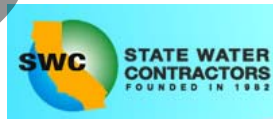


TWO GATE FISH PROTECTION PLAN BACON ISLAND, CALIFORNIA

REQUEST FOR PROPOSAL

Prepared for: State Water Contractors



by:



Moffatt & Nichol
2001 N Main Street, Suite 360
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1.0 INTRODUCTION

This Request for Proposals (RFP) is issued by the State Water Contractors (“**SWC**” or “**Owner**”) to solicit sealed proposals (“**Proposal**”) for a contractor (the “**Contractor**”) to construct and operate the Two Gate Fish Protection Plan Project (the “**Project**”) as more specifically described in the Contract Documents (the “**Contract**”).

1.1 DEFINITIONS

Capitalized terms used in this RFP not otherwise defined herein shall have the meanings set forth in General Conditions.

1.2 PROCUREMENT METHOD

The Owner will award the Contract (if at all) to the responsive and responsible Contractor offering a Proposal meeting the requirements of the Owner and which is determined by the Owner (in Owner’s sole discretion) to provide the best value to the Owner. The Owner will accept Proposals only from submitting contractors (“**Proposers**”) who have been advised by the Owner in writing that they are an eligible Proposer.

1.3 SCOPE OF WORK

Contractor's work (the "**Work**") under the Contract Documents generally includes all work and efforts required to construct the Project as more specifically described in the Contract Documents. A more specific description of the scope of the Work is set forth in Section 01100, Summary of Work, of the Technical Specifications.

1.4 NOTICE TO PROCEED

The Owner anticipates that the procurement process can be completed and a Notice to Proceed issued within 120 calendar days after the Proposal Due Date (as defined in Section 1.5).

1.5 PROCUREMENT SCHEDULE

The following dates are anticipated for procurement milestones:

Milestone	Date
RFP Issue Date	<insert date>
Proposer Information Briefing	<insert date and time>
Deadline for Proposer Questions	<insert date and time>
Proposal Due Date	<insert date and time>
Anