the following Jail Door Control:
 - 1. Provide new Jail Door and Alarm Touchscreen Graphic Control Panels as shown on Drawings.
 - 2. Complete systems are defined as all conduit, raceways, cables, backboxes, custom control panel, alarm contacts, door monitoring and control system, mounting turret, etc., needed to achieve a complete and functional system. Also included are all required power supplies, lock power supplies, battery backup, power filtering, mounts, housings, and interfaces to equipment furnished by others.
 - 3. Coordinate with supplier and installer of doors and frames, locks, and other hardware so as to assure proper mounting details, voltages, etc.
 - 4. Coordinate with Intercommunications and Video Management systems. Furnish and install any required interface equipment.
 - 5. Provide installation, testing, adjustment, and programming for all equipment.
 - 6. Provide written documentation and instructions for system as installed.
 - 7. Provide training to the Owner in the operation, adjustment, servicing, and repair of this system.
 - 8. Provide new electric door locks at new doors as shown on drawings.
- B. The Contractor shall be responsible for coordinating the work. Contractor shall meet the following minimum qualifications:
 - 1. Possess all applicable Contractor's licenses.
 - 2. Provide with bid a list of five locations in which the contractor has successfully installed similar systems by the same equipment manufacturers. Include location, date of installation, person to contact, and telephone number for each referenced project.
- C. Provide a complete working installation of all systems with all equipment called for in proper operating condition. Documents do not undertake to show or list every item to be provided. When an item not shown or listed is clearly necessary



for proper installation and operation of the equipment and systems, provide and test/certify the item at no increase in contract price.

- D. This Specification contains a combination of prescriptive and performance requirements. The contractor is responsible for fully implementing the functions described in the Specifications and shown on the Drawings. This will require the contractor to perform substantial work selecting system components, integrating system functions, and modifying existing installed equipment.

1.02 RELATED SECTIONS

- A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
- B. Related Sections:
 - 1. Section 27 51 23: Intercommunications and Program Systems
 - 2. Section 28 00 00: Electronic Safety and Security
 - 3. Section 28 05 13: Conductors and Cabling for Electronic Safety and Security
 - 4. Section 28 05 53: Identification for Electronic Safety and Security
 - 5. Section 28 20 00: Electronic Surveillance
 - 6. Section 28 52 13.15: Detention Interfaces to Security Detention, Alarm, and Monitoring Systems

1.03 SPECIAL SUBMITTAL REQUIREMENTS

- A. Submit full-scale dimensioned drawings of the Graphic Control Consoles, including custom control. Owner and Architect reserve the right to change labels during submittal review period at no additional charge to the Owner.
- B. Submit detailed drawings and schematic diagrams of all interfaces to equipment of other systems, including Video Surveillance and Intercommunications Systems.

1.04 SYSTEM DESCRIPTION

- A. Touch Screen Interface (TSI)
- B. Provide Touch Screen Interface system with runtime program for each staff workstation where shown on the drawings. Each TSI station shall have a LED monitor, touch screen overlay, keyboard and mouse. The TSI shall provide a graphic user interface to its respective control system.



- C. Screen icons may be selected by Touch Screen Interface activation over the icon or by placing the mouse pointer over the icon and clicking the mouse button. Provide right and left mouse button-swapping function for right or left-handed user.
- D. Operating Software
 - 1. Provide the operating software recommended by the GUI software publisher for the specific GUI software used.
- E. Tone Generators
 - 1. Provide tone generation from internal CPU sound card to speaker to audibly announce intercom calls, alarms, Touch Screen Interface input feedback and other events.
 - 2. Provide a different tone for each type of audibly announced event. Demonstrate different types of tones to the Architect for approval.

1.05 SYSTEM PERFORMANCE

- A. Response Time:
 - 1. Control: The maximum time lag between touching any control icon and activation of its associated control function (i.e. door unlock, intercom/Camera select, etc.) shall not exceed 250 milliseconds. This represents the speed at which control activation begins and does not include the electro-mechanical response time of the device (i.e. additional time may be taken by the device in order to operate).
 - 2. Indication/Alarm: The maximum time lag between any input event (i.e. call request, door position alarm, etc.) and the state change of its associated icon shall not exceed 250 milliseconds.
 - 3. Screen Changes: The time lag required to leave one screen display and generate another screen shall not exceed 500 milliseconds.
 - 4. Recovery Time: In the event of a major system fault, the system must recover (reboot) within 45 seconds of system reset.
 - 5. Restoration Time: In the event of a system fault due to major data loss or data file corruption, the system must be capable of complete restoration through Flash drive or DVD ROM drive within 20 minutes of initiation of data restoration.
- B. Flexibility:
 - 1. Graphic User Interface Application Changes: Accommodate and permit editing or downloading of system administrator database changes, background graphic changes, icon changes, nomenclature and text



annotation changes, and other GUI software modifications from any programming terminal equipped with GUI application software. System software changes and modifications shall be possible by the Owner or third-party vendor.

2. Future Upgrades: Support migration from the original operating environment application to future upgrades. Have software development support to provide these future upgrades at reasonable cost to the Owner.

PART 2 - PRODUCTS

2.01 TOUCH SCREEN INTERFACE

- A. Provide equipment and components including but not limited to the following or approved equal from other manufactures. All products shall have the features described herein. The materials listed below establish the minimum quality and standards that are to be met:

1. LCD Touch Monitor: Elographics, IntelliTouch Series
Touchsystems, Apollo Series
Z Microsystems, Orion Series
2. Touch Screen Interface PC System: Dell
Gateway
HP
3. GUI Software: Cimplicity (No equal)
4. Network Switch : Cisco 1000 Base-T

- B. LED Touch Monitor

1. Minimum Size: 32-inch nominal diagonal display
2. Minimum Resolution: 1920 x 1080 at 75 Hz.
3. Minimum View Angle: Horizontal +/- 80 deg or 160 degrees total
4. Mounting: Desk Top
5. Audio: 2 Watts per channel in head speakers
6. Warranty: Monitor – 3 years



C. TOUCH SCREEN INTERFACE PC System

1. Minimum Processor and System Bus: Intel i7 2.4GHz
2. Dynamic RAM: 12GB
3. 1.0 TB minimum Ultra ATA 100
4. DVD ROM Drive
5. Minimum Ports: Four universal serial bus (USB), one 1Gb ethernet.
6. BIOS: Full Plug-and-Play compliance.
7. Provide with keyboard and mouse for configuration and troubleshooting, but disconnect and deliver to Owner prior to final acceptance.
8. Support of Multi-Threaded Operations
9. Integrated Sound Card with events library configured to generate system chimes, alarm tones, and other required sound events.
10. Graphics Accelerator Card, 512MB with resolution of 1280 x 104 pixels with 64k color.

D. GUI Software

1. Provide GUI software with the following key features:
2. Open architecture design, full integration support
3. User-defined alarm and event processing.
4. User-defined graphic interface with drag & drop
5. Standard and custom reporting
6. SQL/ODBC connectivity to relational database management system
7. Full network support
8. Windows Support: True 64-bit Microsoft Win-64 specification compliant with support for the OLE for Process Control (OPC) specification.

E. Network Switch

1. Description: Stackable 1Gb Level 2/3 managed network switch.
2. RJ-45 Port Quantity: 48 minimum.
3. Other Ports: Minimum of one BNC and one AUI.



4. Protocol: Dual 1Gb standard support with automatic negotiation between standards.
5. Manufacturer:
 - a. Cisco (No Equal)

F. Cable and Connectors

1. Network Cable: Category 6A copper cable complying with TIA/EIA 568A and TSB-67 standards.
2. Network Connectors: RJ-45.

G. UPS Backup

1. Provide a minimum of 1 hour UPS battery backup for each TSI workstation.

2.02 JAIL GATE AND DOOR CONTROL

- A. Video Surveillance System Integration: Activation of intercom call-in, selection of intercom stations from the control panel, or activation of other devices as shown on the Drawing schedules shall cause specific cameras to be displayed on the call-up monitor.
1. Resetting the intercom system or other device shall reset the video surveillance system alarm.
 2. Provide all necessary interfaces between systems to accomplish the specified operation.
- B. Door Control Relays
1. Door control Relays shall be Modicon ABE-7 Series.
- C. Lock Power Supplies
1. Furnish and install 24VDC power supplies for all 24VDC electrically controlled door locks. Refer to hardware schedule for power supplies furnished under that Section.
 2. Size all AC and DC power supplies to permit simultaneous continuous-duty activation of all door locks, with an additional minimum 30% capacity on each supply. Calculate voltage drop to locks; show calculations on shop Drawings. Size lock control wiring to provide proper lock operation. Separately fuse wiring to each AC and DC lock.
 3. Furnish and install interface relays between door controllers and lock power supplies. Install noise suppression diodes on all DC locks as close



as possible to the lock and at the control relay coil. Supply suppression MOV's for all 120VAC locks. Mount all interface relays within equipment enclosures.

4. Lock power supplies shall be Securitron or approved equal.

PART 3 - EXECUTION

3.01 REQUIREMENTS

- A. Refer to Section 28 00 00, for requirements regarding As-Built Drawings, Training, Commissioning, Acceptance Testing, Reports, and Warranty.
- B. Special coordination is required with the Owner regarding programming requirements. Meet with the Architect and submit proposed labels for all input and output points for Architect review and comment. Software labels shall be consistent between various integrated systems, including intercom, door control, and video surveillance.
- C. Special coordination is required with Central Control casework, consoles, and furniture supplier.
- D. Coordinate with hardware installer for wiring of locks and sensors.
- E. Install conduit and wiring for lock control and door position status wiring for locks in compliance with National Electrical Code requirements for Class 1 wiring. All wiring for security systems shall be installed in conduit, including wiring between the security equipment room and the Control Consoles.
- F. Provide a minimum of 16 hours of scheduled training for the equipment furnished under this Section, including programming, operation, service, and maintenance.

END OF SECTION



SECTION 28 52 13.15 – DETENTION INTERFACES TO SECURITY DETENTION, ALARM, AND MONITORING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Software Development.
 - 2. Graphic User Interface (GUI) Appearance.
 - 3. GUI Operational Features.
 - 4. Sequences of Operation.

1.02 RELATED SECTIONS

- A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
- B. Related Sections:
 - 1. Section 27 51 23: Intercommunications and Program Systems
 - 2. Section 28 20 00: Electronic Surveillance
 - 3. Section 28 31 21: Area and Perimeter Intrusion Detection
 - 4. Section 28 52 00: Detention Security Systems
 - 5. Section 28 52 13: Detention Interfaces to Connected Systems

1.03 DEFINITIONS

- A. Control System Software: A software application program that performs logic and control functions based on programmable criteria.
- B. Dashboard: Graphic icon display that presents the operator with a selection of functions. Typically this portion of the screen/graphics does not change as slides change.
- C. Graphic User Interface (GUI): Software program that displays control and annunciation functions in a programmable combination of text and graphics that may include static and dynamic colors, floor plans, icons, pictures, menus and other features to present a pictorial view of the OI information.



- D. Icon: Pictorial graphic display of a symbol or devices such as doors, locks, buttons
- E. Slide: Area of the screen that contains the graphic display area such as floor plans. Typically this portion of the screen/graphics changes while the dashboard area does not.
- F. Operator Interface (OI): Used to generally define a TSI, computer monitor, mouse, touch screen, audio or any other devices used for Human-Machine Interfacing.
- G. Operating Software (System): Software program that runs the computer workstation.
- H. Pop-up Window: A window that is displayed over and covers other screen graphics. The widow may display information, present a menu or both.
- I. Press: Same as Touch.
- J. Screen: The active display area of a computer monitor.
- K. Select: Same as Touch. Generally used with a software-latched icon.
- L. Touch screen: A touch sensitive media placed over a computer monitor video display to act as a pointing device.
- M. Touch: Used to denote the action required to activate an icon. Refers to either using a TSI or mouse pointer.
- N. Touch Screen Interface (TSI): Used to refer to the entire computer, video display and touch screen workstation. TSI shall also refer to the access control and personal alarm computer displays for the purpose of software development.
- O. Workstation: A computer or TSI station or work area (single person) with a control panel.

1.04 SYSTEM DESCRIPTION

- A. Provide software development and programming for each system as defined in each respective section and described in this section for the following systems:
 - 1. Section 27 51 23: Intercommunications and Program Systems
 - 2. Section 28 20 00: Electronic Surveillance
 - 3. Section 28 52 00: Detention Security Systems
 - 4. Section 28 52 13: Detention Interfaces to Connected Systems



1.05 SUBMITTALS

- A. Comply with Section 28 00 00 Requirements.

1.06 LICENSES

- A. Transfer all software licenses to the Owner at the completion of the project. Transfer shall include customer support rights.
- B. Fully comply with all license agreements for the installed software. Install sufficient quantities of each software program so that the Owner fully meets the intent of the publisher's site license agreement. When in doubt, contact the publisher for an interpretation and comply with that interpretation.

1.07 RECORD DOCUMENTS

- A. Prepare and submit the licenses to all software installed on the system. Compile a list giving each program name, its installed version number, the number of copies installed, the serial number of each copy, the publisher's name and address, and the publisher's customer support telephone number.
- B. Prepare and submit complete documentation of the final installed runtime versions of the operator interface software, including a diagram of its component modules, subroutines, databases, libraries, drivers, and other parts. Narrative descriptions shall accompany the diagram, giving basic descriptions of each component and describing the interaction between components. Provide complete, annotated program listings of all custom scripts, macros, and subroutines.
- C. Provide the Owner with all original installation files in electronic format and all software manuals for every software program installed on the system. Provide one complete copy of the full development environment for the operator interface software installed on the maintenance TSI.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PARKING AREA TOUCHSCREEN SLIDE ACTIVATION

- A. General

3.02 FIELD QUALITY CONTROL

- A. Site Tests:
 - 1. Activate the existing touchscreen slides created for the control and operation of the new secure parking area.



3.03 TRAINING

- A. Train two Owner maintenance personnel in the fundamentals, design, and programming of the GUI software. Minimum 8 Hours
- B. Control System Software Training
 - 1. Train two Owner maintenance personnel in the fundamentals and programming of the control system software. Minimum 8 Hours.
- C. On Site Classes:
 - 1. Conduct a four-day class for maintenance personnel in the details of the specific application and configuration of the operator interface software to this project. Provide hands-on training. Minimum 16 Hours

END OF SECTION



SECTION 31 00 00 – EMBANKMENT CONSTRUCTION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work covered by this section consists of furnishing all labor, and materials, and performing all operations necessary for the construction of embankments and fills, including the foundation preparation, placement of embankment materials, construction of ramps, and other incidental earthwork as may be necessary to complete the embankments and fills, as specified herein, as shown on the plans, or as otherwise directed by the County.

1.02 REFERENCES

- A. American Society for Testing of Materials (ASTM) Standards:

D6913	Particle-Size Distribution of Soils Using Sieve Analysis
D698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
D1556	Test Method for Density of Soil in Place by the Sand Cone Method
D2487	Standard Practice for Classification of Soils for Engineering Purposes
D4318	Test Method for the Liquid Limit and Plastic Limit of Soils
D6913	Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
D6938	In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

- B. State of California, Department of Transportation (CALTRANS)

1. 2024 State Standard Specifications



1.03 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures", the following:
 - 1. Surveys: Submit all point data within ten (10) days of performing field surveys.
 - 2. Product Data: Submit gradations and other required test data for all imported materials.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Engineered Fill. The engineered fill shall be constructed of earth obtained from the onsite excavations as prescribed in Section 31 23 16, "Structure Excavation and Backfill" or suitable material sourced and imported by the Contractor. Some earthen materials may be present within the onsite excavations which do not meet the requirements for Atterberg Limits or gradation. These excavated materials shall not be classified as unsuitable or wasted but shall be uniformly blended with other excavated materials until, in the opinion of the County, the blended material is suitable for engineered fill embankment construction. All blending of materials shall be performed prior to placement in the embankment section.
- B. If a disagreement between the Contractor and the County occurs over the suitability of blended materials, the Contractor shall perform laboratory testing to demonstrate compliance with the specifications. The testing by the Contractor shall comply with 3.08, Field Quality Control. The failure of the Contractor to perform the testing shall not relieve the Contractor from the obligation to provide suitable materials.
- C. Engineered Fill Material. Suitable engineered fill material shall consist of low to high plasticity soils classified in accordance with ASTM D 2487 as lean clay (CL), silty clay (CL-ML), silt (ML), or clayey sand (SC). Individual test results shall have a minimum of 20 percent passing the No. 200 standard sieve, 100 percent passing the 2-inch sieve, liquid limit of 50 or less, and plasticity index greater than or equal to 8 and less than or equal to 25.

2.02 EQUIPMENT



- A. Tamping Rollers. Tamping rollers shall consist of a heavy-duty double drum unit. The drums shall be water or sand-and-water ballasted. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each two square feet of drum surface. The tamping feet shall be six to nine inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than five or more than seven square inches. The roller shall be equipped with cleaning fingers, so designed and attached as to prevent the accumulation of material between the tamping feet, and these cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall not be less than 3,500 pounds per foot of linear drum length weighted and shall not be more than 2,000 pounds per foot of drum length empty. The two drums comprising one roller unit shall be yoked such that they will oscillate when traversing uneven surfaces. The design and operation of the tamping roller shall be subject to the approval of the County who shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alterations in the roller and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. The Contractor may be required to add ballast to the roller to the maximum capacity specified by the manufacturer of the roller. The roller shall be drawn by a crawler-type or a rubber-tired tractor at a speed not to exceed 3.5 miles per hour. The use of the rubber-tired tractor shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller.
- B. Self-Propelled Rollers. At the option of the Contractor, self-propelled tamping rollers may be used in lieu of tractor-drawn tamping rollers. Self-propelled rollers exceeding the empty weight requirement may be used, provided that by the substitution of tamping feet having a face area not exceeding 30 square inches, the nominal foot pressure on the tamping feet of the self-propelled roller can be adjusted to approximate the nominal foot pressure of the towed roller for the particular working condition required for the towed rollers. For self-propelled rollers, in which steering is accomplished through the use of rubber-tired wheels, the tire pressure shall not exceed 40 pounds per square inch. Self-propelled rollers shall be operated at a speed not to exceed 3.5 miles per hour.
- C. Rubber-tired Rollers. Rubber-tired rollers shall have a minimum of four (4) wheels equipped with pneumatic tires. The tires shall be of such size and ply as to be capable of being operated at tire pressures between 80 and 100 pounds per square inch at a 25,000-pound wheel load. The roller wheels shall be located abreast and so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50% of the rated tire width of a single tire at the operating pressure for a 25,000-pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, as directed by the County, from 18,000 to 25,000 pounds. The roller shall be towed at a speed not to exceed five (5) miles per hour. The character and efficiency of this equipment shall be subject to the approval of the County.



- D. Smooth Drum Rollers. Smooth drum rollers shall not be used except for compaction of final finished grades.
- E. Sprinkling Equipment. Sprinkling equipment shall consist of tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities to variable widths of surface.
- F. Crawler-type Tractors. Crawler-type tractors used for spreading or compaction shall weigh not less than 20,000 pounds, shall exert a unit tread pressure of not less than 6 pounds per square inch, and shall not be operated at a speed to exceed 3.5 miles per hour.
- G. Miscellaneous Equipment. Scarifiers, disks, spring tooth or spike tooth harrows, spreaders, and other equipment shall be of approved types, suitable for construction of embankment.

PART 3 – EXECUTION

3.01 EMBANKMENT FOUNDATION PREPARATION

- A. General. After stripping and any over-excavation is complete, and prior to the placement of fill materials, pits and other similar cavities or depressions shall be broken down, where so directed, to flatten out to slopes no steeper than 3 to 1 (horizontal to vertical). The embankment foundation sub-grade shall then be thoroughly scarified to a depth of six (6) inches, moisture conditioned to minus 2 to plus 3 percent of the optimum moisture and compacted to a minimum of 95% of the maximum dry density based upon laboratory test procedure ASTM D698. If, for any cause, this scarified surface, or other surface that is to receive fill, becomes compacted in such a manner that, in the opinion of the County, a plane of seepage or weakness might be induced, it shall again be thoroughly scarified before the placement of any additional fill. All scarifying and breaking of ground surface shall be done parallel to the centerline of the embankment.
- B. Drainage. The foundations receiving embankment, and all partially completed fill shall be kept thoroughly drained.
- C. Unstable Materials. Control the moisture content of all soils during compaction to prevent an unstable (pumping) condition. If the soils are trafficked by a minimum 16,000-pound axle load (65-psi tire pressure) and visible deflection or cracking occurs more than 6 inches from the wheel track, corrective measures shall be implemented. Such measures shall include disking to aerate, chemical treatment, replacement with drier materials, and/or other methods suitable to the County.

3.02 EMBANKMENT CONSTRUCTION

- A. General. Place compacted earthfill in embankments in the dry and compact as specified herein.



- B. Horizontal Layer Construction. The compacted embankment shall be constructed to a sufficient section to achieve the required compaction throughout the finished embankment. Materials to be compacted shall be placed or spread in layers not more than six (6) inches in thickness prior to compaction. Materials excavated to form keyways, inspection trenches, and over excavations, and suitable for use as embankment, shall be blended uniformly with other excavated soils or disposed of as directed by the County. Layers shall be started full out to the slope stakes and shall be carried substantially horizontal with sufficient crown or slope to provide satisfactory drainage during construction. All fill placed on slopes steeper than 5 horizontal to 1 vertical shall be keyed and benched as shown on the Drawings. When, in the opinion of the County, the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be scarified to a depth of 6 inches before the succeeding layer is placed thereon. The degree of compaction required is expressed as a percentage of the maximum dry density, based on laboratory test procedure, ASTM D698. The embankment shall be compacted to a minimum of ninety seven percent (97%) of the maximum dry density.
- C. Moisture Control.
1. The moisture content required is expressed as a percentage, based on laboratory test procedure ASTM D698. The moisture shall be uniformly distributed throughout the layer prior to compaction and shall be between minus one percent (-1%) and plus three percent (+3%) of the optimum moisture content. If the material is not within the required moisture content, the Contractor will be required to moisture condition the soil.
 2. The moisture conditioning of fill materials shall be performed prior to placement in the embankment section. The final minor moisture conditioning may be made on the fill, as required. Harrowing or other approved methods will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of fill shall be accurately controlled in amount and distribution so that free water will not appear on the surface during or subsequent to rolling.
 3. If the material is too wet for proper compaction or soft and yielding sub-grade is experienced (pumping), the Contractor will be required to aerate the material to moisture content within the desired limits prior to compaction.



- D. Rolling Operations. The compaction equipment shall conform to the requirements of 2.02, Equipment. If tamping rollers are used in tandem, not more than two rollers in tandem will be permitted. When tamping rollers are used in tandem, the tamper foot spacing shall be offset so that the circumferential rows on the rear drums are in line with the mid-point of the circumferential rows on the forward drums. Each pass of the tamping roller shall overlap the preceding or adjacent pass by not less than one foot. Portions of the embankment that the roller cannot reach for any reason shall be compacted by any approved method.
- E. Dressing. Dress embankment slopes by over-building and cutting back to the required grade. The Contractor may compact the shoulder of each lift during the placement of fill materials to assist in the subsequent dressing of the slopes.

3.03 CROSS SECTIONS

- A. Standard Embankment Sections. The dimensions and slopes of materials shall conform to the applicable embankment and access road sections shown on the Drawings and specified herein.

3.04 ROADS AND RAMPS

- A. Roads. At locations where access roads are destroyed because of the work required under this contract, provide temporary roads, if directed by the County, to give access during the construction period. Remove such facilities to the extent required by the County.
- B. Ramps. Construct road ramps at the locations shown on the Drawings by placement of a compacted fill as specified in 3.01, Embankment Foundation Preparation and 3.02, Embankment Construction. Temporary ramps to be constructed for the Contractor's convenience need not comply with these foundation preparation and embankment construction requirements. Unless otherwise directed by the County, temporary ramps shall be removed prior to completion of the work.

3.05 DITCHES AND DEPRESSIONS

- A. Fill all old pits, ditches, or depressions beyond the limits of the embankment foundation where shown on the Drawings or when required by the County, to the natural surface of the surrounding ground with approved material. Place the fill material in layers or lifts not to exceed six (6) inches in thickness and the only compaction required will be that obtained by the necessary spreading and placement operations, except that the equipment shall be so operated that the tracks are distributed evenly over the surface of each lift.

3.06 GRADE TOLERANCES

- A. General: Embankments shall be constructed to the net grade and cross section shown on the Drawings.



- B. Grade Tolerances: At all points, a tolerance of 0.2 feet above, and 0.0 feet below the prescribed grade will be permitted in the final dressing; provided that any excess material is so distributed that the crown of the embankment drains and there are no abrupt humps or depressions in surfaces or bulges in the width of the crown. The tolerance above grade may be modified at locations where, in the opinion of the County, such modifications will not impair the design or appearance of the structure.

3.07 SLIDES

- A. In the event of the sliding of any part of the embankment or roadway during its construction, or during the one-year period after acceptance, the Contractor shall, upon written order of the County, cut out and remove the slide and then rebuild that portion of the embankment.

3.08 FIELD QUALITY CONTROL

- A. Testing Methods and Frequency. The following tests will be performed by the County for in-place materials. The Contractor shall perform testing as required to control the work.
- B. Pre-Fill Placement. Minimum of five (5) moisture-density relationship tests (ASTM D698), with gradation (ASTM D6913), Atterberg Limits (ASTM D4318), and classification (ASTM D2487) testing for each type of fill material.
- C. During Fill Placement:
1. Minimum of one (1) moisture-density relationship test (ASTM D698) with gradation (ASTM D6913), Atterberg Limits (ASTM D4318), and classification (ASTM D2487) testing for each 600 cubic yards of each type of fill material placed, with a minimum of one (1) per shift.
 2. Minimum of one in-place density test (Nuclear Method, ASTM D6938, or Sand Cone Method, ASTM D1556) for every 300 cubic yards of fill placed, or a minimum of one test per lift of material, whichever is more frequent and regardless of volume placed. One-point compaction test (at or slightly below the optimum moisture content) for each in-place density test to confirm the validity of the Proctor value by comparison with the family of curves for the type of fill being placed.
 3. If the nuclear method of density testing is used, a minimum of one sand cone test for every 10 nuclear tests per shift per fill type shall be performed.
 4. In addition to the testing required for each moisture-density relationship, a minimum of one additional gradation and one Atterberg Limits test for every 1,200 cubic yards of fill placed, or a minimum of one test each per shift per type of fill placed.
 5. The criteria given above are the minimum (type and frequency) testing



requirements. Failing tests should not be applied toward satisfying these requirements; passing re-tests may be included. Additional testing may be requested for any reason by the County.

- D. Retesting. Where tests indicate the embankment construction does not meet the specifications, remove and rework the material represented by the test as necessary to comply with the Specifications. Retest reworked areas until they meet the specified percentage of maximum dry density, gradation, plasticity, or organic content. The costs of all retests will be deducted from monies due or to become due to the Contractor.
- E. Surveys.
1. The Contractor shall perform pre- and post-construction surveys, which will be spot-checked by the County.
 2. Perform pre-construction surveys for embankment quantity measurement after demolition, clearing a grubbing, stripping, over excavation, and foundation preparation.
 3. Perform post-construction top of embankment surveys for verification of grading tolerances after all embankment and surfacing is complete. Post-construction survey shall include spot elevations of the top of embankment at centerline and hinge points at the maximum spacing interval specified herein. Except as otherwise approved by County, the top of embankment survey shall be performed after the entire reach of project and access road embankment has been completed, and no sooner than 30 days after completion of all embankment fill placement for the entire project.
 4. Perform pre- and post-construction surveys at 50-foot maximum intervals and at grade breaks or other changes in geometry that may be required for quantity calculations or grading tolerance verification.
 5. Pre-construction survey cross sections shall extend a minimum of 10 feet beyond the toe of embankment or to extent required to document work performed, whichever is greater.
 6. Surveys shall be tied to baselines or other reference points.
 7. Survey methods and proposed data plots shall be approved by the County in advance. Discrepancies in data provided shall be resolved to the satisfaction of the County prior to final payment.

END OF SECTION



SECTION 31 11 00 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work covered by this section consists of furnishing all labor, equipment, and materials necessary to perform clearing and grubbing, the removal or disposal of all cleared and grubbed materials, and the filling of all grubbing holes, as specified herein, as shown on the plans, or as otherwise directed by the County.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.01 CLEARING

- A. General. In areas where grubbing is not required, the clearing operations shall consist of the complete removal of all obstructions above the ground surface.
- B. Embankment and Structures. Clear remaining trees, stumps, downed timber, snags, brush, vegetation, abandoned structures, and similar debris within the limits of embankment, excavations, roadway, and structure construction as shown on the Drawings. Protect trees located beyond the limits for clearing and grubbing from damage, which are not marked for removal
- C. Debris Removal. Abandoned foundations, concrete rubble, debris, and other unsuitable material, and any other debris designated for removal on the Drawings shall be removed and disposed of in accordance with this section. Buried unsuitable debris encountered during excavations shall be removed and disposed of in accordance with Section 31 23 00, "Stripping and Excavation".

3.02 GRUBBING

- A. General. Grubbing shall consist of the removal of all stumps, roots, buried logs, old piling, old paving, and other objectionable matter.
- B. Embankment, Roadways, and Structures. Except as noted on the Drawings, thoroughly grub the entire area within the limits of the footprint of excavations, fills, and improvements. All tap roots, lateral roots, or other projections over one and one-half (1-1/2) inches in diameter within the footprint shall be removed to a depth of 3 feet below the foundations or subgrade level.
- C. Filling of Holes. All holes caused by grubbing operations, except in borrow areas, shall be excavated with 3 to 1 (horizontal to vertical) side slopes in conformance with Section 31 23 00, "Stripping and Excavation". The excavation shall then be backfilled with compacted embankment material in conformance with Section 31 00 00, "Embankment Construction".



3.03 DISPOSAL OF DEBRIS

- A. Cleared and Grubbed Materials. Except as hereinafter specified, remove all logs, brush, slash, stumps, roots, and other debris that are the products of the clearing and grubbing operations from the site and dispose of at licensed disposal sites, or other locations arranged for, by, and at the expense of the Contractor and approved in advance by the County.

END OF SECTION



SECTION 31 23 00 – STRIPPING AND EXCAVATION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work covered by this section consists of furnishing all labor, equipment, materials, and performing all operations necessary for the following work, as specified herein, as shown on the plans, or as otherwise directed by the County.
1. Stripping for removal of vegetation and surface organics.
 2. Excavation for removal of existing culverts and construction of new culvert and related structures.
 3. Excavation for removal of unsuitable material.
 4. Over-excavation of embankment foundation.
 5. Other miscellaneous excavation incidental to the construction of the improvements.
 6. Disposal of unsuitable debris encountered during excavation.

1.02 SUBMITTALS

- A. Surveys. Submit all point data within ten (10) days of performing field surveys.

1.03 QUALITY ASSURANCE

- A. Comply with all applicable permits and regulations, the project Storm Water Pollution Prevention Plan.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Suitable Materials. Materials suitable for use in the embankments shall meet the requirements specified in Section 31 00 00, "Embankment Construction." Materials suitable for use as structure backfill shall meet the requirements specified in Section 31 23 16, "Structure Excavation and Backfill." Materials removed from excavations shall be blended, as necessary, with import materials to meet the gradation and Atterberg limit requirements. Materials that do not meet the requirements for organic content for Embankment Materials or Structure Backfill shall be classified as unsuitable and shall not be mixed with other material to meet the Specification requirements.



- B. Unsuitable Materials. Materials with a low in-place density, as determined by the County, and materials that do not meet the Embankment or Structure Backfill requirements for organic content (visible organic content is not allowed) shall be classified as unsuitable material. Materials shall not be classified as unsuitable based solely on moisture content.
- C. Unsuitable Debris. Material containing debris, rubble, trash, or other deleterious items shall be classified as unsuitable debris.

PART 3 – EXECUTION

3.01 GENERAL

- A. Protect existing utilities in performing any excavation work.
- B. Comply with all permit conditions in performing any excavation work.
- C. Material to construct the embankments and fills shall be obtained from the project excavations or as sourced by the Contractor.

3.02 STRIPPING

- A. Stripping. Strip surfaces of all excavations and fill foundations of heavy growth of grass, weeds, and other vegetation to a minimum depth of 0.5 feet. Greater depths of stripping may be necessary in selected areas to remove vegetation, as determined by the County.
- B. Disposal. The stripped materials shall be spoiled on-site as directed by the County. Placement of stripped material shall not restrict drainage from upland areas and shall be graded to drain.

3.03 EXCAVATION

- A. General. Excavations shall extend into firm, undisturbed native soils. Excavation shall consist of removal of material for embankment foundation preparation, mass excavation, and other miscellaneous excavations. In the event that organic materials, yielding sub-grade (pumping) or other deleterious materials are encountered during foundation excavations, remove as directed by the County.
- B. Control of Water. When water is encountered, either ground water or surface runoff, furnish, install, maintain, and operate all necessary machinery and equipment required to keep the excavation reasonably free from water until the placement of backfill material has been completed, inspected, and approved, and danger of flotation and other damage is removed. Dispose of the water pumped from the excavation in such a manner as not to cause injury to public or private property or constitute a nuisance or menace to the public. The disposal method shall conform to the Storm Water Pollution Prevention Plan and be subject to the approval of the County.



- C. Excess Excavation. Exercise care not to excavate below the grades shown on the Drawings, except as specified herein, and as directed by the County. Backfill all excavations in excess of the grades shown on the Drawings that are not directed by the County with compacted embankment material.
- D. Excavations in Low Spots or Unsuitable Foundations. Depending upon the time of year, the moisture content of the in-place foundation soils may be greater than the optimum moisture content to achieve the specified compaction. Where excess moisture or unconsolidated material is encountered, prepare and re-compact the foundation material in-place in accordance with Section 31 00 00, "Embankment Construction," unless over-excavation is directed by the County. Where approved by the County, areas may be over-excavated as described herein.
- E. Over-Excavations. Areas of unsuitable in-place foundation soils may also be encountered. Over-excavate these areas as directed by the County and process the materials. The actual locations of these excavations may vary and will be determined in the field by the County. The side slopes of the excavations shall be no steeper than 1 to 1 (horizontal to vertical). The over-excavations shall be backfilled with suitable embankment material in accordance with Section 31 00 00.
- F. Disposition of Excavated Materials. Excavated materials, which, in the opinion of the County, are suitable for incorporation into embankment or other fills, shall be placed directly therein. Segregate and remove all unsuitable debris and organics, and stockpile suitable excavated materials for re-use. Blend materials removed from excavations, as necessary, with borrow materials to meet the gradation or Atterberg limit requirements.
- G. Disposition of Unsuitable Materials. Process the excavated materials that are considered unsuitable based solely on moisture content as necessary to meet specification requirements for suitability and use as embankment material. Materials that are determined unsuitable based on organic content will be ordered wasted and shall be disposed of by the Contractor.
- H. Disposition of Unsuitable Debris. Segregate excavated materials that are considered unsuitable debris and dispose of them by the Contractor.
- I. Structure Excavation. Excavation for structure foundations shall be in accordance with Section 31 23 16, "Structure Excavation and Backfill."

END OF SECTION



SECTION 31 23 16 STRUCTURE EXCAVATION AND BACKFILL

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work covered by this section consists of furnishing all labor, equipment, and materials, and performing all operations necessary in connection with the excavations and the subsequent backfill for structures and foundations, as shown on the Drawings, as specified herein or as otherwise directed by the County.

1.02 REFERENCES

- A. American Society for Testing of Materials (ASTM) Standards:
- | | |
|-------|---|
| D1556 | Test Method for Density of Soil in Place by the Sand Cone Method |
| D698 | Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort |
| D2794 | Test Method for the Organic Content of Soils |
| D6938 | In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) |
| D3017 | Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) |
| D4318 | Test Method for the Liquid Limit and Plastic Limit of Soils |
| D6913 | Particle-Size Distribution Analysis of Soils Using Sieve Analysis |

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Structure Backfill. Structure backfill shall comply with the suitable embankment material requirements as specified in Section 31 00 00, "Embankment Construction," except liquid limit shall be 35 or less for each individual test.

Unless otherwise specified on the Drawings, structure backfill shall be all fill to be placed within three (3) feet of a structure. Structure backfill shall also be placed to provide for the support of footings, foundations, or slabs-on-grade. Structure Backfill shall begin at the limit of excavation and extend to the lines and grades, as required on the Drawings.

- B. Unsuitable Materials. Unsuitable materials are specified in Section 31 00 00, "Embankment Construction."



PART 3 – EXECUTION

3.01 STRUCTURE EXCAVATION

- A. General. Excavation shall include the removal and disposal of all materials of whatever nature encountered as required to complete the work. Remove unsuitable materials and reprocess or spoil in accordance with Section 31 23 00, "Stripping and Excavation." Stockpile suitable materials for backfill for reuse, re-handle as necessary, and place in the work.
- B. Control of Water (Dewatering). When water is encountered, either ground water or surface runoff, furnish, install, maintain, and operate all necessary machinery, appliances, and equipment to keep the excavation free of water until the concrete placement, and the placement of backfill material has been completed, inspected, and approved, and all danger of flotation and other damage is removed. Water pumped from the excavation shall be disposed of in such manner as will not cause injury to public or private property, or constitute a nuisance or menace to the public, and the disposal method shall be subject to the approval of the County. Water shall be controlled until each structure and backfill are complete.
- C. Excavation
 - 1. General – The original material at foundation surfaces shall be undisturbed and carefully graded. Where unsuitable material is found at planned foundation grade it shall be removed to a depth as directed by the County and replaced with structure backfill placed and compacted as specified herein.
 - 2. Foundations – Surfaces upon or against which concrete is to be placed shall be free of standing water, mud, debris, and loose material. The surfaces shall be inspected and approved by the County before any concrete is placed.

3.02 STRUCTURE BACKFILL

- A. General.
 - 1. Place backfill at near optimum moisture content, in uniform layers of not more than four (4) inches in thickness prior to compaction. The backfill shall be brought up evenly on all sides of the structure.
 - 2. Compaction equipment or methods that may cause displacement or damage structures shall not be used. Compact backfill within three (3) feet of the structure with hand-operated power tampers. The remaining backfill shall not be compacted with equipment that exerts a total force greater than 25,000 pounds or a uniform load greater than 5,000 pounds per square foot.



3. Backfill shall not be placed until cast-in-place concrete has been in place at least seven days and has obtained its specified 28-day compressive strength, except as otherwise approved by the County.
 4. Compaction of backfill by ponding or jetting will not be permitted.
- B. Structure Backfill. Compact structure backfill to a relative compaction of not less than 97% maximum dry density, based on laboratory test procedure ASTM D698.

3.03 FOUNDATION PREPARATION FOR STRUCTURES

- A. After stripping and excavation operations, scarify the foundation soils beneath new concrete structures to a depth of eight (8) inches; moisture condition to at least 1% above optimum moisture, and compact to 100% maximum dry density, based on laboratory test procedure ASTM D698.

3.04 FIELD QUALITY CONTROL

- A. Testing Methods and Frequency. The County will perform the following tests. The Contractor shall perform testing as required to control the work.

<u>Test</u>	<u>ASTM Designation</u>
Field Density	D1556; D6913; D3017
Moisture-Density	D698
Gradation	D6913
Atterberg Limits	D4318
Organic Content	D2794

- B. Backfill: Material gradation tests will be performed when the materials are first incorporated into the work and each time the source of the materials is changed.

- C. Compaction

1. Foundations, Subgrades: At least one compaction test on cast-in-place concrete structure foundations.
2. Backfill: Compaction tests on each different backfill material at least once each day that material is placed, and for each 50 cubic yards of material placed.

END OF SECTION



SECTION 32 11 23 – AGGREGATE BASE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work covered by this section consists of furnishing all labor, equipment, and material, and performing all operations necessary for placing and compacting aggregate base as specified herein, as shown on the plans, or as otherwise directed by the County.

1.02 REFERENCES

- A. State of California, Department of Transportation (CALTRANS)
2024 State Standard Specifications

<u>California Test</u>	<u>Method of Test for:</u>
231	Relative Compaction of Untreated and Treated Soils and Aggregates by the Area Concept Utilizing Nuclear Gages

1.03 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures," the following:
1. Product Data
 - a. Source of aggregates
 - b. Test results, performed within the last six (6) months, showing that the aggregates conform to all the material requirements specified herein.
 2. Field Test Reports: Certified weights of aggregate base rock delivered to the site.

1.04 PROJECT CONDITIONS

- A. Base courses shall be placed when the atmospheric temperature is above 35 degrees Fahrenheit. Areas of completed base course that are damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.



PART 2 – PRODUCTS

2.01 MATERIALS

- A. Aggregate Base Course shall be Class 2 Aggregate Base, 3/4 inch maximum, conforming to Section 26 of the State Standard Specifications.

PART 3 – EXECUTION

3.01 PLACING, COMPACTING, AND FINISHING

- A. Preparation of Subgrade. Clean the underlying course or subgrade of all foreign substances prior to constructing the base course(s). Do not construct base course(s) on underlying course or subgrade that is frozen. Construct the surface of the underlying course or subgrade to meet specified compaction and surface tolerances. Correct ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the specified requirements set forth herein by loosening and removing soft or unsatisfactory material and adding approved material, reshaping to line and grade, and recompacting to density requirements specified in Section 31 00 00, "Embankment Construction." Do not allow traffic or other operations to disturb the finished underlying course, and maintain it in a satisfactory condition until the base course is placed.
- B. Grade Control. Place and maintain stakes to control the lines and grades including crown and cross slope indicated for the aggregate base course.
- C. Placing. Place the mixed material on the prepared subgrade in layers of uniform thickness with a suitable spreader. No layer shall exceed 6 inches or be less than 3 inches when compacted. Place the layers so that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Adjust placing procedures or equipment as required, or directed, to obtain true grades, to minimize segregation and degradation, or to adjust the water content.
- D. Compaction. Compact each layer of the base course, as specified, with approved compaction equipment. Maintain water content during the compaction procedure to within plus or minus 2 percent of the optimum water content. Begin rolling at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Slightly vary the length of alternate trips of the roller. Adjust speed of the roller as needed so that displacement of the aggregate does not occur. Compact mixture with hand-operated power tampers in all places not accessible to the rollers. Continue compaction until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density. Make such adjustments in compacting or finishing procedures as may be directed by the County to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory base course. Remove any materials found to be unsatisfactory and replace with satisfactory material or rework, as directed, to meet the requirements of this specification.



- E. Finishing. Finish the surface of the top layer of base course after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Do not add thin layers of material to the top layer of base course to meet grade. If the elevation of the top layer of base course is 1/2 inch or more below grade, scarify the top layer to a depth of at least 3 inches and blend new material in and compact to bring to grade. Make adjustments to rolling and finishing procedures as directed by the County to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic-marked prior to completion, scarify the unsatisfactory portion and rework and recompact it, or replace as directed.

3.02 FIELD QUALITY CONTROL

- A. Smoothness. Construct the top layer so that the surface shows no deviations in excess of 3/8 inch when tested with a 12-foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Also take measurements perpendicular to the centerline at 50-foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.
- B. Thickness. The completed thickness of the aggregate base course shall be within 1/2-inch of the thickness indicated. The thickness of the aggregate base course will be measured at intervals providing at least one measurement for at least each 200 square yards of aggregate base course placed. The depth measurement will be made by test holes at least three (3) inches in diameter. Where the measured thickness of the aggregate base course is deficient, such areas shall be corrected by excavating and placing with additional material as specified in 3.01.E, *Finishing*. The average job thickness shall be the average of the job measurements as specified above, but within 1/4-inch of the thickness indicated.
- C. Compaction. County will perform field density test of the in-place soils and aggregate base coarse at random locations, with a maximum frequency of one test for every 200 square yards, or portion thereof, of aggregate base course placed.
- D. Rework. Where tests indicate the base course does not meet specified relative compaction, rework and recompact the material represented by the test to the specified relative compaction. Retest the reworked areas until the specified relative compaction is met.

END OF SECTION



SECTION 32 12 16 – ASPHALT CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work covered by this section consists of furnishing all labor, equipment, and material and performing all operations necessary for placing and compacting asphalt concrete pavements, as specified herein, as shown on the Drawings, or as otherwise directed by the County.

1.02 REFERENCE

- A. American Society for Testing and Materials (ASTM):

D2172 Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures

D2950 Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

D5581 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6-inch-Diameter Specimen)

- B. State of California, Department of Transportation (CALTRANS)

2024 State Standard Specifications

<u>California Test</u>	<u>Method of Test for:</u>
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304	Method of Preparation of Bituminous Mixtures for Testing
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375	Determining the In-Place Density and Relative Compaction of AC Pavement
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1.03 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures," the following:

1. Product Data:

- a. Proposed mix and source.

2. Testing Reports:

- a. Certified weights of asphalt concrete delivered to the site.
b. Field testing reports



PART 2 – PRODUCTS

2.01 MATERIALS

- A. Asphalt concrete shall conform to Section 39 of the State Standard Specifications Type B, half-inch (1/2") maximum aggregate (medium). Asphalt emulsion for the paint binder (tack coat) shall conform to Section 94 of the State Standard Specifications.
- B. Aggregate base course shall conform to Section 32 11 23, "Aggregate Base."

PART 3 – EXECUTION

3.01 GENERAL

- A. Place and compact of asphalt concrete pavements shall conform to Section 39 of the State Standard Specifications.

3.02 COMPACTION

- A. Compact asphalt concrete to a density of not less than 95% of the maximum theoretical unit weight, as determined in the laboratory by Test Methods No. Calif. 304 and No. Calif. 375.

3.03 THICKNESS OF PAVEMENTS

- A. The structural section for pavements is shown on the Drawings or specified herein.

3.04 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 - 1. Mill existing asphalt to a minimum depth of 2 inches.
 - 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
 - 3. Control rate of milling to prevent tearing of existing asphalt course.
 - 4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
 - 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 - 6. Patch surface depressions deeper than 1 inch after milling, before overlay asphalt concrete pavement is laid.



3.05 PAVEMENT CONSTRUCTION

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.
- D. Cut lines on existing pavements shall be straight and smooth. Joints between old and new pavements or between successive day's work, or joints that have become cold because of delay, shall be made carefully to ensure continuous bond between old and new sections of course. All joints shall have the same texture, density, and smoothness as other sections of course. Contact surfaces of previously constructed pavements that have become coated with dust, sand or other objectionable material shall be cleaned by brushing or cut back with approved power saw, as directed. The surface against which new material is placed shall be sprayed with a uniform layer of tack coat.
- E. Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
- F. Trim edges of pavement adjacent to shoulders neatly to line. An earth berm of selected material not less than one foot wide shall be placed against and to the full height of the pavement surface as soon as practicable after final rolling has been completed and pavement has sufficiently hardened.
- G. The finish surface shall conform to the tolerances identified in Section 39 of the State Standard Specifications.
- H. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- I. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- J. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.



3.06 FIELD QUALITY CONTROL

- A. Testing Methods and Frequency. The following tests will be performed by the County. The Contractor shall perform testing as required to control the work.
- B. Asphalt Mix Testing. 2 samples per day per mix type at plant or from truck. Test uncompacted mix for extraction in accordance with ASTM D2172 and sieve analysis in accordance with AASHTO T30. Test samples for stability and flow in accordance with ASTM D5581. When 2 consecutive tests fail to meet requirements of specifications, cease placement operations, and test a new trial batch prior to resumption of placement operations. Submit 2 per day of each mix type. When two tests on uncompacted mix fail, submit new trial batch for approval.
- C. Testing of Pavement Course
 - 1. Density. Determine density of pavement by in-place testing using Nuclear Method in accordance with ASTM D2950. Take in-place density tests at location designated by the County for each 200 feet, or fraction thereof, of asphalt placed.
 - 2. Thickness. Two pavement cores at locations designated by the County to verify pavement thickness. Job thickness of finished pavement by use of following equation.

$$t = W/0.75d$$

where t = pavement thickness (inches)

W = average weight per square yard of mixture actually used in the work

d = compacted density as measured by nuclear density device

END OF SECTION



SECTION 32 16 13 – CONCRETE CURBS AND GUTTERS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Furnish and install all labor, material, equipment, and incidentals necessary to construct concrete curbs and gutters as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.02 REFERENCES

- A. City of Fairfield, Department of Public Works Capital Improvement Projects
Engineering Design Standards and Standard Details

1.03 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures," the following:
 - 1. Product Data: Concrete mix designs and related materials in accordance with the City Standard Construction Specifications

PART 2 – PRODUCTS

2.01 CONCRETE

- A. Comply with Section 03 30 00, "Cast-In-Place Concrete" and City Standards and Details.

PART 3 – EXECUTION

3.01 CURB AND GUTTER INSTALLATION

- A. Comply with City Standards and the Drawings.
- B. Construct type of curb and gutter as shown on the Drawings and in accordance with the City Standards.

3.02 FIELD QUALITY CONTROL

- A. Inspect the finished curb and gutter to verify conformance with the City Standards. The finished surface of curb and gutter shall be free from humps, sags, or other irregularities. The surface shall be uniform to a degree such that no depressions greater than 0.02 foot are present when tested with a ten-foot (10') straightedge, except at grade changes. Curb and gutter shall be tested by the application of water in the presence of the County. No standing water will be permitted.

END OF SECTION



SECTION 32 17 23 – PAVEMENT MARKING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This work covered by this section consists of specifications for applying traffic stripes and pavement markings. Submit for review, the following:
- B. MARKINGS MUST COMPLY WITH THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CA MUTCD).

1.02 REFERENCE

- A. State of California, Department of Transportation (CALTRANS)
2024 State Standard Specifications
CA MUTCD
- B. US Environmental Protection Agency (EPA):

<u>EPA Test</u>	<u>Method of Test for:</u>
3052	Microwave-Assisted Acid Digestion of Siliceous and Organically Based Matrices
6010 B or C	Inductively Coupled Plasma-Atomic Emission Spectrometry
- C. American Society for Testing and Materials (ASTM):

ASTM D6628	Standard Specification for Color of Retroreflective Pavement Marking Materials
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
- D. American Association of State Highway and Transportation Officials (AASHTO):

M 247	Glass Beads for Road Marking
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1.03 DEFINITIONS

- A. pavement marking: Transverse marking such as (1) a limit line, (2) a stop line, or (3) a word, symbol, shoulder, parking stall, or railroad-grade-crossing marking.
- B. traffic stripe: Longitudinal centerline or lane line used for separating traffic lanes in the same direction of travel or in the opposing direction of travel or a



longitudinal edge line marking the edge of the traveled way or the edge of a lane at a gore area separating traffic at an exit or entrance ramp. A traffic stripe is shown as a traffic line.

1.04 SUBMITTALS

- A. For each lot or batch of thermoplastic, paint, and glass beads, submit:
 - 1. Certificate of compliance, including the product name, lot or batch number, and manufacture date.
 - 2. METS notification letter stating that the material is authorized for use, except for thermoplastic.
 - 3. SDS.
 - 4. Material data sheet for thermoplastic primer.
- B. For each lot or batch of thermoplastic, submit a manufacturer's certificate of compliance with test results for the tests specified in section 84-2.01D. The date of test must be within 1 year of use.
- C. For glass beads used in drop-on applications and in thermoplastic formulations, submit a certificate of compliance and test results for each lot of beads specifying the EPA test methods used and tracing the lot to the specific test sample. The testing for lead and arsenic content must be performed by an independent testing laboratory.
- D. Submit retroreflectivity readings for traffic stripes and pavement markings at locations with deficient retroreflectivity determined by the Engineer.

1.05 QUALITY ASSURANCE

- A. Before starting permanent application of two-component painted traffic stripes or markings, apply a test stripe of the paint on roofing felt or other suitable material in the presence of the Engineer. The test section must be at least 50 feet in length.
- B. Test each lot of glass beads for arsenic and lead under EPA Test Method 3052 and 6010B or 6010C.
- C. The Engineer will perform a nighttime, drive-through, visual inspection of the retroreflectivity of the traffic stripes and pavement markings and notify you of any locations with deficient retroreflectivity. Measure the retroreflectivity of the deficient areas using a retroreflectometer under ASTM E1710 and the sampling protocol specified in ASTM D7585.
- D. Each lot or batch of thermoplastic must be tested under Caltrans Test 423 for:
 - 1. Brookfield Thermosel viscosity



2. Hardness
 3. Yellowness index, white only
 4. Daytime luminance factor
 5. Yellow color, yellow only
 6. Glass bead content
 7. Binder content
- E. During the installation of thermoplastic traffic stripes or markings at the job site, apply a test stripe of the thermoplastic on suitable material in the presence of the Engineer. The test stripe must be at least 1 foot in length. The test stripe will be tested for yellow color, daytime luminance factor, and yellowness index requirements.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Traffic stripes and pavement markings must be retroreflective. Within 30 days of applying traffic stripes and pavement markings, the retroreflectivity of the stripes and markings must be a minimum of $250 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ for white and $125 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ for yellow when measured under ASTM E1710.

2.02 THERMOPLASTIC

- A. Thermoplastic must comply with State Specification PTH-02SPRAY, PTH-02HYDRO, or PTH-02ALKYD.
- B. For recessed thermoplastic stripes and pavement markings, mark packages of thermoplastic with the words For Recessed Application.

2.03 PAINT

- A. The paint for traffic stripes and pavement markings must comply with the specifications for the paint type and color shown in following table:



Paint Specifications		
Paint Type	Color	Specification
Waterborne traffic line	White, yellow, and black	State Specification PTWB-01R2
Acetone-based	White, yellow, and black	State Specification PT-150VOC(A)
Waterborne traffic line for the international symbol of accessibility and other curb markings	Blue, red, and green	Federal Specification TT-P-1942E

- B. The color of painted traffic stripes and pavement markings must comply with ASTM D6628.

2.04 GLASS BEADS

- A. Glass beads applied to paint must comply with State Specification 8010-004.
- B. Glass beads applied to molten thermoplastic material must be Type 2 beads complying with AASHTO M 247. The glass beads must have a coating that promotes adhesion of the beads to thermoplastic.
- C. At least 75 percent of the beads by count must be true spheres that are colorless and do not exhibit dark spots, air inclusions, or surface scratches when viewed under 20X magnification.
- D. Each lot of glass beads used in pavement markings must contain less than 200 ppm each of arsenic and lead when tested under EPA Test Methods 3052 and 6010B or 6010C.

2.05 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKING WITH ENHANCED WET-NIGHT VISIBILITY

- A. A thermoplastic traffic stripe or pavement marking with enhanced wet-night visibility consists of a single uniform layer of thermoplastic and 2 layers of glass beads.
- B. The 1st layer of glass beads must be on the Authorized Material List for high-performance glass beads. The color of the glass beads must match the color of the stripe or marking to which they are being applied.
- C. The 2nd layer of glass beads must comply with AASHTO M 247, Type 2.
- D. The glass beads used in both layers must be surface treated for use with thermoplastic under the bead manufacturer's instructions.
- E. Within 14 days of applying a thermoplastic traffic stripe or pavement marking with enhanced wet-night visibility, the retroreflectivity must be a minimum of 700



$\text{mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ for white stripes and markings and $500 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ for yellow stripes and markings when measured under ASTM E1710.

2.06 TWO-COMPONENT PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS

- A. A two-component painted traffic stripe or pavement marking consists of 1 coat of paint and 2 applications of retroreflective glass beads of 2 gradations.
- B. The large-gradation glass beads must be on the Authorized Material List for two-component traffic striping paints and large-gradation retroreflective glass beads.
- C. The small-gradation glass beads must comply with AASHTO M 247, Type 1.
- D. The glass beads must have an adhesion-promoting and water-repellant coating complying with the paint manufacturer's instructions.
- E. You may use alternative types of glass beads recommended by the paint manufacturer if authorized.
- F. The daytime and nighttime color of the painted traffic stripes and pavement markings must comply with ASTM D6628.

PART 3 – EXECUTION

3.01 GENERAL

- A. Establish the alignment for traffic stripes and the layouts for pavement markings with a device or method that will not conflict with other traffic control devices.
- B. Protect existing retroreflective pavement markers during work activities.
- C. Remove existing pavement markers that are coated or damaged by work activities and replace each with an equivalent marker on the Authorized Material List for signing and delineation materials.
- D. A completed traffic stripe must:
 - 1. Have clean, well-defined edges without running or deformation.
 - 2. Be uniform.
 - 3. Be straight on a tangent alignment and on a true arc on a curved alignment.
- E. The width of a completed traffic stripe must not deviate from the width shown by more than 1/4 inch on a tangent alignment and 1/2 inch on a curved alignment.
- F. The length of the gaps and individual stripes that form a broken traffic stripe must not deviate by more than 2 inches from the lengths shown. The gaps and stripes must be uniform throughout the entire length of each section of broken traffic



stripe so that a normal striping machine can repeat the pattern and superimpose successive coats on the applied traffic stripe.

- G. A completed pavement marking must have well-defined edges without running or deformation.
- H. A completed thermoplastic traffic stripe or thermoplastic pavement marking must be free from runs, bubbles, craters, drag marks, stretch marks, and debris.
- I. Protect newly placed traffic stripes and pavement markings from traffic and other deleterious activities until the paint is thoroughly dry or the thermoplastic is hard enough to bear traffic.

3.02 SURFACE PREPARATION

- A. Use mechanical wire brushing to remove dirt, contaminants, and loose material from the pavement surface that is to receive the traffic stripe or pavement marking.
- B. Use abrasive blast cleaning to remove laitance and curing compound from the surface of new concrete pavement that is to receive the traffic stripe or pavement marking.

3.03 APPLICATION OF STRIPES AND MARKINGS

- A. Apply thermoplastic for a pavement marking with a stencil or a preformed marking.
- B. Apply paint for a pavement marking by hand with a stencil and spray equipment.
- C. You may use permanent tape for a traffic stripe or a pavement marking instead of paint or thermoplastic. The permanent tape must be on the Authorized Material List for signing and delineation materials. Apply the tape under the manufacturer's instructions.
- D. Immediately remove drips, overspray, improper markings, paint, and thermoplastic tracked by traffic with an authorized method.
- E. Apply a traffic stripe or a pavement marking only to a dry surface during a period of favorable weather when the pavement surface is above 50 degrees F.
- F. The glass beads must be embedded in the coat of paint or thermoplastic to a depth of 1/2 their diameters.
- G. Verify the rate of application of the glass beads by stabbing the glass bead tank with a calibrated rod.
- H. Where a new broken traffic stripe joins an existing broken traffic stripe, allow enough overlap distance between the new and existing striping patterns to ensure continuity at the beginning and end of the transition.



3.04 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

- A. Do not thin the primer. Apply the primer under the manufacturer's instructions:
 - 1. To all roadway surfaces except for asphaltic surfaces less than 6 months old
 - 2. At a minimum rate of 1 gallon per 300 square feet
 - 3. To allow time for the thermoplastic primer to dry and become tacky prior to application of the thermoplastic
- B. Use preheaters with mixers having a 360-degree rotation to preheat the thermoplastic material.
- C. Apply the thermoplastic in a single uniform layer by spray or extrusion methods.
- D. Completely coat and fill voids in the pavement surface with the thermoplastic.

3.05 EXTRUDED THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

- A. Apply extruded thermoplastic at a temperature from 400 to 425 degrees F unless a different temperature is recommended by the manufacturer.
- B. Apply extruded thermoplastic for a traffic stripe at a rate of at least 0.36 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied thermoplastic traffic stripe must be at least 0.060 inch thick.
- C. An applied thermoplastic pavement marking must be from 0.100 to 0.150 inch thick.
- D. Apply glass beads to the surface of the molten thermoplastic at a rate of at least 8 lbs of beads per 100 sq ft.

3.06 SPRAYABLE THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

- A. Apply sprayable thermoplastic under State Specification PTH-02SPRAY at a temperature from 350 to 400 degrees F.
- B. Apply sprayable thermoplastic at a rate of at least 0.24 lb of thermoplastic per foot of 6-inch-wide solid stripe.
- C. The applied sprayable thermoplastic material must be at least 0.040 inch thick.

3.07 RECESSED THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

- A. Construct recesses for double traffic stripes in a single pass.
- B. Keep the recesses dry and free from debris. Apply primer to the recesses.
- C. After constructing the recesses, apply the thermoplastic traffic stripes and



pavement markings before the end of the same work shift.

3.08 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS WITH ENHANCED WET-HIGH VISIBILITY

- A. Use a ribbon-extrusion or screed-type applicator to apply thermoplastic traffic stripes with enhanced wet-night visibility. Operate the striping machine at a speed of 8 mph or slower during the application of the stripe and glass beads.
- B. Apply the stripe at a rate of at least 0.57 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied thermoplastic traffic stripe must be at least 0.090 inch thick.
- C. Apply thermoplastic pavement marking at a rate of at least 1.06 lb of thermoplastic per square foot of marking. The applied thermoplastic pavement marking must be at least 0.100 inch thick.
- D. Apply thermoplastic traffic stripe and both types of glass beads in a single pass. First apply the
- E. thermoplastic, followed immediately by consecutive applications of high-performance glass beads and then AASHTO M 247, Type 2, glass beads. Use a separate applicator gun for each type of glass bead.
- F. You may apply glass beads by hand on pavement markings.
- G. Uniformly distribute glass beads on traffic stripes and pavement markings. Apply high-performance glass beads at a rate of at least 6 lbs of glass beads per 100 sq ft of stripe or marking. Apply AASHTO M 247, Type 2, glass beads at a rate of at least 8 lb of glass beads per 100 sq ft of stripe or marking. The combined weight of the 2 types of glass beads must be greater than 14 lbs of glass beads per 100 sq ft of stripe or marking.

3.09 PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS

- A. Do not thin paint for traffic stripes and pavement markings. Mix the paint by mechanical means until it is homogeneous. Thoroughly agitate the paint during its application.
- B. Use mechanical means to paint traffic stripes and pavement markings and to apply glass beads for traffic stripes.
- C. The striping machine must be capable of superimposing successive coats of paint on the 1st coat and on existing stripes at a speed of at least 5 mph.
- D. The striping machine must:
 - 1. Have rubber tires.
 - 2. Be maneuverable enough to produce straight lines and normal curves in



- true arcs.
3. Be capable of applying traffic paint and glass beads at the specified rates.
 4. Be equipped with:
 - a. Pointer or sighting device at least 5 feet long extending from the front of the machine.
 - b. Pointer or sighting device extending from the side of the machine to determine the distance from the centerline for painting shoulder stripes.
 - c. Positive acting cutoff device to prevent depositing paint in gaps of broken stripes.
 - d. Shields or an adjustable air curtain for line control.
 - e. Pressure regulators and gauges that are in full view of the operator for a pneumatically operated machine.
 - f. Paint strainer in the paint supply line.
 - g. Paint storage tank with a mechanical agitator that operates continuously during painting activities.
 - h. Glass bead dispenser located behind the paint applicator nozzle that is controlled simultaneously with the paint applicator nozzle.
 - i. Calibrated rods for measuring the volumes of paint and glass beads in the paint and glass bead tanks.
- E. Air-atomized spray equipment must:
1. Be equipped with oil and water extractors and pressure regulators.
 2. Have adequate air volume and compressor recovery capacity.
 3. Have properly sized orifices and needle assemblies for the spray gun tip.
- F. Where the configuration or location of a traffic stripe is such that the use of a striping machine is not practicable, you may apply the traffic paint and glass beads by other methods and equipment if authorized. The Engineer determines if the striping machine is not practicable for a particular use.
- G. For an existing surface, apply traffic stripes and pavement markings in 1 coat.
- H. For a new surface, except for the black stripe between the 2 yellow stripes of a double traffic stripe, apply traffic stripes and pavement markings in 2 coats. The 1st coat of paint must be dry before applying the 2nd coat.



- I. Paint a 1-coat, 3-inch-wide black stripe between the two 6-inch-wide yellow stripes of a double traffic stripe.
- J. If the two 6-inch-wide yellow stripes are applied in 2 coats, apply the black stripe concurrently with the 2nd coat of the yellow stripes.
- K. Apply each coat of paint for any traffic stripe in 1 pass of the striping machine, including the glass beads, regardless of the number, width, and pattern of the individual stripes. Do not paint traffic stripes and pavement markings if:
 - 1. Freshly painted surfaces could become damaged by rain, fog, or condensation.
 - 2. Atmospheric temperature could drop below 40 degrees F for acetone-based paint and 50 degrees F for waterborne paint during the drying period.
- L. On 2-lane highways:
 - 1. If the 1st coat of the centerline stripe is applied in the same direction as increasing post miles, use the right-hand spray gun of the 3 spray guns used to apply the double yellow stripe to apply a single yellow stripe.
 - 2. If the 1st coat of the centerline stripe is applied in the same direction as decreasing post miles, use the left-hand spray gun of the 3 spray guns used to apply the double yellow stripe to apply a single yellow stripe.
 - 3. Apply the 2nd coat of centerline striping in the opposite direction of the 1st coat.
- M. Apply 1-coat paint at an approximate rate of 107 sq ft/gal.
- N. Apply 2-coat paint at the approximate rate shown in the following table:

Two-Coat Paint Application Rates		
Paint Type	Coverage (sq ft/gal)	
	1 st Coat	2 nd Coat
Waterborne Paint	215	215
Acetone-based Paint	360	150

- O. Apply glass beads at an approximate rate of 5 lb of beads per gallon of paint.
- P. The Engineer determines the exact application rate of the paint and glass beads.
- Q. Verify the application rate of paint by stabbing the paint tank with a calibrated rod. If the striping machine has paint gauges, the Engineer may measure the volume of paint using the gauges instead of stabbing the paint tank with a calibrated rod.



3.10 TWO-COMPONENT PAINTED TRAFFIC STRIPES AND PAVEMENT MARKING

- A. Do not apply paint for two-component painted traffic stripes and pavement markings until authorized.
- B. Apply the paint only to clean, completely dry surfaces when the pavement surface temperature is above 39 degrees F and the ambient temperature is above 36 degrees F.
- C. Comply with the paint manufacturer's instructions for the temperature of the paint during its application.
- D. The striping machine must not travel faster than 10 mph when applying the paint and glass beads.
- E. Apply the paint and glass beads in 1 pass in the following order:
 - 1. Paint
 - 2. Large-gradation glass beads
 - 3. Small-gradation glass beads
- F. Apply the glass beads with 2 separate applicator guns.
- G. Uniformly distribute the glass beads on traffic stripes and pavement markings.
- H. You may apply the glass beads by hand methods on pavement markings.
- I. Apply the large-gradation glass beads at a minimum rate of 11.7 lbs of beads per gallon of paint.
- J. Apply the small-gradation glass beads at a minimum rate of 8.3 lbs of beads per gallon of paint.

END OF SECTION



SECTION 32 31 00 – FENCES AND GATES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work covered by this section consists of the construction of new fences and gates, as specified herein, as shown on the Drawings, or as otherwise directed by the County.
- B. Removal and replacement of the automated vehicle access barrier is covered in Section 02 40 00, "Demolition." Removal and reinstallation of fencing and gates shall be performed in a manner that will protect the integrity of the enclosed property and encroachment of unauthorized persons or workers on the same property.
- C. For gate hardware, controls, and detection and alarm systems refer to Division 28 specifications.
- D. For fence grounding and bonding refer to requirements in Section 26 05 26, "Grounding and Bonding for Electrical Systems."

1.02 REFERENCES

- A. American Society for Testing of Materials (ASTM) Standards:
 - A36 Structural Steel, Bars, Flats, and Shapes
 - A116 Metallic-Coated, Steel-Woven Wire Fence Fabric
 - A121 Metallic-Coated Carbon Steel Barbed Wire
 - A123 Zinc Coating (Hot-Dip) Coatings on Iron and Steel Products
 - A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A428 Test Method for Weight of Coating on Aluminum Coated Iron or Steel Articles
 - A490 Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
 - A500 Steel Structural Tubing in Rounds and Shapes
 - A563 Carbon and Alloy Steel Nuts
 - A641 Zinc-Coated (Galvanized) Carbon Steel Wire
 - A653 Steel Sheet, Zinc-Coated (Galvanized) Or Zinc-Iron Alloy-Coated (Galvannealed) By the Hot-Dip Process



- A924 General Requirements for Steel Sheet, Metallic-Coated By The Hot-Dip Process
 - F552 Standard Terminology Relating to Chain Link Fencing
 - F567 Standard Practice for Installation of Chain Link Fence
 - F626 Fence Fittings
 - F900 Industrial and Commercial Swing Gates
 - F934 Standard Colors for Polymer-Coated Chain Link Fence Materials
 - F1043 Strength And Protective Coatings on Steel Industrial Fence Framework
 - F1083 Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
 - F2200 Automated Vehicular Gate Construction
 - F2408 Ornamental Fences Employing Galvanized Steel Tubular Pickets
- B. Chain Link Manufacturer's Institute for "Galvanized Steel Chain Link Fence Fabric and Accessories"
- C. National Fire Protection Association (NFPA):
- 70 National Electrical Code (NEC)

1.03 QUALIFICATIONS:

- A. Installer bonded and licensed in the State of California
- B. Installer shall have a minimum 2 years of experience installing similar fencing
- C. Utilize only AWS-certified welders
- D. Electric gate operators to be UL listed
- E. Grounding by an electrician licensed in the State of California

1.04 DEFINITIONS

- A. See ASTM F552.
- B. NPS: Nominal pipe size, in inches.
- C. Installer: Installer is the person installing or applying the product in the field at the Project site.



1.05 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures," the following:
 - 1. Product Data:
 - a. Product technical data, including acknowledgement that products submitted meet requirements of referenced standards
 - b. Manufacturer's installation instructions
 - c. Equipment Operation and Maintenance Manuals
 - 2. Shop Drawings: For each type of fence and gate assembly.
 - a. Include plans, elevations, sections, details and attachments to other work.
 - b. Include accessories, hardware, gate operation, and operational clearances.
 - c. Gate Operator: Show locations and details for installing operator components, switches, and controls, indicate motor size, electrical characteristics, drive arrangement, mounting and grounding provisions.
 - d. Wiring Diagrams: For power, signal, and control wiring.
 - 3. Test Reports: Source quality control test results
 - 4. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.06 QUALITY CONTROL

- A. Design, supply of equipment and components, installation, and on-call service shall be product of individual company with record of installations meeting requirements specified.
- B. Pre-installation Conference: Conduct conference at Project Site with fence and gate installer to verify layout.

PART 2 – PRODUCTS

2.01 CHAIN LINK FENCE COMPONENTS

- A. Chain Link Fabric: Provide fabric in height measured between top and bottom of outer edge of selva in accordance with "CLFMI Product Manual" and requirements indicated below:



1. Fabric. Unless otherwise noted on the Drawings, chain link fence shall be PVC-coated, as described herein.
 - a. PVC-Coated Steel: Galvanized core wire ASTM A641, Class 3, PVC color per ASTM F934, Black
2. Core Wire gage: No. 9
3. Pattern: 2-inch diamond mesh
4. Salvage End Treatment: twisted and barbed top and bottom
- B. Concrete: Class B, in accordance with Section 03 30 00, "Cast-in-Place Concrete."
- C. Line post: ASTM F1083 Schedule 40, 2 1/2-inch NPS.
- D. Corner or Terminal Post: ASTM F1083 Schedule 40, 4-inch NPS.
- E. Brace and Intermediate, Top, and Bottom Rail: in accordance with ASTM F1083 for Heavy Industrial
- F. PVC Coating for Post, Braces, Rails, and Fittings: Fusion-bonded vinyl coating 10-14 mils thick; color to match fabric.
- G. Fence Fittings (Post and Line Caps, Rail and Brace Ends, Sleeves-Top Rail, Tie Wires and Clips, Fasteners, Tension and Brace Bands, Tension Bars, Truss Rods): ASTM F626.
- H. Swing Gates: ASTM F900 with materials and coatings as specified for fence framework and fabric, and ASTM A153 galvanized hardware. Gate hinges shall allow a 90-degree in and out gate opening.
- I. Barbed Wire Arms: With clips, slopes, or other means for attaching strands of barbed wire and razor wire for each post unless otherwise indicated.
- J. Barbed Wire: Barbed wire must comply with ASTM A121, High Security Grade, have three-strand barbed wire; 0.099-inch diameter line wire with 0.08-inch diameter, four-point round barbs spaced not more than 3 inches O.C.
- K. Razor Wire:
 1. ASTM A176 reinforced barbed tape, double coil fabricated from 430 series stainless steel with a hardness range of Rockwell (30N) 37-45 minimum.
 2. Strips: 0.025-inch thick by 1 inch wide before fabrication, with 1.2-inch-long barbs in groups of 4 spaced 4 inches on center.
 3. Core Wire: ASTM A478 0.098-inch diameter stainless steel with a minimum tensile strength of 140 psi.



4. Clips: 0.065-inch thick by 0.375-inch-wide stainless steel.

L. Vertical stays for barbed wire must comply with ASTM A641, be 12-1/2 gauge, and have a Class 3 zinc coating.

2.02 MEDIUM SECURITY FENCE

A. Approved manufacturers: The fence system shall conform to Montage Industrial Welded and Rackable Ornamental Steel, Classic design, 4 rail style manufactured by Ameristar Fence Products, Inc., or approved equal.

B. Manufactured fence system shall meet the vertical load, horizontal load, and infill performance requirements of ASTM F2408 for industrial weight fences.

C. All steel material for fence framework shall be galvanized prior to forming and meet the requirements of ASTM A924/A924M with a minimum yield strength of 45,000 psi (310 MPa).

1. Coatings: Hot-dip galvanized; zinc coatings shall meet the requirements of ASTM A653/A653M with a minimum coating weight of 0.60 oz/ft² (coating designation G60)

D. Concrete: Class B, in accordance with Section 03 30 00, "Cast-in-Place Concrete."

E. Line Posts: Minimum of 2.5" square x 12 ga.

F. Pickets: 1" sq x 16 ga. Tubing.

G. Rails: 1.75" x 1.75" x 0.105" steel channel. Rails shall be fabricated with pre-punched holes to accept pickets.

H. Fasteners: Use manufacturer-recommended fasteners.

I. Finishes: Use manufacturer-recommended products and processes to apply finishes.

2.03 HIGH SECURITY FENCE

A. Approved manufacturers: The steel ornamental pale high security fence system shall conform to Ameristar Impasse II, Stronghold, 3-rail panel style, manufactured by Ameristar Perimeter Security, Inc or approved equal.

B. All steel material for fence framework shall be galvanized prior to forming and meet the requirements of ASTM A924/A924M with a minimum yield strength of 45,000 psi (310 MPa).

1. Coatings: Hot-dip galvanized; zinc coatings shall meet the requirements of ASTM A653/A653M with a minimum coating weight of 0.90 oz/ft² (coating designation G90)



- C. Concrete: Class B, in accordance with Section 03 30 00, "Cast-in-Place Concrete."
- D. Corner and Line Posts: 3" x 2.75" 12 ga I-beam post.
- E. The cross-sectional shape of the rails shall conform to the manufacturer's Impasse II rail design, a nominal 2" x 2" x 11 Ga. Pre-drilled holes in the Impasse II rail shall be spaced 6" on center, providing a pale airspace of no greater than 3.25"
- F. Corrugated pales: 2.75" x 0.75" x 14 ga.
- G. Fasteners: Use manufacturer-recommended fasteners.
- H. Finishes: Use manufacturer-recommended products and processes to apply finishes.
- I. Privacy Screen: Use manufacturer-recommended privacy screen.

2.04 HIGH SECURITY BIFOLD GATE

- A. Approved manufacturers: The high security bifold gate shall conform to Post Drive, Top Track (PDTT) manufactured by Wallace Perimeter Security or approved equal.
- B. Gate shall be meet the requirements of ASTM F2200.
- C. Concrete: Class B, in accordance with Section 03 30 00, "Cast-in-Place Concrete."
- D. Steel sheet: Base material shall meet the requirements of ASTM A36, hot-dipped galvanized meeting the requirements of ASTM A653/A653M
- E. Steel sections: Steel sections shall comply to ASTM standard sections.
- F. Welding materials: Welding materials shall comply to ASWD1.1.
- G. Electrical components: In accordance with UL325.
- H. Power supply: 208V, 60 Hz, single phase
- I. Gate columns: Formed steel columns, 12" square with a wall thickness of 0.250", anchored to a concrete foundation.
- J. Panels to be capable of fully opening within seven (7) seconds.
- K. Panels: 1.5" vertical bar infill.
- L. Hinges: Use manufacturer-recommended corrosion-resistant hinges; hinges are to be heavy-duty corrosion-resistant base material with a minimum 1" stainless steel shaft.



M. Drive unit:

1. Variable frequency drive with programmable logic controller for controlling electromechanical drive system. Drive system to incorporate encoders with reduced speed sensing software as primary entrapment detection device.
2. All drive components to be enclosed in manufacturer-recommended weather-resistant housing.
3. Dual 0.75HP 3-phase gear motors with integrated brake and 360:1 gear reduction box with synthetic lubricant
4. Emergency override: Provide secured access panel for manual opening and closing in case of power failure or malfunction.

N. Safety/Obstruction Devices:

1. Provide reduced speed sensor; absolute encoder mounted directly to drive motor to act as primary entrapment detection device.
2. Photoelectric transmitter and receiver: Equip each column with two (2) built-in photocells at 20" and 60" above the base plate. Mount within the columns.
3. Provide 2-channel obstruction loop relay card for integration of dual obstruction loops.

O. Finishes: Hot-dip galvanized; zinc coatings shall meet the requirements of ASTM A653/A653M with a minimum coating weight of 1.65 oz/ft² (coating designation G165)

2.05 MEDIUM SECURITY BIFOLD GATE

- A. Approved manufacturers: The medium security bifold gate shall conform to Post Drive, Trackless Speedgate (PDXT) manufactured by Wallace Perimeter Security or approved equal.
- B. Gate shall be meet the requirements of ASTM F2200.
- C. Concrete: Class B, in accordance with Section 03 30 00, "Cast-in-Place Concrete."
- D. Steel sheet: Base material shall meet the requirements of ASTM A36, hot-dipped galvanized meeting the requirements of ASTM A653/A653M
- E. Steel sections: Steel sections shall comply to ASTM standard sections.
- F. Welding materials: Welding materials shall comply to ASWD1.1.
- G. Electrical components: In accordance with UL325.



- H. Power supply: 208V, 60 Hz, single phase
- I. Gate columns: Formed steel columns, 12" square with a wall thickness of 0.250", anchored to concrete foundation.
- J. Panels to be capable of fully opening within seven (7) seconds.
- K. Panels: 1.5" vertical bar infill.
- L. Hinges: Use manufacturer-recommended corrosion resistant hinges; hinges are to be heavy-duty corrosion resistant base material with a minimum 1" stainless steel shaft.
- M. Drive unit:
 - 1. Variable frequency drive with programmable logic controller for controlling electromechanical drive system. Drive system to incorporate encoders with reduced speed sensing software as primary entrapment detection device.
 - 2. All drive components to be enclosed in manufacturer-recommended weather-resistant housing.
 - 3. Dual 0.75HP 3-phase gear motors with integrated brake and 360:1 gear reduction box with synthetic lubricant
 - 4. Emergency override: Provide secured access panel for manual opening and closing in case of power failure or malfunction.
- N. Safety/Obstruction Devices:
 - 1. Provide reduced speed sensor; absolute encoder mounted directly to drive motor to act as primary entrapment detection device.
 - 2. Photoelectric transmitter and receiver: Equip each column with two (2) built-in photocells at 20" and 60" above the base plate. Mount within the columns.
 - 3. Provide 2-channel obstruction loop relay card for integration of dual obstruction loops.
- O. Finishes: Hot-dip galvanized; zinc coatings shall meet the requirements of ASTM A653/A653M with a minimum coating weight of 1.65 oz/ft² (coating designation G165)

2.06 SWING GATE

- A. Swing gates shall meet the requirements of Caltrans Standard Specifications section 80-10.



- B. Concrete: Class B, in accordance with Section 03 30 00, "Cast-in-Place Concrete."
- C. Posts and Braces: Base metal for posts and braces must be commercial-quality, weldable steel complying with AASHTO M181, Type 1, except for the following protective coating requirements.
 - 1. Posts and braces must comply with the strength requirements in ASTM F1043 for one of the following. Group IC, 50,000 psi yield, for round steel pipes may be used instead of Group IA, regular grade steel round pipes of the same diameter.
 - a. Group IA, regular grade, for round pipes
 - b. Group IC, 50,000 psi yield, for round pipes
 - c. Group II-L for roll-formed posts and braces
 - 2. Galvanize posts and braces in accordance with Caltrans Standard Specifications section 75-1.02B.
 - 3. Each post length must be at least the depth of the concrete footing plus the height of the fabric less 4 inches. The length does not include any top fixture or other top tension wire support integral with the post.
 - 4. Each post must have provisions to securely hold the top tension wire in position and allow for post removal and replacement without damaging the wire. Fit each tubular post with a rainproof top.
 - 5. Post tops, extension arms, stretcher bars, and other fittings and hardware must be steel, malleable iron, or wrought iron, galvanized after fabrication in accordance with Caltrans Standard Specifications section 75-102.B.
- D. Gate frames must be made with pipe at least 1-1/2" in diameter. Interior vertical stays must be made with pipe at least 1" in diameter.
- E. Gates greater than 8' in width must have vertical stays such that no panel exceeds 8' in width.
- F. Chain Link Fabric: In accordance with section 2.01A.
- G. Each gate frame panel must be cross-trussed with adjustable truss rods at least 3/8" in diameter.
- H. Fasten and reinforce each corner of a gate frame with a malleable iron or pressed steel fitting or by welding.
- I. Each pressed steel fitting must:
 - 1. Have a nominal thickness before galvanizing of at least 0.135"



2. Be fastened to develop the strength of connected members
- J. Welds must be smooth and develop the strength of the connected member.
- K. Galvanize fittings, latches, rods, and other gate hardware in accordance with Caltrans Standard Specifications section 75-102.B.
- L. Attach chain link fence fabric to the gate frame using stretcher bars and tie wires as specified for fence construction. Space tension connectors at 1' intervals.
- M. Each gate must have a combination steel or malleable iron catch and locking attachment that does not rotate around the latch post.
- N. Tension Wires, Hog Rings, Turnbuckles, Truss Tighteners, Truss Rods, and Stretcher Bars and Bar Bands
 1. Tension wire must be commercial-quality 7-gauge coil spring steel.
 2. Tie wires and hog rings must be at least 9-gauge steel.
 3. Post clips must be at least 6-gauge steel.
 4. Galvanize tension and tie wires, hog rings, and post clips in accordance with ASTM A116, coating Class 3.
 5. Turnbuckles and truss tighteners must be:
 - a. Commercial-quality steel, malleable iron, or wrought iron
 - b. Galvanized in accordance with Caltrans Standard Specifications section 75-102.B
 - c. Equal in tensile strength to the truss rod
 6. Truss tighteners must have a strap thickness of at least 1/4"
 7. Truss rods must be steel and have a diameter of at least 3/8"
 8. Stretcher bars must at least 1/4" by 3/4"
 9. Stretcher bar bands must be at least 1/8" by 3/4"
- O. Barbed Wire: In accordance with sections 2.01J and 2.01K.

2.07 CANTILEVERED SLIDE GATE

- A. Approved manufacturers: The cantilever slide gate shall conform to Alpha Cantilever Slide Gate manufactured by Wallace Perimeter Security or approved equal.
- B. Gate shall meet the requirements of ASTM F2200.



- C. Electrical components: In accordance with UL325.
- D. Power supply: 208V, 60 Hz, single phase
- E. Cantilevered Gate Components:
 - 1. Components shall be modular and capable of being replaced in field
 - 2. Site tensioned beam: 205mm x 285mm section, corrosion-resistant, hollow aluminum, incorporating high-tensile steel tensioning rods
 - 3. Pickets: OD 1" x 0.05", pre-galvanized, inserted vertically through the main beam and secured to top and bottom rails with roll pins at each picket
 - 4. Internal tension rods: 0.3" diameter, galvanized
 - 5. Serrated anti-climb aluminum top strip: 2.375" x 1.312"
 - 6. Chain link infill: 9 gauge
- F. Guides:
 - 1. Welded structural gate posts with top rail guide wheels and cantilever wheels
 - 2. Galvanized after fabrication meeting the requirements of ASTM A123/A123M
 - 3. Support posts: 2.36" x 3.15" x 116", connected at the top, form rigid frames to support the gate. Flanged for securing to foundation.
 - 4. Sealed bearing, nylon polyamide 6-5/16" maintenance-free, guarded cantilever roller sets.
 - 5. Catch post (portal) with run-on plate for secure closure.
 - 6. Gate support posts feature integral mount for gate operator, ensuring correct alignment for the life of the system
 - 7. Included standard "reach through guards" per ASTM F2200.
- G. Fasteners: Use manufacturer-recommended fasteners.
- H. Kinetic electronic gate drive:
 - 1. Electric microprocessor controller unit with many standard logic sequences, provisions for dedicated, labeled accessory inputs and outputs. Alert, Fault, Error logging for simplified troubleshooting and remote diagnostics.



2. Limit Switches: motor output shaft embedded encoder with 1/32" resolution to determine gate full open, full close, partial open, acceleration, and deceleration points.
3. Variable Speed (field selectable speed +/- 0.25fps) rack and pinion drive mechanism with nylon polyamide drive gear/rack hardware. Select 1 or 2 fps gate travel speed based on UL 325 classification.
4. Integrated uninterruptible power supply
5. Field selectable, fail-safe or fail-secure operation upon AC power loss
6. Field selectable, 240V, single phase input power
7. Adaptive inherent entrapment sensor with "ice breaker mode"
8. Built-in multi-level power surge and lightning strike protection
9. Tested and Listed for all UL 325 usage classes 1-4. Speed greater than 1 fps approved only for use on UL325 class 3 and 4 sites.

I. Finishes: Aluminum beam and rails with galvanized steel components.

2.08 PEDESTRIAN GATES – SECURITY FENCING

- A. Approved manufacturers: Ameristar Perimeter Security, Wallace Perimeter Security, or approved equal.
- B. All steel material for fence framework shall be galvanized prior to forming and meet the requirements of ASTM A924/A924M with a minimum yield strength of 45,000 psi (310 MPa).
 1. Coatings: Hot-dip galvanized; zinc coatings shall meet the requirements of ASTM A653/A653M with a minimum coating weight of 0.90 oz/ft² (coating designation G90)
- C. Concrete: Class B, in accordance with Section 03 30 00, "Cast-in-Place Concrete."
- D. Infill frame shall be 12 ga steel. Expanded metal mesh shall be 3/4" x #9 flattened or perforated metal mesh shall be 3/16" round x 1/2" x 18 ga.
- E. Ornamental picket infill material shall be 1" square x 14 ga. tubing for pickets. Pickets shall be spaced no greater than 5" O.C.
- F. If applicable, material for pales shall be 2.75" x 0.75" x 14 ga corrugated shape. Standard pale spacing shall be no greater than 6" O.C. or anti-scale pale spacing at no greater than 4.25" O.C.
- G. Gate shall be 1.75" x 14 ga steel reinforced structural design with 1/4" plate reinforced hinge mounting.



- H. Hinges: Use manufacturer-recommended hinges.
- I. Fasteners: Use manufacturer-recommended fasteners.
- J. Finishes: Use manufacturer-recommended products and processes to apply finishes.

PART 3 – EXECUTION

3.01 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Manufactured materials shall be delivered in containers or packages approved by the manufacturer. Gate products shall have tags bearing the names of the manufacturer and item.
- B. Storage: Store products above ground in a manner acceptable to the manufacturer, in an area that is protected from all deleterious elements. Storage conditions shall prevent damage to the product or marring of finishes.

3.02 PREPARATION

- A. Examine areas and conditions with installer present, for compliance with requirements for pavement work and other conditions affecting performance of the Work. Do not begin installation before final grading is completed unless otherwise permitted by the County.
- B. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks and property monuments.
- C. Remove obstructions that interfere with the proper alignment of gates. Verify any grade change and surface irregularities and make adjustments as needed.
- D. Discrepancies between the shop drawings and field conditions shall be brought to the attention of the County immediately upon discovery.

3.03 TEMPORARY SECURITY FENCES AND GATES

- A. Construction of fences and gates shall be in locations as shown on Drawings and in accordance with City of Fairfield Standards.

3.04 HIGH SECURITY CHAIN LINK FENCE INSTALLATION

- A. Install in accordance with the manufacturer's instructions, to the lines and grades shown on the Drawings, and in accordance with ASTM F567.
- B. Drill or hand excavate holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
- C. Set posts in concrete. Verify the posts are set plumb, aligned, and at correct



height and spacing, and hold in position during setting with concrete or mechanical devices.

- D. Where indicated in the drawings, embed fence posts in the wall in accordance with drawing details. Where fence is embedded into the wall, fence shall be installed to provide a 9-foot minimum height from base of the wall.
- E. Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of post from concrete splatter. Extend exposed concrete 1 inches above grade; shape and smooth to shed water.
- F. Terminal Posts: Install terminal end, corner, and gate posts in accordance with ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more, at any abrupt change in grade, and at intervals not greater than 500 feet. For runs exceeding 500 feet, space pull posts and equal distance between corner and end posts.
- G. Line Posts: Space line posts uniformly at 10 feet.
- H. Post Bracing and Intermediate Rails: Install in accordance with ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts adjacent line posts with truss rods and turnbuckles. Install braces at the end and gate posts, and at both sides of the corner and pull posts.
- I. Top Rail: Install in accordance with ASTM F567, maintaining plumb position and alignment of fence posts. 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 in writing by fencing manufacturer.
- J. Bottom Rail: Secure to posts with fittings.
- K. Chainlink Fabric: apply fabric to outside of enclosed framework. Place bottom edge of fabric within maximum clearance above grade, as shown on the Drawings. Correct irregularities in earth to maintain maximum clearance. Pull fabric taut and secure to posts, rails, and tension wires. Anchor framework so fabric remains under tension after pulling force is released.
- L. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches O.C.
- M. Tie Wires: Power-fastened or manually fastened ties configured to wrap a full 360 degrees around rail or post and a minimum of one complete diamond of fabric. Twist ends one and one-half machine twists or three full manual twists and cut off protruding ends to preclude untwisting by hand. Bend ends of wire to minimize hazard to persons or clothing.



- N. Barb Wire Arms: Bolt or rivet to top of post.
- O. Barb Wire: Install barbed wire uniformly spaced as indicated on the drawings. Pull wire taut, install securely to extension arms, and secure to end post or terminal arms.
- P. Razor Wire: Install Razor Wire in accordance with ASTM F1911. Install uniformly in configurations indicated and fasten securely to prevent movement or displacement.
- Q. Gates: Install gates in accordance with manufacturer's written instructions. 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 hardware for smooth operation. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.05 MEDIUM SECURITY FENCE INSTALLATION

- A. Install in accordance with the manufacturer's instructions, to the lines and grades shown on the Drawings. For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade.
- B. Fence installation shall not commence before final grading is complete and finish elevations are established.
- C. Drill post holes in firm, undisturbed or compacted soil.
- D. Space posts at equal intervals not exceeding 8 feet on center as shown on the Drawings.
- E. Posts shall be embedded in concrete footings having a minimum depth of 36", or as detailed on the drawings.
- F. When cutting or drilling rails or posts, ensure all metal shavings are removed from cut area. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. Apply two (2) coats of custom finish paint matching fence color.

3.06 HIGH SECURITY BIFOLD GATE INSTALLATION

- A. Install concrete footings in accordance with the Drawings.
- B. Install in accordance with manufacturer's instructions.
- C. Submit certificate of installation to manufacturer upon completion of installation for warranty validation
- D. Perform cleaning and maintenance procedures in accordance with manufacturer's instructions.



3.07 MEDIUM SECURITY BIFOLD GATE INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Perform cleaning and maintenance procedures in accordance with manufacturer's instructions.
- C. Submit certificate of installation to manufacturer upon completion of installation for warranty validation

3.08 SWING GATE INSTALLATION

- A. Hang each gate with at least two (2) steel or malleable iron hinges at least 3" in width such that the gate is securely clamped to the gate post and permits the gate to be swung back against the fence. The bottom must have a socket to take the ball end of the gate frame.
- B. Construct a center rest with a catch and stops to hold gates open.

3.09 CANTILEVERED SLIDE GATE INSTALLATION

- A. Install in accordance with the manufacturer's instructions.
- B. Install structural post in concrete foundations, completely level both horizontally and vertically.
- C. Test and adjust complete system for proper function and leave in perfect working order.
- D. Install vehicle detection loops and lead-in-wires in accordance with manufacturer's instructions.
- E. Supply and install other electrical wiring, conduit junction boxes, transformers, circuit breakers and auxiliary components required for complete installation. Conform to NEC and local requirements.

3.10 PEDESTRIAN GATE – SECURITY FENCING INSTALLATION

- A. Install in accordance with the manufacturer's instructions.
- B. Install posts in concrete footers at a minimum depth of 36", or in accordance with details shown on the Drawings.
- C. When cutting/drilling gate components or posts, ensure all metal shavings are removed from cut area. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. Apply two (2) coats of custom finish paint matching fence color.

END OF SECTION



SECTION 32 84 00 - IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: All labor, materials, supplies, tools and transportation to perform all operations in connection with and reasonably incidental to the complete installation of the automatic sprinkler irrigation systems as shown on the Drawings.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 RELATED SECTIONS:

- A. Final Acceptance for Work of this Section is contingent on completion of Work of Section 32 90 00.
- B. Division 32 – Exterior Improvements: Irrigation sleeving under paving.
- C. Division 33 – Utilities: Water meter and stub-out installation.

1.3 REFERENCES

- A. ASTM – American Society for Testing and Materials
 - 1. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 2. D1785 – Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40 and 80 and Classes 200 and 315.
- B. ICC – International Code Council
- C. NEC – National Electric Code
- D. State of California, Division of Industrial Safety
 - 1. Electrical Safety Orders
- E. UPC – Uniform Plumbing Code

1.4 QUALITY ASSURANCE

- A. OSHA Compliance:
 - 1. 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.
 - 2. The subcontractor shall erect and maintain barricades, guards, warning signs, and



lights as necessary or required by OSHA regulations for the protection of the public or workmen.

- B. Regulatory requirements: In addition to complying with all pertinent codes and regulations, comply with the latest rules of NEC and the Electrical Safety Orders of the State of California, Division of Industrial Safety, for all electrical work and materials. The materials and methods to be used in constructing the irrigation system shall conform to the applicable provisions of the UPC.
- C. 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 the said rules and regulations.
- D. The subcontractor shall furnish without any 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.
- E. Any existing buildings, equipment, piping, pipe covering sewers, sidewalks, landscaping, etc., damaged by the subcontractor during the course of his work shall be replaced or repaired by the subcontractor in a manner satisfactory to the Owner's Agent and at subcontractor's own expense, and before the final payment is made. The subcontractor shall be responsible for damage caused by leaks in the piping systems being installed by him. He shall repair, at his own expense, all damage so caused, in a manner satisfactory to the Owner's Agent.
- F. The subcontractor, 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.
- G. The subcontractor shall pay for all permits, licenses, and fees required.

1.5 SUBMITTALS

- A. Materials List: Within 15 days after award of contract and prior to installation, submit six copies of materials list. Include manufacturer, model number, and description of all materials and equipment. Include sealants, cements, lubricants and other proprietary items.
- B. Substitutions: Submit six copies of catalog information on materials which are to be submitted for substitution. No substitution will be permitted without prior written approval by the Architect. A complete material list shall be submitted prior to performing any work.
- C. Record Drawings:



1. The subcontractor shall maintain in good order, in the field office, one complete set of bond prints of all irrigation drawings which form a part of the Contract, showing all water lines, sprinklers, valves, controllers and stub-outs. Any work not installed as indicated on the Drawings, shall be recorded and dimensioned accurately from the building walls on these prints. All as-built markups shall be indicated in red.
 2. Two wire system record drawings shall include two wire path.
 3. All underground stub-outs for future connections and valves shall be located and dimensioned accurately from building walls on these record drawings.
 4. Upon completion of the work, obtain reproducible prints from Architect and neatly correct the prints to show the as-built conditions.
- D. Controller Charts:
1. Record Drawings shall be accepted by Architect before controller charts are prepared.
 2. Provide one controller chart for each controller supplied.
 3. Charts shall be the maximum size that the controller door will allow, showing areas covered by each controller. Chart shall be an electrostatic copy and a different color shall be used to indicate area of coverage for each station. Enlarge valve sequence to be readable when drawing is reduced.
 4. After being completed and accepted, seal by plastic laminating. Laminating sheets shall be a minimum of 10 mil thick.
- E. Operations and maintenance manuals:
1. Deliver to owner at least 10 days prior to completion of construction, 2 complete sets of the following data. Data shall be on 8 1/2 inch by 11 inch sheets, in a 3-ring binder.
 - a. Index sheet stating Contractor's address and telephone number and list of equipment with name and addresses of local manufacturer's representatives.
 - b. Catalog and parts sheets on all material and equipment installed under this Section.
 - c. Complete operating and maintenance instructions for all equipment.
 - d. Complete and dated manufacturer's warranties for all materials used.
 2. Irrigation Maintenance Schedule to include, but not be limited to, routine inspection, adjustment, and repair of the irrigation system and its components.
 3. Irrigation audit report by an Irrigation Association certified irrigation auditor. Irrigation audit shall be performed by auditor for final inspection and report shall be provided by auditor.

1.6 LAYOUT OF WORK

- A. The irrigation contractor shall stake out the irrigation system as shown on the Drawings. Stakes shall be approved by Landscape Architect before construction is started. Any changes, deletions or additions shall be determined at this check.

1.7 INSTRUCTION

- A. After the system has been installed and approved, subcontractor shall instruct the Owner's representative in complete operation and maintenance of the irrigation



system.

1.8 WARRANTY

- A. Provide 1 year guarantee for Work of this Section in accordance with Section 1700.
- B. Provide supplemental guarantee, on Contractor's letterhead:
 - 1. Warrant that irrigation system has been installed according to Drawings and Specifications, and that system will be free of defects in products and installation for 1 year from Substantial Completion. Manufacturer's warranties shall only supplement special warranty.
 - 2. Agree to repair or replace defective Work, or adjacent work which is damaged by such defects, with the exception of ordinary wear and tear, abuse or neglect. This includes damage to site improvements caused by settlement of improperly compacted trench backfill.
 - 3. Owner reserves the right to make temporary repairs as required.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Main lines (constant pressure) shall be 1120 Schedule 40 polyvinyl chloride (PVC) solvent weld pipe, Type 1, and shall conform to ASTM D1785. Use Schedule 40 and Schedule 80 PVC solvent weld fittings.
- B. Lateral lines (non pressure) shall be 1120-Schedule 40 polyvinyl chloride (PVC) plastic pipe Type 1, and shall conform to ASTM D1785. Use Schedule 40 PVC solvent weld fittings.
- C. Metal Pipe:
 - 1. Steel pipe shall be Schedule 40 galvanized steel conforming to ASTM 53B. Metal pipe shall be wrapped in 2 inch wide, 20 mil thick, black PVC all weather corrosion-resistant tape with high tack adhesive. Use threaded galvanized steel fittings.
 - 2. Brass pipe shall be red brass conforming to ASTM B43. Use threaded brass fittings.
 - 3. Provide dielectric fittings where dissimilar metals come into contact.
- D. Fittings:
 - 1. Solvent Weld socket fittings: Schedule 40, Type 1, Grade 1, PVC and shall conform to ASTM D2466. Schedule 80, Type 1, Grade 1 PVC and shall conform to ASTM D2467. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type recommended by pipe manufacturer.
- E. Connections between main lines and remote control valves shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.



- F. Risers shall be as follows: Schedule 80 PVC threaded nipples and Schedule 80 PVC ell as shown on the construction details.

2.2 QUICK COUPLING VALVES

- A. Quick Coupling valves shall be brass construction, 3/4-inch connection, two-piece body, locking purple vinyl top, single slot and lug. Provide one 3/4-inch single lug key and 3/4-inch hose swivel for every 5-6 quick couplers.
- B. Quick Coupling valves shall be restrained with ductile iron restrainers that attach securely to the base of the valve. Restrainers shall make contact with the hex flats of the valve and be secured by a single bolt.

2.3 GATE VALVES

- A. 2½ inch and smaller shall be lead-free bronze construction conforming to ASTM B584 Alloy C87850 with screw-in bonnet, non-rising stem, operating wheel and threaded connections.

2.4 BALL VALVES

- A. Ball valves shall be Schedule 80 PVC full port design with double unions. PVC ball valves to be installed upstream of each remote control valve.

2.5 REMOTE CONTROL VALVES

- A. Remote control valves shall be globe pattern constructed of heavy duty glass-filled nylon and stainless steel with internal and external bleed. Operating pressure shall be 10 to 220 psi and flow range shall be .1-180 gpm. All internal parts shall be removable from the top.
- B. Remote control valves shall be installed with the appropriate decoder as listed on the drawings.
- C. Install pressure regulating module on remote control valves as shown on drawings. Pressure regulating module shall be by same manufacturer as remote control valve.
- D. Each valve shall have a plastic tag denoting its controller and station number.

2.6 MASTER REMOTE CONTROL VALVE

- A. Master remote control valve shall be constructed of heavy duty cast iron, bronze, stainless steel, and copper with metering pin and manual flow stem to adjust closing speed. Operating pressure shall be 3 to 200 psi and flow range shall be .01 to 3000 gpm.
- B. Master Valve shall be normally closed.



2.7 FLOW SENSOR

- A. Flow sensors shall be capable of sensing programmed water flows during the operation of the irrigation system and shall be capable of detecting excess or inadequate water flows as per the operator entered parameters.
- B. The flow sensors shall be compatible with the irrigation controller and shall be capable of transmitting water flow information to the irrigation controller.
- C. The flow sensor shall meet the following requirements:
 - 1. Brass or bronze construction. Tee shall be PVC with sensor pre-installed.
 - 2. Insertion type with a non magnetic, spinning impeller as the only moving part.
- D. Use Sensor Decoder to connect flow sensor to controller. Install per manufacturer's instructions.

2.8 CONTROLLERS

- A. Controllers shall be as listed on the Drawings and shall have the following features:
 - 1. Two wire configuration.
 - 2. Utilize either evapotranspiration or soil moisture data for irrigation scheduling.
 - 3. UL listed, solid state, capable of automatic or manual operation.
 - 4. Non-volatile memory.
 - 5. Scheduling with 365 day calendar, odd/even watering, and rain delay of 1-14 days.
 - 6. Cycle and soak feature.
 - 7. Compatible with master valve and flow sensor.
 - 8. Hand held remote ready.
- B. ♦Controller enclosure shall be stainless steel and as listed on the Drawings.
- C. Controllers shall be grounded per manufacturer's instructions and ASIC grounding guidelines.

2.9 CONTROL WIRE

- A. Splices shall be made with 3M DBR/Y-6 connectors.
- B. Twisted pair, solid-core, color-coded red/blue with each conductor in a polyethylene jacket suitable for direct burial. Use only manufacturer recommended wire.
- C. All connections in the two-wire path shall be made with 3M DBR/Y-6 waterproof, strain-relieving direct burial connectors.
- D. Grounding: Decoders and surge protectors shall be grounded per manufacturer instructions and ASIC grounding guidelines.

2.10 DECODERS

- A. Decoders shall be by the same manufacturer as controller.



- B. Install decoders per manufacturer's instructions.

2.11 VALVE BOXES

- A. High density polyethylene construction with UV inhibitors. Lid shall be green in color and have stainless steel bolt-down mechanism. Boxes, lids, and bolts shall be from the same manufacturer. Plastic valve boxes shall be by Carson, NDS Pro Series, or equal.
- B. The lid shall be marked as follows:
 - 1. Remote Control Valves – "Irrigation Control Valve" or "ICV" with the station number in one inch (1") high white enamel or heat branded numbers and letters.
 - 2. All other valves - "Irrigation Control Valve" or "ICV".
- C. Valve box sizes are noted on drawing details.

2.12 SPRINKLER HEADS AND BUBBLERS

- A. All sprinkler heads and nozzles shall be as listed on the Drawings.
- B. All pop-up sprinkler heads shall have shut-off devices, check valves, and pressure regulation built into the sprinkler head.
- C. Bubblers shall be as listed on the Drawings and shall be pressure compensating.
- D. The tree root aeration and nutrient delivery device shall be manufactured specifically for this purpose. It shall:
 - 1. Be constructed of a single tubular high-density polypropylene polymer.
 - 2. Contain sidewall openings in a horizontal and vertical pattern, equally spaced, that span the entire length and circumference in a uniform manner.
 - 3. Be capable of having the sidewall shape distorted without damage to the device.
 - 4. The top and bottom end caps shall be constructed of a high-density styrene polymer. The top end cap also contains the air convection insert device which shall have a flexible central tube that extends from the top cap into the tube's interior 5". The flexible tube shall have an outside sidewall dimension of .3125 ", and an internal diameter of .25 ". The top cap has additional 1/4" openings to promote the convection of internal air currents for fresh air transition for increased Oxygen and Nitrogen content.
 - 5. Be manufactured by Rootwell Products, Inc.

2.13 DRIP SYSTEM

- A. Provide all components required for complete system:
 - 1. Wye Filter: Corrosion resistant plastic housing, 1inch FIPT/MIPT connections with removable stainless steel screen and integral flush valve with hose threads. Screen shall be 155 mesh.
 - 2. Pressure regulator: Constructed of thermoplastic with stainless steel compression spring and securing screws. Pre-set to maintain constant outlet pressure of 40 psi.



3. Filter: Basket type filter pressure rated at 150 psi constructed of glass-filled polypropylene with glass-filled nylon cap. Filter screen shall be 200 mesh stainless steel basket design and reinforced with polypropylene ribs. The unit shall incorporate an indicator window that shows when the filter needs to be cleaned.
4. Pressure regulator: Built-into the Basket Filter and pre-set at 40 psi.
5. Drip tubing shall be extruded from low-density polyethylene. Tubing shall be UV protected. Fittings shall be by the same manufacturer as the tubing.
6. Emitters: as listed on the Drawings.
7. End Flush Valve: 1/2 inch PVC full port Ball Valve connected to 1/2 inch algae resistant PVC flex hose.

2.14 SUBSURFACE IRRIGATION

- A. Dripline tubing and pressure compensating emitters shall be extruded from linear low-density polyethylene. Tubing shall have a minimum nominal diameter of 1/2 inch with a minimum wall thickness of 0.045. Protection from root intrusion shall be provided by means of impregnation of copper shiel technology in pipe during the manufacturing process.
- B. All accessories listed below shall be furnished by the same manufacturer as the dripline.
 1. Line Flushing Valves – the subsurface irrigation system shall utilize manual line flush valves at the end of each independent zone area.
 2. Air/Vacuum Relief Valve – each independent irrigation zone shall utilize an air/vacuum relief valve at its high point. The air and vacuum relief valve shall seal effectively from 2 to 10 psi.

2.15 BACKFLOW PREVENTION DEVICE

- A. Backflow prevention device is existing to remain in service.

2.16 RAIN SENSOR

- A. UV resistant, polymer housing with weatherproof switch mechanism and mounting bracket.
- B. Fully adjustable shutoff from 1/8 inch to 1 inch of accumulated rainfall with automatic return to normal watering cycle.

2.17 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. Use only Weld-On 795 Cement for flexible PVC to rigid PVC connections. Cement shall be maintained at proper consistency



throughout use. Assembly practice shall be in accordance with ASTM D2855. Active Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.

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 Christy Ultra Seal Thread Sealant T10,000..

C. Drain rock: 3/4 inch washed pea gravel.

2.18 MISCELLANEOUS EQUIPMENT

A. Provide all equipment called for by the Drawings.

B. Provide to the Owner, 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 valves. Include all wrenches necessary for complete disassembly of all heads and valves.

C. Provide two (2) each of quick coupler keys and hose swivels and three (3) sets of keys to both controller cabinets and enclosures.

PART 3 - EXECUTION

3.1 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.

B. Contractor shall field verify the static water pressure at the project site prior to commencing work or ordering irrigation materials. If contractor fails to verify static water pressure prior to commencing work, contractor shall assume responsibility for all costs required to make system operational.

C. Examine areas and conditions under which work of this section is to be performed. Do not proceed with work until necessary conditions have been corrected.

3.2 HANDLING AND STORAGE

A. Protect work and materials from damage during construction and storage as directed by Architect.

B. Handle plastic pipe carefully; especially protecting it from prolonged exposure to sunlight.



- C. Store sub-surface dripline and polyethylene tubing in cool dry place out of sunlight during installation.

3.3 LAYOUT

- A. Layout 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 Architect immediately and determine relocation in a joint conference.
- C. Run pipelines and automatic control wiring in common trenches whenever practical.

3.4 EXCAVATING AND TRENCHING

- A. Excavation shall be in all cases ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining.
- B. Depth of trenches shall be enough to provide minimum cover from finish grade to top of pipe in trenches, as follows:
 - 1. 18 inch minimum cover over main lines to the control valves and quick coupling valves.
 - 2. 18 inch minimum cover over direct burial control wires from controller to valves.
 - 3. 12 inch minimum cover over the valve controlled lines to sprinkler heads.
 - 4. 24 inch minimum cover over sleeves.
- C. Restore surfaces, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in a manner approved by the Architect.
- D. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by Architect.

3.5 ASSEMBLING PIPELINES

- A. All pipes 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.
- B. Solvent Weld Joint:
 - 1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning the pipe and fitting of dirt.
 - 2. Dry-insert pipe into fitting to check for missizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.
 - 3. Coat the inside socket surface of the fitting and the external surface of the male end of the pipe with primer, immediately followed by solvent weld cement liberally applied to the male end of the pipe and lightly applied to the inside of the socket. Then, apply a second coat of cement to the pipe end.
 - 4. Insert pipe immediately into fitting and turn it 90° 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 and at least six (6) hours before allowing water in the pipe.

C. Threaded Joint:

1. Field threading of plastic pipe or fittings is not permitted. Factory-formed threads only 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 the 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, no 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 tightening.
6. Where assembling soft metal (brass or copper) or plastic pipe, use a strap type friction wrench only; do not use a metal-jawed wrench.

D. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstruction. Remove caps or plugs only when necessary to continue assembly.

E. Where pipes or control wires pass through sleeves, provide a removable non-decaying plug at ends of sleeve to prevent entrance of earth.

F. Install copper tracer wire on top of the entire mainline, taped every fifteen feet (15'). Stub tracer wire up at backflow and isolation valves.

3.6 REMOTE CONTROL VALVES

A. Install where shown on Drawings and group together where practical. Limit one remote control valve per box with no exceptions. Decoders to be installed in one remote control box per group. Decoders shall be mounted securely to the side of the valve box.

B. Locate valve boxes 12 inches from and perpendicular to walk edges, buildings and walls. Provide 12 inches between valve boxes where valves are grouped together.

C. Thoroughly flush main line before installing the valve.

D. Install in shrub or ground cover areas where possible.

E. Label control line wire at each valve with a 2 1/4" x 2 3/4" polyurethane I.D. tag, indicating identification number of the valve (controller and station number). Attach a



label to control wire.

- F. Label control line wire at each valve with a Paige 270WMP wire marking tag identifying the decoder numbers and electrical information.

3.7 QUICK COUPLING VALVES

- A. Install quick coupling valves on double swing-joint assemblies of Schedule 80 PVC risers and fittings.
- B. Thoroughly flush main line before installing the valve.
- C. Install 12 inch from hardscape areas.

3.8 VALVE BOXES

- A. Install one valve box for each type of valve unless otherwise noted.
- B. Install boxes 12 inches from walk or header and 12 inches apart. Short side of rectangular boxes shall be parallel to walk or header. Install 2 inches above finish grade in groundcover areas and flush with grade in lawn areas.
- C. Install common bricks as shown and as required to keep box stable. Install gravel sump after compaction of all trenches.
- D. Gopher Wire: Install 1/2 inch wire mesh at base of all irrigation boxes. Wrap wire mesh tightly up all sides of box for sufficient seal.

3.9 FLOW SENSOR

- A. Install flow sensor a minimum of 10 times pipe diameter upstream and 5 times pipe diameter downstream of any valves, fittings, pipe bends, etc.
- B. Use only sensor cable approved by the controller manufacturer. Install cable in a separate 1 inch conduit routed to controller. Leave enough flexibility in the cable to allow for future service of sensor.

3.10 SPRINKLER HEADS AND BUBBLERS

- A. Thoroughly flush lines before installing heads, drip tubing, or bubblers.
- B. Locate heads and bubblers as shown in the Drawings and Detail.
- C. Set sprinkler heads perpendicular to grade unless otherwise shown.
- D. Adjust sprinkler heads for proper distribution and trim, providing complete coverage with minimal overspray.



- E. Install lawn heads 2 inches above grade in seeded lawn area at time of installation. Lower to finish grade after turf is well established and as directed by Architect.

3.11 SUB-SURFACE IRRIGATION

- A. Install per manufacturer's instructions.
- B. Install dripline in a grid pattern 2 inch below finish grade.
- C. Install air/vacuum relief valve at the highest point of each circuit on a line that is perpendicular to the dripline rows (exhaust header or lateral connecting dripline.) Install in 6 inch round valve box.
- D. Install manual flush valve at a point farthest away from source or along exhaust header. Install in 6 inch round valve box.

3.12 AUTOMATIC CONTROL WIRING

- A. Run lines along mains where 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 as shown on plans.
- 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.
- F. Common wire and control wires shall be tagged with 1/4" wide embossed plastic labeling tape, showing controller and station number designation.
- G. Run two wire path along mains where practical.
- H. Loop a minimum of two (2) feet of extra wire in each valve box; both control wire and ground wire.
- I. Connections shall be made as shown on plans.
- J. Locate all splices at valve locations within valve boxes.
- K. Where control lines pass under paving, they shall pass through Schedule 40 electrical PVC conduit.

3.13 AUTOMATIC CONTROLLER



- A. Provide and install automatic irrigation controller in approximate locations shown on Drawings. The exact location will be determined on the site by Architect. Provide conduit and wire and connect to 120 volt switch accessible to controller for ease of maintenance.
- B. Connect control lines to controller in sequential arrangement according to assigned identification number of the valve. Each control line wire shall be labeled at controller with a permanent non-fading label indicating station number of the valve controlled. Attach label to control wire.
- C. Program decoders to controller in sequential arrangement according to assigned identification number of the valve. Each decoder shall be labeled indicating station numbers of the valves controlled.
- D. Contractor is responsible for programming the controller. Provide optimum amounts of water for each plant type to maintain plants in vigorous healthy condition. Reprogram as required at end of maintenance period.

3.14 BACKFLOW PREVENTION ASSEMBLY

- A. Local codes shall govern installation requirements.
- B. Install a minimum of 12 inches and a maximum of 30 inches above grade.
- C. Install enclosure on concrete pad as shown on drawings.

3.15 PIPE TESTS

- A. Notify Architect at least three (3) days in advance of testing.
- B. Perform testing at his own expense
- C. Center load piping with a small amount of backfill to prevent arching or slipping under pressure. No fitting or joint shall be covered.
- D. Do not connect remote control valves, quick couplers or any other valve assembly until testing is satisfactorily complete.
- E. Apply the following tests after weld plastic pipe joints have cured at least 24 hours.
 - 1. Test live (constant pressure) and quick coupling valve lines hydrostatically at 125 PSI minimum. Lines shall be filled with water and pressure gauge connected to the pipe line. After lines have reached the 125 PSI, (use hydraulic pump or other safe method – do not use an air compressor) cut off the source of pressure. Lines will be approved if test pressure (with an allowable drop of 2 PSI) is maintained for two (2) hours. Should leaks develop during the test period, they shall be located



and repaired and retested in the same method. The subcontractor shall make tests and repairs as necessary until test conditions are met.

2. Test remote control valve controlled lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

F. Remake faulty joints with new materials. Do not use cement or caulking to seal leaks.

3.16 SYSTEM ADJUSTMENT

- A. Adjust pressure regulating modules to proper and similar pressure to provide optimum and efficient coverage.
- B. Adjust sprinkler heads by fully opening the sprinkler furthest from control valve. Open manual adjustment of control valve slightly to obtain a 12-inch spray at sprinkler mentioned above. After this condition has been met, adjust all other sprinklers in the section for equal height sprays, regulating the control valve as required to maintain this condition. With a pressure gauge on the sprinkler first opened, adjust control valve to obtain the catalog-rated pressure for sprinkler installed. Adjust nozzle sizes and degree of arc and install pressure compensating screens as required to cover planting areas without overspray. Adjust all sprinklers to keep spray in confines of planted area. Minimize overspray onto paving.
- C. Drip System Check
 1. Immediately after installation, flush lateral line piping by removing automatic flush valve, figure 8 fitting, or by opening the shut-off flush valve.
 2. Clean filter screens. Open filter flush valve for at least 10 seconds. Clean or replace clogged elements
 3. Adjust pressure regulator to system design pressure.
 4. Verify that emitters are producing specified water output. If not, replace emitters, check filter element, check pressure at emitters, and review system for clogs and leaks. Correct deficiencies.
- D. Spray and Bubbler Check
 1. Perform coverage test in the presence of Architect to establish that coverage of all planting areas is complete and adequate.
 2. Correct deficiencies and repeat test until approved.

3.17 GUARANTEE

- A. It shall be the responsibility of subcontractor 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 subcontractor 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.



3.18 CLEANUP

- A. When work of this section has been completed, and at such other times as may be directed, remove all trash, debris, surplus materials and equipment from the site.

3.19 WINTERIZATION OF IRRIGATION SYSTEM

- A. The subcontractor shall be responsible for draining irrigation system in preparation for the first winter after construction has been completed. Instruct Owner's representatives in proper procedures.
- B. Winterization shall proceed as follows:
 - 1. Close the gate valve in irrigation main line located at the water meter.
 - 2. Insert a quick coupling quill, connected to air compressors, into the quick coupling valve located at the water meter.
 - 3. Following start of the air compressor, program irrigation controller through three (3) complete cycles or until all water has been forced out of system.
 - 4. Insert a quick coupling quill into quick coupling valve at dead end runs of main line to force out all remaining trapped water.
 - 5. Remove the compressor, leaving the gate valve to irrigation system closed.

END OF SECTION



SECTION 32 90 00 PLANTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section includes:

1. Plant Procurement and Installation
2. Soil Amendments
3. Mulch
4. Maintenance during guarantee period

B. Related Sections:

1. Section 01 33 00, Submittal Procedures
2. Section 31 11 00, Clearing and Grubbing
3. Section 31 23 00, Stripping and Excavation
4. Section 32 80 00, Irrigation

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI A300 - Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices.
2. ANSI Z60.1 - Nursery Stock.

B. *The Jepson Manual - Higher Plants of California*, James C. Hickman, editor, University of California Press, Berkeley.

1.3 SUBMITTALS

A. Product Data: Manufacturer's specifications for plant fertilizer.

B. Mulch: Submit sample and manufacturer's or distributor's analysis.

C. Imported Soil: Submit sample and manufacturer's or distributor's analysis.

D. Plant Order Forms: Within 30 days of the award of the Contract, the Contractor shall verify that all of the plant material is available from nursery suppliers by submitting plant order forms that include all of the plants that are required for the project. The plant order forms shall include contact information for the plant supplier, botanical name of each species, container size, quantity, and scheduled delivery date. Contractor to obtain approval from the Landscape Architect for any substitutions or deviations from the planting plans prior to ordering. Upon rejection of any plant substitutions, new plant material shall be procured until all of the plant material is in compliance with the specifications as determined solely by the Landscape Architect. The plant orders shall be completed within 60 days of the award of the Contract.



- E. Planting Work Plan: The Contractor shall prepare a written projected construction schedule for installation of all plant material and irrigation system. The work plan shall outline the estimated completion date, number of working days required and any special coordination requirements. The work plan shall outline in detail the equipment, sequence of work, and methods to be used for plant layout and installation. The Landscape Architect must approve the work plan prior to commencing any site work.

1.4 QUALITY ASSURANCE

- A. Acceptance Criterion for Materials and Workmanship: The Landscape Architect shall inspect all materials and workmanship for compliance with the Drawings and special construction provisions. Acceptance of all materials and workmanship is at the discretion of the Landscape Architect.
- B. Pre-Construction Meeting: Prior to commencing work, meet with the Landscape Architect and all other concerned parties on the site to review the Planting Work Plan. Request this meeting one week prior to desired meeting time.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect and maintain plant life until planted. Hand water container plants as often as needed to prevent wilting before plant installation.
- B. Plant material damaged as a result of delivery, storage or handling will be rejected.
- C. Criterion for Accepting Containerized Shrubs:
 - 1. The container size shall be at least as large as indicated in the special construction provisions or shown in the plant tables/lists. Plants shall not be rejected if supplied in containers larger than specified.
 - 2. Upon removal of the plants from the containers, the soil/root masses shall be the size of the specified container size. If the soil/root masses are substantially smaller than the specified container size and loose soil exists on the bottom of the containers, the plants shall be rejected since they have not been grown sufficiently long in the containers to root into the soil contained therein.
 - 3. Should spiraling primary woody roots exist on the outside of the soil/root mass upon the removal of the plants from the containers, the Contractor shall be instructed to either cut these roots or separate and spread them out from the soil/root mass prior to planting. The Landscape Architect can reject plant material if spiraling of roots is severe.



4. If growing, the plants shall appear healthy with no leaf spots, leaf damage, leaf discoloration, chlorosis, leaf wilting or curling, or evidence of insects on the leaves.
5. If dormant, woody plants shall have an abundance of well-developed terminal buds on the leaders and branches, and have a cambium, which is light green to yellowish green in color.
6. The soil and root mass of containerized plant material shall be saturated upon delivery to the job site. Plants that are dry or lightweight shall be rejected. If not planted immediately after delivery to the job site, the plants shall be stored in an area that is not exposed to direct sun or wind and shall be maintained moist, through periodic watering, until time of planting.

1.6 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period

1. Failures include, but are not limited to the following:
 - a. Death and unsatisfactory growth, lack of adequate maintenance, or neglect.
 - b. Structural failures including plantings failing or blowing over
2. Warranty Periods: from date of Substantial Completion.
 - a. The Contractor shall guarantee the survival of all of plants for the duration of the guarantee period. The guarantee period shall be 120 days after completion of the planting and approval of the installation by the Landscape Architect. At the end of the guarantee period, the Contractor shall replace, at no additional cost to the Owner, plant material that is determined by the Landscape Architect to be either dead or in poor health. Subsequent replacement plant material shall be subject to an identical guarantee.



PART 2 – PRODUCTS

2.1 PLANTS

A. Planting Stock:

1. Species: In accordance with Standardized Plant Names, official code of American Joint Committee on Horticulture Nomenclature.
2. Identification: Label individual plants or each bundle of plants when tied in bundles.
3. Plants: No. 1 Grade conforming to “American Standard for Nursery Stock” of American Association of Nurserymen (AAN); well-branched, vigorous and balanced root and top growth; free from disease, injurious insects, mechanical wounds, broken branches, decay and other defects.

B. Tree Selection: Trees shall be selected and tagged at the nursery by the Landscape Architect.

2.2 SOIL AMENDMENTS

A. The soil amendments described below are based on the results of preliminary soil tests performed at the project site in January 2022. The contractor shall provide updated soil tests and amendment recommendations to be approved by the Landscape Architect for all salvaged soils to be used as topsoil. All soil amendments shall be applied on a volumetric basis and thoroughly mixed prior to or during installation.

1. Ammonium sulfate (21-0-0) – ¼ pound per cubic yard for all salvaged soil
2. Potassium sulfate (0-0-50) – ¼ pound per cubic yard for soil salvaged from lawn and landscape area along Texas and Union St.
3. Triple superphosphate (0-45-0) – ¼ pound per cubic yard for soil salvaged from lawn and landscape area along Texas and Union St.
4. Agricultural gypsum – 1 pound per cubic yard for all salvaged soil
5. Organic soil amendment – about 20% by volume for all landscape areas. sufficient for 4% to 6% soil organic matter on a dry weight basis. Organic matter amendment shall be at least 50% on a dry weight basis. The pH of the material shall be between 6 and 7.5. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials, and with a carbon: nitrogen ratio of less than 25:1. Composted wood products are conditionally acceptable (stable humus must be present). Wood based products are not acceptable which are based on red wood or cedar. Sludge-based materials are not acceptable.



2.3 IMPORTED TOPSOIL

- A. The contractor shall submit a sample and manufacturer's or distributor's analysis for all imported topsoil to the Landscape Architect.
- B. Additional soil amendments for imported topsoil may be required pending the results of the soil lab analysis.
- C. All imported and salvaged topsoil shall be thoroughly mixed with endomycorrhizal inoculum prior to or during installation.

2.4 MULCH

- A. Organic weed-free shredded cedar mulch with a one-half (½) inch minimum and three (3) inch maximum particle size and low salt content. Mulch shall be free of material injurious to plant growth. Source of mulch shall be tree clippings free of weeds and invasive plant parts or seeds. Germination inhibiting ingredients, sawdust, dirt, garbage, or other debris mixed in the mulch is not acceptable. Submit sample and mulch analysis for approval by Landscape Architect.

2.5 ENDOMYCHORRHIZAL INOCULUM

- A. AM 120, or approved equal, consisting of spores, mycelium, and mycorrhizal root fragments in a solid carrier. Inoculum shall include one or more species of endomycorrhiza of the genus glomus. The label shall include certification for each species of endomycorrhizal fungus and a certified propagule count of each species. Material shall be transported and stored per manufacturer's recommendations. Inoculum shall be mixed into the backfill soil used for all shrub and tree planting holes at a rate of five (5) pounds per cubic yard. Inoculum shall be uniformly mixed into the salvaged and/ or imported topsoil used for the landscape berm at a rate of five (5) pounds per cubic yard. Inoculum available from Pacific Coast Seed, or other.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Underground Utilities and Obstructions: Verify the location of all underground utilities and other obstructions that may affect the work with the General Contractor prior to commencing work. Any obstructions encountered shall be reported to the Landscape Architect. Repair all damage to any known utility line or other underground obstructions at Contractor's expense. Report damage to any unknown utilities to the Landscape Architect.
- B. Planting Window: Trees and shrubs shall be planted between October 15th and December 31st or as approved by the Landscape Architect. Planting shall not occur



until the automatic irrigation system is operating as specified in **Section 32 84 00**, unless otherwise approved by the Landscape Architect.

- C. Layout: Trees and shrubs shall be located in accordance with the planting plans. The Contractor shall use pin flags to mark the location of the trees and shrubs in the field for review and approval by the Landscape Architect prior to the installation of the irrigation system and the installation of the trees and shrubs. A demonstration layout shall consist of a thirty-foot long section of the landscape berm area that extends from the toe of slope on the eastern side of the berm to the toe of slope on the western side of the berm.
- D. Planting Holes: Planting holes for trees and shrubs shall be a minimum of twice the diameter of the container size and equal in depth to the container size. Planting holes shall be flat bottomed and shall be scarified on the sides and bottom to prevent root spiraling. Plants grown in flat-bottomed containers shall not be planted in V-shaped holes that result when using a dibble or pointed spade in the planting operation. Otherwise, the air pockets at the bottom of the holes may lead to plant mortality.
- E. Soil amendment: Soil salvaged on-site shall be stockpiled as noted on the drawings. Amendments shall be uniformly mixed into salvaged soil before or during installation, along with imported soil. All imported soil shall be uniformly mixed into salvaged soil on a volumetric basis before or during installation as needed to comply with the grades and details indicated in the drawings. Separate, distinct lifts of salvaged and imported soils will not be allowed. The Contractor shall submit soil labs for all imported soil to the Landscape Architect prior to ordering to determine any additional amendment requirements. See Appendix A: Soil Lab Report for more information on soil amendments.
- F. Plant Installation: Refer to the applicable planting details on the planting plans for clarification of planting parameters.
- G. Watering: Newly planted trees, shrubs, groundcovers, and grasses shall be watered immediately after installation, and additionally as needed to prevent wilting during construction activities. All planting shall occur after the automatic irrigation system has been installed and tested. In the case that this is not possible, and with approval from the Landscape Architect, all plants shall be watered from the time that they are planted until the time that the automatic irrigation system is in operation.
- H. Place mulch where indicated on Drawings in a manner consistent with planting details.
- I. Upon completion of work, the Contractor shall remove all materials, tools, rubbish and debris associated with this work.

END OF SECTION



SECTION 32 92 23 SOD LAWN

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section includes:

1. Preparation of subsoil.
2. Placement of topsoil.
3. Fertilization.
4. Sod installation.
5. Maintenance.

B. Related Sections:

1. Section 01 33 00, Submittal Procedures
2. Section 31 11 00, Clearing and Grubbing
3. Section 31 23 00, Stripping and Excavation
4. Section 32 80 00, Irrigation

1.2 REFERENCES

A. Turfgrass Producers International:

1. TPI - Guideline Specifications to Turfgrass Sodding.

1.3 SUBMITTALS

A. Product Data:

1. Manufacturer's specifications for sod grass species, as indicated on plans.
2. Manufacturer's specifications for fertilizer.

B. Imported Soil: Submit sample and manufacturer's or distributor's analysis.

C. Qualifications Statements: Submit qualifications for sod producer, manufacturer, and installer.

D. Planting Work Plan: The Contractor shall prepare a written projected construction schedule for installation of all plant material and irrigation system. The work plan shall outline the estimated completion date, number of working days required and any special coordination requirements. The work plan shall outline in detail the equipment, sequence of work, and methods to be used for plant layout and installation. The Landscape Architect must approve the work plan prior to commencing any site work.



1.4 QUALITY ASSURANCE

- A. Sod: Ensure root development capable of supporting its own weight without tearing when suspended vertically by holding upper two corners.

1.5 QUALIFICATIONS

- A. Sod Producer: Company specializing in products as specified in this Section with minimum three years' documented experience.
- B. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- C. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery
 - 1. Deliver sod on pallets or in rolls.
 - 2. Do not deliver more sod than can be laid within 24 hours.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage. Plant material damaged as a result of delivery, storage or handling will be rejected.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from excess moisture and desiccation by storing in a dry, shaded location remote from construction operations areas.
 - 2. Protect exposed roots from dehydration.
 - 3. Provide additional protection and/ or hydration according to manufacturer instructions.

1.7 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace sod that fails in materials, workmanship, or growth within specified warranty period
 - 1. Failures include, but are not limited to the following:
 - a. Death and unsatisfactory growth, lack of adequate maintenance, or neglect.
 - b. Structural failures including sod failing to establish



2. Warranty Periods: from date of Substantial Completion.
 - a. The Contractor shall guarantee the survival of all of plants for the duration of the guarantee period. The guarantee period shall be 120 days after completion of the planting and approval of the installation by the Landscape Architect. At the end of the guarantee period, the Contractor shall replace, at no additional cost to the Owner, plant material that is determined by the Landscape Architect to be either dead or in poor health. Subsequent replacement plant material shall be subject to an identical guarantee.

PART 2 – PRODUCTS

2.1 SOD

A. Description:

1. Sod shall consist of a live, dense, well-rooted growth of turf grass species as noted on the Drawings. The sod shall be free from all non-native obnoxious grasses and shall be of suitable character for the purpose intended and for the soil in which it is to be planted. It shall be un-injured at the time of planting.
2. Sod shall be uniform in thickness, having not over 2-inches or less than 1-inch of soil.

2.2 SOIL AMENDMENTS

A. The soil amendments described below are based on the results of preliminary soil tests performed at the project site in January 2022. The contractor shall provide updated soil tests and amendment recommendations to be approved by the Landscape Architect for all salvaged soils to be used as topsoil. All soil amendments shall be applied on a volumetric basis and thoroughly mixed prior to or during installation.

1. Ammonium sulfate (21-0-0) – ¼ pound per cubic yard for all salvaged soil
2. Potassium sulfate (0-0-50) – ¼ pound per cubic yard for soil salvaged from lawn and landscape area along Texas and Union St.
3. Triple superphosphate (0-45-0) – ¼ pound per cubic yard for soil salvaged from lawn and landscape area along Texas and Union St.
4. Agricultural gypsum – 1 pound per cubic yard for all salvaged soil
5. Organic soil amendment – about 20% by volume for all landscape areas. sufficient for 4% to 6% soil organic matter on a dry weight basis. Organic matter amendment shall be at least 50% on a dry weight basis. The pH of the material shall be between 6 and 7.5. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials, and with a carbon: nitrogen ratio of less than



25:1. Composted wood products are conditionally acceptable (stable humus must be present). Wood based products are not acceptable which are based on red wood or cedar. Sludge-based materials are not acceptable.

2.3 IMPORTED TOPSOIL

- A. The contractor shall submit a sample and manufacturer's or distributor's analysis for all imported topsoil to the Landscape Architect.
- B. Additional soil amendments for imported topsoil may be required pending the results of the soil lab analysis.
- C. All imported and salvaged topsoil shall be thoroughly mixed with endomycorrhizal inoculum prior to or during installation.

2.4 ENDOMYCHORRHIZAL INOCULUM

- A. AM 120, or approved equal, consisting of spores, mycelium, and mycorrhizal root fragments in a solid carrier. Inoculum shall include one or more species of endomycorrhiza of the genus glomus. The label shall include certification for each species of endomycorrhizal fungus and a certified propagule count of each species. Material shall be transported and stored per manufacturer's recommendations. Inoculum shall be mixed into the backfill soil used for all shrub and tree planting holes at a rate of five (5) pounds per cubic yard. Inoculum shall be uniformly mixed into the salvaged and/ or imported topsoil used for the landscape berm at a rate of five (5) pounds per cubic yard. Inoculum available from Pacific Coast Seed, or other.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Underground Utilities and Obstructions: Verify the location of all underground utilities and other obstructions that may affect the work with the General Contractor prior to commencing work. Any obstructions encountered shall be reported to the Landscape Architect. Repair all damage to any known utility line or other underground obstructions at Contractor's expense. Report damage to any unknown utilities to the Landscape Architect.
- B. Planting Window: Sod shall be planted between October 15th and December 31st or as approved by the Landscape Architect. Planting shall not occur until the automatic irrigation system is operating, unless otherwise approved by the Landscape Architect. Planting shall not occur until the automatic underground irrigation system is operating as specified in **Section 32 80 00**, unless otherwise approved by the Landscape Architect.



C. Subsoil Preparation:

1. Eliminate uneven areas and low spots.
2. Maintain grades as indicated in the drawings and
3. Remove foreign materials and undesirable plants and their roots. Do not bury foreign materials beneath areas to be sodded.
4. Scarify subsoil to depth of 4 inches where topsoil is to be placed.
5. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

D. Placing of Topsoil:

1. Spread topsoil to minimum depth of 4 inches over area to be sodded.
2. Grade topsoil to eliminate rough, low, or soft areas, and to ensure positive drainage.

E. Soil amendment: Soil salvaged on-site shall be stockpiled as noted on the drawings. Amendments shall be uniformly mixed into salvaged soil before or during installation, along with imported soil. All imported soil shall be uniformly mixed into salvaged soil on a volumetric basis before or during installation as needed to comply with the grades and details indicated in the drawings. Separate, distinct lifts of salvaged and imported soils will not be allowed. The Contractor shall submit soil labs for all imported soil to the Landscape Architect prior to ordering to determine any additional amendment requirements. See Appendix A: Soil Lab Report for more information on soil amendments.

F. Fertilizing:

1. Apply fertilizer at application rate recommended by soil analysis.
2. Apply fertilizer after smooth raking of topsoil and prior to installation of sod.
3. Apply fertilizer no more than 48 hours before laying sod.
4. Mix fertilizer thoroughly into upper 4 inches of topsoil.
5. Lightly water soil to aid dissipation of fertilizer.

G. Laying of Sod:

1. Moisten prepared surface immediately prior to laying sod.
2. Lay sod immediately after delivery to Site to prevent deterioration.
3. Joints:
 - a. Lay sod tightly with no open joints visible and no overlapping.
 - b. Stagger end joints minimum 12 inches.
 - c. Do not stretch or overlap sod pieces.
4. Place top elevation of sod 1/2 inch below adjoining edging, paving and curbs.

H. Rolling:



1. After sod and soil have dried, roll sodded areas to bond sod to soil and to remove minor depressions and irregularities.
2. Roll sodded areas with roller as recommended by sod manufacturer.
3. Roll before first watering.

I. Watering: Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

J. Upon completion of work, the Contractor shall remove all materials, tools, rubbish and debris associated with this work.

3.2 MAINTENANCE

A. Provide service and maintenance of sodded areas until final acceptance.

B. Mowing:

1. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches.
2. Do not cut more than 1/3 of grass blade at each mowing.
3. Neatly trim edges and hand-clip where necessary.
4. Immediately remove clippings after mowing and trimming.

C. Water to prevent grass and soil from drying out. Sod shall be watered as directed by the Engineer for a period of two weeks after which ammonium nitrate shall be applied at the rate of three pounds per 1,000 square feet and the sod given a final watering.

D. Roll surface to remove irregularities.

E. Weed Control:

1. Control growth of weeds by hand weeding

F. Immediately replace sod on areas showing deterioration or bare spots.

G. Protect sodded areas with warning signs during maintenance period.

END OF SECTION



SECTION 33 40 00 – STORMWATER AND SEWER UTILITIES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Furnish and install pipe, bioretention planters, catch basins, manholes, and accessories, as specified herein, as shown on the Drawings, or as otherwise directed by the County.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):

A48	Standard Specification for Gray Iron Castings
A536	Standard Specification for Ductile Iron Castings
C33	Standard Specification for Concrete Aggregates
C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C478	Standard Specifications for Precast Reinforced Concrete Manhole Sections
C923	Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals
C1478	Resilient Connectors between Reinforced Concrete Storm Sewer Structures, Pipes, and Laterals
D422	Standard Test Method for Particle-Size Analysis of Soils
D1557	Laboratory Compaction Characteristics of Soil Using Modified Effort
D2216	Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass Scope
D2412	Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
D2434	Standard Test Methods for Measurement of Hydraulic Conductivity of Coarse-Grained Soils
D3212	Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals



- D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus
- D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
- D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile
- D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F667 Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
- F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings

B. American Water Works Association – AWWA

- C 200 Steel Water Pipe, 6 In. (150 mm) and Larger
- C 207 Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)
- C 220 Stainless-Steel Pipe, ½-In. (13 mm) and Larger
- C 222 Polyurethane Coatings and Linings for Steel Water Pipe and Fittings
- C 226 Stainless-Steel Fittings for Waterworks Service, Sizes ½ In. Through 72 In. (13 mm Through 1,800 mm)
- C 228 Stainless-Steel Pipe Flange Joints for Water Service – Sizes 2 In. Through 72 In. (50 mm Through 1,800 mm)
- C 906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks

C. California Department of Transportation (Caltrans)

- 1. Standard Specifications
- 2. California Tests

D. City of Fairfield, Department of Public Works

- 1. 2021 Standard Specifications and Details



- E. US Composting Council (USCC)
 - 1. Seal of Testing Assurance (STA)
 - 2. Compost Analysis Proficiency (CAP)
 - 3. Test Methods for the Examination of Compost and Composting (TMECC)
- F. California Code of Regulations
 - 1. Title 14. Natural Resources
- G. United States Code of Federal Regulations
 - 1. Title 40. Protection of Environment

1.03 SUBMITTALS

- A. Submit for review in accordance with Section **01 33 00**, "Submittal Procedures", the following:
 - 1. Shop drawings showing pipe and pipe joint details, and precast structures.
 - 2. Manufacturer's product data and installation instructions for pipe, , filter fabric, and precast structures.
 - 3. Fabrication details for precast structures.
 - 4. Fabrication drawings for HDPE special fittings and outlet pipe.
 - 5. Bioretention Soil Mix (BSM)
 - a. Source certificates for all BSM Materials
 - b. Sieve analysis of BSM per ASTM D422 of Caltrans Test Method C202 performed within two months of product delivery to the site.
 - c. Certification from the soil supplier or an accredited testing agency that the BSM, including sand and compost components conforms to local city and state water quality standards.
 - d. A description of the equipment and methods used to mix the sand and compost to produce BSM.
 - e. Organic content test results for the BSM, performed in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) 05.07A, "Loss-On-Ignition Organic Matter Method."
 - f. Permeability test results for BSM per ASTM D2434.



6. Sand Submittals
 - a. Sieve analysis of sand per ASTM D422 or Caltrans Test Method C202 performed within two months of product delivery to site.
7. Compost Submittals
 - a. Quality analysis results for compost performed in accordance with Seal or Testing Assurance standards and performed within two months of produce delivery to site.
 - b. Sieve analysis of compost per TMECC 02.02B performed within two months of product delivery to site.
8. BSM Testing Agency qualifications.
9. Filter Fabric Submittals
 - a. Water Permeability test results in accordance with ASTM D4491.

1.04 QUALITY ASSURANCE

- A. Concrete Products. Manufacturer shall comply with applicable ASTM Specifications. Inspect the pipe sections for cracking, spalling, checking, or damage beyond ASTM limits upon delivery.
- B. Gaskets. Gaskets shall be flexible with sufficient resiliency and free of any cracks or defects upon delivery.
- C. Bioretention:
 1. General: Test and inspect bioretention materials and operations as Work progresses as described in this section. Failure to detect defective Work or materials at any time will not prevent rejection if a defect is discovered after installation, nor shall it constitute final acceptance.
 2. Testing Agency Qualification:
 - a. General: Agencies that perform testing on bioretention materials including permeability testing shall be accredited by STA (USCC), ASTM, AASHTO, Caltrans or other designated recognized standards organization. All certifications shall be current. Testing agency shall be capable of performing all testing to the designated and recognized standards specified and shall provide test results with an accompanying Manufacture's Certificate of Compliance. The following information shall be provided for all testing laboratories used:
 - 1) Name of lab(s) and contact person(s)



- 2) Address(es) and phone number(s)
 - 3) Email address(es)
 - 4) Qualifications of laboratory and personnel, including the date of current certification.
- b. Compost: Laboratory that performs testing shall be independent, enrolled in the US Composting Council's (USCC) Compost Analysis Proficiency (CAP) program, and perform testing in accordance with USCC Test Method for The Examination of Composting and Compost (TMECC). The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741, 631-737-4931, www.compostingcouncil.org.
3. Responsibilities of Contractor:
- a. Submittals: Some of the tests required for this specification are unique, and BSM shall be considered a long-lead-time item.
 - b. Pre-Placement Conference: A mandatory pre-placement conference will take place, including at a minimum the Landscape Architect, County Representative, Installer, and the general Contractor, to review schedule, products, soil testing, permeability testing, and installation. Notify the Landscape Architect a minimum of 2 working days prior to conference.
 - c. Testing: All BSM testing is the responsibility of the Contractor and shall be conducted by an independent testing agency, retained by the Contractor. The Owner reserves the right to conduct additional testing on all materials submitted, delivered, or in-place to ensure compliance with Specifications.

1.05 PRODUCT HANDLING

- A. Delivery. Each shipment shall be loaded, blocked, and tied down at the plant to avoid damage during transit.
- B. Installation. Handle piping and accessories in such a manner that will insure delivery to the trench in sound, undamaged condition.
- C. Rubber Gaskets. Store rubber gaskets in as cool a place as practical, preferably at 70 degrees Fahrenheit or less and in no case shall rubber gaskets be exposed to direct rays of sun for more than 24 hours.
- D. Bioretention:
 1. Protect the BSM and mulch from contamination and all sources of additional moisture (e.g., rainfall, surface runoff, and other sources of



moisture) at supplier site, during transport, and at the project site, until incorporated into the Work.

2. The Contractor is required to coordinate delivery of BSM and aggregates with bioretention facility excavation and soil installation. A written schedule shall be submitted for review as part of the submittal package. In no case shall BSM be stockpiled onsite for more than 24 hours without prior written approval by the County/Landscape Architect. If stockpiling onsite for any length of time, BSM stockpiles shall meet the following requirements:
 - a. Locate stockpiles away from drainage courses, inlets, sewer cleanout vents, and concentrated stormwater flows
 - b. Place stockpiles on geotextile fabric (or on steel road plates for longer-term and higher-volume stockpiles)
 - c. Cover stockpiles with polyethylene plastic sheeting, tarps, or comparable material
 - d. Contain eroded material from stockpiles (and prevent contamination from adjacent stockpiles) with temporary perimeter barrier (e.g., gravel bags, wattles, silt fence)
 - e. For longer-term and higher-volume stockpiles, contain stockpiles using precast concrete blocks, jersey barrier or similar materials to prevent contamination from adjacent stockpiles and ground surfaces and to provide a backstop for re-handling operations
3. Filter Fabric shall be protected from UV exposure to prevent degradation and shall be stored to prevent accidental puncture or ripping of the fabric.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Reinforced Concrete Pipe (RCP). ASTM C76, Class IV, unless otherwise shown on the Drawings.
- B. HDPE pipe (smaller than 12 inches in diameter): Corrugated interior and exterior heavy-duty high-density polyethylene pipe in accordance with ASTM F667.
- C. HDPE pipe (12 inches in diameter and larger): Corrugated exterior, smooth interior high-density polyethylene pipe, with a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D2412. Gasketed integral bell and spigot joint, watertight according to the requirements of ASTM D3212. Spigot shall have two gaskets meeting the requirements of ASTM F477.
- D. Perforated HDPE underdrain pipe: Corrugated interior and exterior heavy duty high-density polyethylene pipe with slotted perforations in accordance with ASTM



F667.

- E. Precast Concrete Manholes. Comply with ASTM C478, City of Fairfield Standard Specifications and Details, size and depth as shown on the Drawings.
- F. Precast Concrete Catch Basins. Comply with City of Fairfield Standard Specifications and Details, size and depth as shown on the Drawings.
- G. Precast Concrete Barrel. Concrete barrel structure for water overflow. Comply with specification section 03 40 00, size and depth as shown on the Drawings.
- H. HDPE Catch Basins, ASTM D4976, size and depth as shown on the Drawings.
- I. Pipe and Drain Inlet Joints. Rubber gasketed, watertight joints that comply with ASTM C443.
- J. Resilient Connectors. ASTM C923, Kor-N-Seal II 306 series, or approved equal.
- K. Pipe Bedding: Granular material free from clay or organic matter and graded such that 90 percent to 100 percent passing the No. 4 sieve and not more than 5 percent passing a No. 200 sieve.
- L. Watertight Sanitary Sewer Manhole Frame and Cover. Heavy duty, H20 rated frame and cover shall meet the requirements for Watertight Level 8, utilizing a bolted, dual-gasket design. Frame shall be gray iron in accordance with ASTM A48, with a ductile iron cover in accordance with ASTM A536, and stainless steel hardware. Frame and cover shall be DUOSEAL W824ZPT, or approved equal.
- M. Beehive (Dome) Grated Inlet: Shall be ADS Nyoplast 12" dome 1299GCD, Locking, light duty ductile iron in accordance with ASTM A536, or approved equal.
- N. Filter Fabric: Filter fabric shall be a permeable, non-woven geotextile fabric in accordance with Caltrans Standard Specifications (Class A). Filter fabric shall be tested for tensile strength in accordance with ASTM D4751, water permeability in accordance with ASTM D4491, and UV Performance in accordance with ASTM D4355.

2.02 BIORETENTION PLANTERS

Bioretention Planters shall meet the material requirements listed below.

- A. Bioretention Soil Mix. Bioretention Soil Mix shall be a well-blended mixture of sand, topsoil and compost, have sufficient moisture retention to support healthy plant growth, and meet the following requirements:
 - 1. Mixture proportions: 30-40% Compost by volume and 60-70% Sand by volume.
 - 2. Organic matter content: 4-8% as determined by TMECC 05.07-A, Loss on



Ignition Method.

3. Extraneous materials: Bioretention Soil Mix shall be free of all roots, plants, weeds, sod, stones, clods, pockets of coarse sand, construction debris, or other extraneous materials harmful to plant growth.
4. Permeability/Saturated Hydraulic Conductivity: 10 inches per hour (minimum) tested in accordance with ASTM D2434.
5. Acceptance of Bioretention Soil Mix quality and performance may be based on samples taken from stockpiles at supplier's yard, submitted test results, and/or onsite and laboratory testing of installed material at the discretion of the County. The point of acceptance will be determined in the field by the County.

B. Sand. Sand used in the Bioretention Soil Mix shall meet the following requirements:

1. Sand shall be free of wood, waste, coating, or any other deleterious material.
2. Gradation requirements for Sand shall be as follows:

Sieve Size¹	Percent Passing by Weight²
3/8 inch	100
No. 4	90 to 100
No. 8	70 to 100
No. 16	40 to 95
No. 30	15 to 70
No. 50	5 to 55
No. 100	0 to 15
No. 200	0 to 5

¹ Sieve provided in nominal size square openings or United States Standard Sieve Series Sizes

² Sand conforming to ASTM C33 for Fine Aggregate satisfies the requirements of this specification for Sand.

3. All aggregate passing the No. 200 sieve shall be non-plastic.
4. Acceptance of grading and quality of the sand may be based on samples taken from stockpiles at supplier's yard or a submitted gradation report at the discretion of the County. The point of acceptance will be determined in the field by the County.

C. Compost. Compost used in the Bioretention Soil Mix shall be well-decomposed, stable, weed-free organic matter sourced from waste materials including yard debris, or wood wastes. Compost shall conform to California Code of Regulations Title 14, Division 7, Chapter 3.1 requirements, meet the PFRP (Process to



Further Reduce Pathogens) standard to reduce weed seeds, pathogens, and deleterious materials under 14 CA Code of Regs §17868.3 (i.e., reaching the required minimum temperature of 55 degrees Celsius for the required length of time), be certified through the USCC Seal of Testing Assurance (STA) Program, and meet the criteria specified herein.

1. Feedstocks. Feedstock materials shall be specified and include one or more of the following: landscape/yard trimmings, grass clippings, food scraps, and agricultural crop residues. Feedstock shall not include biosolids, manure, or post-consumer or post-industrial wood products.
2. Organic Matter Content. 35 to 75 percent by dry weight, tested in accordance with TMECC 05.07-A (Loss on Ignition Method).
3. Carbon to Nitrogen Ratio: C:N between 15:1 and 25:1 when tested in accordance with TMECC 05.02 A.
4. Maturity/Stability. Compost 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 (120°F) upon delivery or rewetting is not acceptable. In addition, any one of the following is required to indicate stability:
 - a. Specific Oxygen Uptake Rate (SOUR): 1.5 milligrams O₂ per gram biodegradable volatile solids per hour (maximum) per TMECC 05.08 A.
 - b. Carbon Dioxide Evolution Rate: 8 milligrams CO₂ per gram volatile solids per day per TMECC 05.08-B.
 - c. Dewar Self Heating Test: 20°C temperature rise (maximum) per TMECC 05.08-D (Class IV or V).
 - d. Solvita®: Index value greater than 6 per TMECC 05.08-E.
 - e. Toxicity: Any one of the following measures is sufficient to indicate non-toxicity.
 - 1) Seed Germination: greater than 80 percent of control
 - 2) Vigor: greater than 80 percent of control per TMECC 05.05-A.
 - 3) Ammonium < 500 ppm, dry basis
 - 4) Plant Trials > 80% of control
 - f. Nutrient Content: provide analysis detailing nutrient content including N-P-K, Ca, Na, Mg, S, and B.



Total Nitrogen: 0.9% (minimum)

Boron: Total shall be < 80 ppm.

- g. Salinity/Electrical Conductivity: less than 6.0 deciSiemen per meter (dS/m or mmhos/cm) per TMECC 04.10-A (1:5 Slurry Method, Mass Basis).
- h. pH: 6.0 to 8.5 per TMECC 04.11-A (1:5 Slurry pH).
- i. Gradation: Compost for Bioretention Soil Mix shall meet the following size gradation per TMECC 02.02-B:

Sieve Size	Percent Passing by Weight
2 inch	100
1 inch	99 to 100
5/8 inch	90 to 100
1/4 inch	75 to 100

- j. Bulk density: 500 to 1,100 dry pounds per cubic yard.
- k. Moisture content: 30 to 55 percent of dry solids.
- l. Inerts: compost shall be relatively free of inert ingredients, including glass, plastic, and paper, less than 1% by weight or volume per TMECC 03.08A.
- m. Weed seed/pathogen destruction: provide proof of process to further reduce pathogens (PFRP). For example, turned windrows must reach minimum 55°C for 15 days with at least 5 turnings during that period.
- n. Select Pathogens (choose one):
 - 1) Salmonella: less than 3 Most Probable Number per 4 grams of total solids, dry weight per TMECC 07.02.
 - 2) Coliform Bacteria: fecal coliform less than 1,000 Most Probable Number per gram of total solids, dry weight per TMECC 07.01.
- o. Trace Contaminants Metals: Product must meet US EPA, 40 CFR 503 regulations for Trace Contaminants Metals (lead, mercury, etc.).

- D. Aggregate Storage. Aggregate Storage shall consist of hard, durable, and clean, sand, gravel, or mechanically crushed stone, substantially free from adherent coatings. Materials shall be washed thoroughly to remove fines, organic matter, extraneous debris, or objectionable materials. Recycled materials are not



permitted. The material shall be obtained only from a source(s) approved by the County. Written requests for source approval shall be submitted to the County not less than ten (10) working days prior to the intended use of the Material. Should the proposed source be one that the County has no history of Material performance with, the County reserves the right to take preliminary samples at the proposed source, and make preliminary tests, to first determine acceptability of the new source and then perform the applicable Material approval testing. Continued approval of a source is contingent upon the Materials from that source continuing to meet Contract requirements. Materials shall meet the Standard Specifications for grading and quality for use in the Work; however, allowable exceptions may be specified in the Contract.

1. Gradation Requirements. Aggregate storage shall be double washed at the source (on-site washing of aggregate is not allowed) and meet the following specifications for grading and quality.
2. Aggregate gradation testing in accordance with ASTM C136 at least once per 500 cubic yards.

Sieve ¹	Percent Passing by Weight
	Caltrans Class 2 Permeable Aggregate
1 inch	100
3/4 inch	90 to 100
1/2 inch	–
3/8 inch	40 to 100
No. 4	25 to 40
No. 8	18 to 33
No. 16	–
No. 30	5 to 15
No. 50	0 to 7
No. 200 ²	0 to 3

¹ Sieve provided in nominal size square openings or United States Standard Sieve Series sizes.

² Gradation modified from ASTM for portion passing the No. 200 sieve.

3. Crushed Particles: 90% (minimum) fractured faces tested in accordance with California Test 205. Do not use rounded river gravel.
4. L.A. Abrasion: 40% (maximum) tested in accordance with ASTM C131.
5. Cleanness Value: 80 (minimum) tested in accordance with California Test 227 (Method of Test for Evaluating Cleanness of Coarse Aggregate).

- E. Composted Wood Mulch (Mulch). Refer to specification section 32 90 00 for requirements.

**F. Streambed Cobbles**

1. Streambed Cobbles shall be clean, naturally occurring water rounded gravel material. Streambed Cobbles shall have a well-graded distribution of cobble sizes and conform to the following gradation:

Approximate Size¹	Percent Passing by Weight
4"	99-100
3"	70-90
2"	
1.5"	20-30
3/4"	10 max.

1 Approximate size can be determined by taking the average dimension of the three axes of the rock, Length, Width, and Thickness, by use of the following calculation: (Length + Width + Thickness)/3 = Approximate Size Length is the longest axis, width is the second longest axis, and thickness is the shortest axis.

2. Cobbles must be washed before placement

2.03 LIFT STATION DISCHARGE PIPING

The discharge piping from both the Interior and Exterior Lift Stations and the outlet pipe shall meet the following requirements:

A. HDPE Pressure Piping

1. Supply smooth-walled HDPE pipe and fittings conforming to AWWA C906 with a minimum dimensional ratio (DR) of 32.5.
2. Connect the HDPE pipe to the ductile-iron (DI) pipe at the lift station sumps using a flexible, mechanical coupling, coated for direct-buried service.
3. Perform electric welding for joining of HDPE pipe sections and fittings to reduce the number of flanged joints. Welding to conform to the requirements of ASTM F2620.
4. Design flange joints to withstand all stresses, including stresses due to seismic forces, conforming to AWWA C207.

B. HDPE Bifurcation and Trifurcation Special Fittings

1. Submit for County approval, shop drawings for the fabrication of the both the HDPE bifurcation at the Interior Lift Station and the HDPE trifurcation at the Exterior Lift Station. A conceptual configuration for these fittings is provided in the contract drawings.
2. Fittings and welding of HDPE special fittings to comply with AWWA C906



and ASTM F2620.

C. Outlet Pipe Fabrication

1. Submit for County approval, shop drawings for the fabrication of the 32-inch Outlet Pipe shown in the contract drawings.
2. Outlet Pipe may be fabricated from, either: carbon steel pipe and fittings and coated and lined with polyurethane coating conforming to AWWA C222; or stainless-steel pipe and fittings conforming to AWWA C220 and C226.
3. Design flange joints to withstand all applied stresses, including stresses due to seismic forces, conforming to AWWA C207 or C228.

PART 3 – EXECUTION

3.01 TRENCH EXCAVATION, BEDDING AND BACKFILL

- A. Trench Excavation. Excavate to the dimension indicated on trench sections. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding or base placement. Tamp if necessary to provide a firm bed. Excavate recesses to accommodate bells and joints so that pipe will be uniformly supported for the entire length.
- B. Foundation Preparation. Unless trench bottom is founded in firm, undisturbed native material, scarify to a depth of 6-inches, moisture condition to at least 1% above optimum moisture, and re-compacted to a minimum of ninety percent (90%) relative compaction in accordance with ASTM D1557.
- C. Pipe Bedding. Place bedding material from 6 inches minimum depth under the pipe to the pipe spring line. Special care should be exercised to ensure that the pipe is fully supported on bedding material to the pipe spring line.
- D. Trench Backfill. Backfill pipe trench above spring line with native material. Place backfill in uniform lifts not exceeding 8-inch loose thickness, moisture condition, and compact to not less than ninety percent (90%) relative compaction in accordance with ASTM D1557.
- E. Structure Backfill. Comply with Section **31 23 16** for all backfill within 3 feet of structures.
- F. Prior to placing backfill, inspect pipe and accessories for damage and repair or replace any damaged sections of pipe or accessories.

3.02 PIPE

- A. Install pipe to the true alignment and grade in accordance with the Drawings.
- B. Keep interior free of dirt and other foreign material during installation.



- C. Join pipe sections together to provide the proper space between abutting ends of pipe. Use wood blocking to prevent damage to pipe ends when driving pipe into position. Check each joint for proper position prior to placing the next section of pipe.
- D. Install lubricated rubber gaskets in accordance with the manufacturer's recommendations.
- E. Clean and lubricate the connecting surfaces of two (2) pipe sections just prior to connection. Check the complete circumference of each joint, in accordance with the manufacturer's installation recommendations, to assure that the gasket(s) is properly seated and under compression.
- F. Unless otherwise approved by the County or shown on the Drawings, use resilient connectors to make all connections of pipe to drain inlets, manholes and structures.
- G. Field welding of HDPE pressure pipe to conform to ASTM F2620. After cooling to ambient temperature, pressure test all heat-fused pipe using air and inspected for leaks with pipe snoop solution. If no leaks are detected, pressurize the pipe to 1.5 times the working pressure and disconnect from air source. Check pressure after 1 hour and if the pressure is lower than 1 psi drop from the initial pressure, the fusion joint needs to be repaired or redone. This test is not applicable to perforated HDPE pipe.
- H. Install gaskets on all flanged connections and tighten bolts to proper torque values, in appropriate bolting pattern. Leave flange joints unburied until after initial startup of pumps to allow for inspection for leaks and any necessary adjustments of the connections.

3.03 PRECAST MANHOLES AND CATCH BASINS

- A. Comply with City of Fairfield Standard Specifications and Details.
- B. Join pipes to precast with resilient connectors.
- C. Foundation preparation and backfill shall comply with Section **31 23 16**.
- D. Make joints in precast sections with rubber gaskets in accordance with manufacturer's installation instructions, unless otherwise approved by the County.

3.04 WATERTIGHT SANITARY SEWER MANHOLE FRAME AND COVER

- A. Comply with City of Fairfield Standard Specifications and Details.
- B. Install watertight frame and cover in accordance with the manufacturer's recommendations and instructions.

3.05 BIORETENTION PLANTERS



A. General

1. Prevent runoff from adjacent pervious and impervious surfaces from entering the bioretention facility (e.g., gravel bag inlet curb cuts, stabilize adjacent areas, flow diversion) until authorization is given by the County.
2. Exclude equipment from bioretention facilities. No equipment shall operate within the facility once bioretention facility excavation has begun, including during and after excavation, backfilling, mulching, or planting.
3. Prevent foreign materials and substances, such as silt laden run-off, construction debris, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid from entering or being stored in the facility at any point during construction.
4. Do not dump Materials or substances except the bioretention soil within the cell area.
5. Prevent debris, equipment, and other construction materials from puncturing the filter fabric before and during installation.

B. Grading

1. The Contractor shall not start bioretention facility grading until all areas draining to the facility are stabilized and authorization has been given by the County.
2. Construct bioretention facility subgrade to +/- 3/4 inch of the grades and slopes specified on the Plans.
3. Excavation within 6 inches of final native soil grade shall not be permitted if facility soils have standing water or have been subjected to more than 1/2 inch of precipitation within the previous 48 hours.

C. Subgrade Preparation and Protection

1. Protect the bioretention excavation from over compaction and/or contamination.
 - a. Areas which have been over compacted by equipment or vehicle traffic or by other means and which need to be ripped, over excavated, receive additional scarification, or other restorative means shall be done at the Contractor's expense and at the direction of the County.
 - b. Excavated areas contaminated by sediment laden runoff prior to placement of Bioretention Soil Mix or Aggregate Storage material shall be remediated at the Contractor's expense by removing the contaminated soil (top 3 inches minimum) and replacing with a



suitable material, as determined by the County.

2. Remove all trash, debris, construction waste, cement dust and/or slurry, or any other materials that may impede infiltration into prepared subgrade.
3. The subgrade shall be inspected and accepted by the County prior to placement of any materials or final subgrade scarification.
4. Scarify the surface of the subgrade to a minimum depth of 3 inches immediately prior to placement of Bioretention Soil Mix or Aggregate Storage material. Acceptable methods of scarification include use of excavator bucket teeth or a rototiller to loosen the surface of the subgrade.
5. Place Aggregate Storage material, where shown on the Plans with conveyor belt or with an excavator or loader from a height no higher than 6 feet unless otherwise approved by the County (i.e., do not dump material directly from truck into cell).
6. Aggregate Storage areas contaminated by sediment-laden runoff prior to placement of Bioretention Soil Mix shall be remediated at the Contractor's expense by removing the contaminated Aggregate Storage material (top 3 inches minimum or as directed by the County) and replacing with clean Aggregate Storage material per Section 2.02.D, to the lines and grades on the Plans.
7. Aggregate Storage material shall be inspected and accepted for placement and finish grade by the County prior to the installation of Bioretention Soil Mix. Any material that does not conform to this Specification shall be removed and replaced with acceptable material or remediated to the satisfaction of the County, at the Contractor's expense.

D. Bioretention Soil Mix Placement

1. The Contractor shall not place Bioretention Soil Mix until the County has reviewed and confirmed the following:
 - a. Delivery Ticket(s): Delivery tickets shall show that the full delivered amount of Bioretention Soil Mix matches the product type, volume and manufacturer named in the submittals. Each delivered batch of Bioretention Soil Mix shall be accompanied by a certification letter from the supplier verifying that the material meets specifications and is supplied from the approved Bioretention Soil Mix stockpile.



- b. Visual match with submitted samples: Delivered product will be compared to the submitted 1-gallon sample, to verify that it matches the submitted sample. The County may inspect any loads of Bioretention Soil Mix on delivery and stop placement if the soil does not appear to match the submittals; and require sampling and testing of the delivered soil before authorizing soil placement.
 - c. Inspection of the Aggregate Storage layer, underdrain, cleanout, and overflow structure installation, where included on the Drawings.
 2. Bioretention Soil Mix placement, grading and consolidation shall not occur if there is standing water in the excavation or when the Bioretention Soil Mix is excessively wet, or has been subjected to more than 1/2 inch of precipitation within 48 hours prior to placement. Excessively wet is defined as being at or above 22 percent soil moisture by a General Tools & Instruments DSMM500 Precision Digital Soil Moisture Meter with Probe (or equivalent). A minimum of three readings with the soil moisture probe will be used to determine the average percent soil moisture reading per each truck load. There should be no visible free water in the material.
 3. The Contractor shall place Bioretention Soil Mix loosely in even lifts no deeper than 9 inches unless otherwise approved by the County, with a conveyor belt or with an excavator or loader from a height no higher than 6 feet, unless otherwise approved by the County (i.e., do not dump material directly from truck into cell). After each lift, rake the surface to a uniform grade, consolidate as specified below, and rake again to scarify before placing subsequent lifts or planting.
 4. Soil shall be placed upon a prepared subgrade in accordance with these Specifications and in conformity with the lines, grades, depth, and typical cross-section shown in the Drawings or as established by the County.
 5. Excessively dry Bioretention Soil Mix may be lightly and uniformly moistened, as necessary, to facilitate placement and workability.
 6. Compact Bioretention Soil Mix using non-mechanical compaction methods (e.g., boot packing, hand tamping, or push type lawn roller) to 83% (+/- 2%) of the maximum dry density in accordance with ASTM D1557, or as directed by the Geotechnical Engineer. Determination of in-place density shall be made in accordance with ASTM D6938, using a nuclear gauge. Moisture content determination in accordance with ASTM D2216 shall be conducted on a soil sample taken at the location of the nuclear gage reading.
 7. Grade Bioretention Soil Mix to a smooth, uniform surface plane with loose, uniformly fine texture. Rake, remove ridges, and fill depressions to meet finish grades.



8. Final soil depth shall be measured and verified only after the soil has been compacted. If, after consolidation, the soil is not within +/- 3/4 inch of the grades and slopes specified on the Drawings, add material to bring to final grades and rake.
9. The Bioretention Soil Mix shall be inspected and accepted for placement and finish grade by the County prior to the installation of planting and mulch. Any Bioretention Soil Mix that does not conform to this Specification shall be remediated to the satisfaction of the County, or removed and replaced with acceptable Bioretention Soil Mix, at the Contractor's expense.

E. Erosion Control

1. Bioretention facilities shall be constructed with a concrete paver splash apron adjacent to inflow gutters, as indicated on the Plans, to reduce erosion potential.
2. Further erosion control will be achieved through the placement of streambed cobble. Streambed cobble shall be placed along the concrete paver splash pad, at the end of any sidewalk flumes, and around the overflow gutter as indicated on the Plans.

F. Planting and Mulching

1. Bioretention facilities shall be planted and mulched as shown on the Plans.
2. Bioretention facilities shall not be planted or mulched when soils are excessively wet.
3. Bioretention facility areas contaminated by sediment laden runoff prior to planting or placement of mulch shall be remediated at the Contractor's expense by removing and replacing the contaminated Bioretention Soil Mix (top 3 inches minimum) .
4. All mulch shall be inspected and accepted by the County to ensure appropriate depth and material prior to facility commissioning (e.g., unblocking of inlets).
5. At the conclusion of planting and mulching, the 90-day plant root-in period begins. During the 90-day plant root-in period the inlets shall be blocked to prevent runoff from adjacent pervious and impervious surfaces from entering the bioretention facility (e.g., gravel bag inlet curb cuts, stabilize adjacent areas, flow diversion) until authorization is given by the County.

3.06 FIELD QUALITY CONTROL

- A. Material. Inspect the pipe sections for cracking, spalling, checking, or damage beyond ASTM Specifications prior to installation. Replace material found to be



defective before, or after, laying with sound material.

- B. Installation. Install in accordance with manufacturer's instructions, verifying proper seating and gasket position for each joint.
- C. Line and Grade. Verify proper alignment and slope of each pipe section prior to backfill.
- D. Compaction. Compaction tests shall be performed by the County on each different backfill material at least once each day that material is placed. Testing frequency shall be no less than once for every 50 cubic yards of material placed, with at least one test for each lift of fill placed.
- E. Inspection. Periodic visual inspections will be made by the County. Checks will include, but are not limited to, proper joint and gasket seating, debris and obstructions, cracks and damage, alignment, and connections to structures. Items not in accordance with Specifications and Drawings shall be reworked or repaired.
- F. Bioretention System Flow Testing
 - 1. Inlets shall be free from all obstructions prior to commencing flow testing.
 - 2. Initial testing shall take place immediately following the construction of curbs, walls, and/or inlet structures.
 - 3. Final testing shall be conducted at the conclusion of the 90-day plant root-in period.
 - 4. Prior to testing, broom sweep gutter and other impervious surfaces within the test area to remove sediments and other objectionable materials.
 - 5. The County shall be present during the demonstration. The Contractor shall notify the County a minimum of two (2) working days prior to testing.
 - 6. The Contractor shall water test each facility to demonstrate that all inlet curb openings are capturing and diverting all water in the gutter to the facility, or diverting as per design intent. Testing shall include application of water from a hydrant or water truck, at a minimum rate of 10 gallons per minute, into the gutter a minimum of 15 feet upstream of the inlet curb opening being tested. Each inlet shall be tested individually. If erosion occurs during final testing, restore soils, plants, and other affected materials.
 - 7. The County will identify deficiencies and required corrections including, but not limited to, relocating misplaced plants, adjusting streambed gravel, adjusting mulch, adjusting inlets, splash aprons, and forebays, removing and replacing inlets, and removing debris.
 - 8. Once adjustments are made, the Contractor shall re-test to confirm all



test-water flows into the facility from the gutter and correct any remaining deficiencies identified by County.

9. Inlets, outlets, and other bioretention facility appurtenances shall not be accepted until testing and any required correction and retesting is complete and accepted by the County.

END OF SECTION



SECTION 35 22 63 – STORM GATES AND RISER

PART 1 – GENERAL

1.01 SECTION

- A. Passive Automatic Storm Gates for vehicular and pedestrian use and Removable Flashboard Riser.

1.02 RELATED SECTIONS

- A. N/A.

1.03 REFERENCES

- A. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- B. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
- C. AWS - American Welding Society.
- D. FEMA - Federal Emergency Management Agency.
- E. The Aluminum Association - Aluminum Design Manual
- F. AISC Design Guide 27 – Structural Stainless Steel
- G. ASCE 7 – Minimum Design Loads for Buildings and Other Structures
- H. ASCE 24 – Flood Resistant Design and Construction
- I. ASCE 7 – Minimum Design Loads for Buildings and Other Structures

1.04 DEFINITIONS

- A. Barrier Top Elevation: The design water surface elevation (DWSEL) plus one (1) foot, shown in the project drawing plans. DWSEL is the design storm maximum water elevation on the exterior of the barrier protection.

1.05 SUBMITTALS

- A. Submit for review in accordance with Section 01 33 00, "Submittal Procedures," the following:
 - 1. Calculations: Submit calculations, approved by a qualified engineer, to verify the barrier's ability to withstand the design pressure loading, based on current building code and specified load combinations.
 - 2. Product Data: Manufacturer's data sheets on each product to be used,



including:

- a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods.
 - d. Maintenance Instructions.
3. Shop Drawings: Submit plan, section, elevation, and perspective drawings as necessary to depict proper placement, connections, and anchorage, installation, and operation methods for each gate and flashboard riser to be installed.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of 5 years of experience in design and manufacturer of passive flood barrier systems and evidence of a minimum of 25 projects.
- B. Installer Qualifications: All Work listed in this section is to be installed by a contractor approved by the manufacturer. Manufacturer representative must be on-site during gate installation to provide advisory services.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 1. Finish areas designated by Engineer.
 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Engineer.
 3. Refinish mock-up area as required to produce acceptable work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY



- A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Passive Automatic Storm Gate Acceptable Manufacturer: FloodBreak Automatic Floodgates, which is located at: 5909 West loop S Suite 200; Bellaire, TX 77401; Tel: 713-980-6610; Fax: 713-629-9936; Email: info@floodbreak.com; Web: www.floodbreak.com
- B. Substitutions: Substitutions are allowed so long as all other requirements of the specification are met by the substitute bidder and approved by the Contracting Officer.

2.02 DESIGN REQUIREMENTS:

- A. Gates:
 - 1. Design the gate height based on the barrier top elevation provided in the drawings.
 - 2. Design the gate to hinder the passage of surface storm water and resist water forces. Gates shall be watertight while rising and when in the "open" position. Gate design shall include a wiper wall to maintain contact with gate seal and gaskets at all points of operation.
 - 3. Design that the actual gate installation "set-down" below surface grade is a maximum of 6 inches for pedestrian openings and vehicular applications. Gate shall anchor into a concrete foundation as provided in the project drawings. See specification Section 03 30 00, "Cast-In-Place Concrete," for concrete requirements.
 - 4. Design the gate to exclude the use of any electric or mechanical powered support equipment, springs, or pumps, for any operation of the gate to its open or closed position in passive mode without assistance to deploy and drain.
 - 5. Design the gate to allow safe passage of vehicular and human traffic while in its dry or "Closed" position.
 - 6. For vehicular gates, while the gate is in the "Closed" position, it should be able to sustain traffic loads corresponding to AASHTO HS-25 (40 ton) truck. For the pedestrian gates, while the gate is in the "Closed" position it should be able to sustain a live load of 100 psf.
 - 7. Design the gate system using only aluminum and stainless-steel components to resist corrosion and EPDM rubber gaskets for durability.



8. Gate components shall be provided by the manufacturer to meet the requirements listed above. Shop drawings and product data shall be submitted for approval prior to installation.
9. Gate shall come equipped with status sensor pre-installed by manufacturer such that when gate is partially or fully activated, a continuous output signal is transmitted.
 - a. Sensor shall be DW 30mm Stainless Steel Triple Sensing Proximity Sensor or equivalent. Sensor should be waterproof/designed to be submerged.
 - b. Sensor to be powered at all times as required.
- B. Gate Drainage: Connect 4-inch (102mm) diameter drain to the drainage trough centered within the pan in all directions.
- C. Concrete:
 1. Encapsulate pan and extending bars in a monolithic concrete pour with a depth of no less than 11 inches (280mm) and extending a lateral distance from the pan no less than 12 inches (305mm) in any direction.
- D. Pan:
 1. Fabricate pan to include a drainage trough running parallel to and for the entire length of the gate at the approximate centerline of the pan. Trough will have a depth of 2 inches (51mm) and a width of 6 inches (152mm).
- E. Flashboard Riser:
 1. Design the height based on the barrier top elevation provided in the drawings.
 2. Flashboard riser design to hinder the passage of surface storm water and resist water forces. Flashboards shall be designed to slide into place by personnel in preparation for a storm event and be watertight. Minimize weight to less than 100lbs per flashboard for easy installation and removal.
 3. Design flashboard riser for load combinations in accordance with ASCE 7. Flood Loads shall consider the following: Hydrostatic Loads, Hydrodynamic Loads, Wave Loads, Impact Loads. Design flashboard riser for maximum wind load pressure as required for the specific project.
 4. Removable storm panels to be of 6063-T6 aluminum alloy or an acceptable corrosion-resistant substitute.
 5. All posts and end tracks shall be aluminum manufactured from a minimum 6005A-T61 alloy.



6. Bolts shall be stainless steel Type 304 Condition AF complying with ASTM F593A. Nuts shall be stainless steel type 304 complying with ASTM F594. Washers shall be stainless steel Type 304.
7. Gaskets shall be EPDM with a durometer appropriate for the waterproofing needs.

2.03 FABRICATION

A. General Requirements:

1. All components and elements shall be fabricated following the manufacturer's standards to meet the requirements identified above.
2. Welding shall be performed by a certified welder in accordance with AWS standards.
3. Tighten all bolts to torque specifications determined by the manufacturer and Engineer of record.

B. Gate:

1. At panel joints, stitch weld every 5 inches (127mm) on center with a 3/16-inch fillet weld 3 inches (76mm) long. Contractor shall verify with Engineer of Record these weld requirements prior to start fabrication.
2. At panel splices, place splice flanges within 12 inches (305mm) of adjacent retention arms. Contractor shall verify with Engineer of Record these weld requirements prior to start fabrication.

C. Hinges and Anchors:

1. Seam-weld retention arm brackets to gate and pan. Include stiffener plates on each side.
2. Attach retention arm anchors through pan and into concrete with 1/2-inch (13mm) diameter anchor bolts.

D. Wiper Wall: Manufacturer to provide 3/8-inch (10mm) aluminum wiper wall to maintain contact with gate seal and protective gaskets at all points of operation.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.



3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.04 TESTING AND ACCEPTANCE

- A. Test in accordance with manufacturer recommendations for a float test demonstrating passive operation and lid buoyancy.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION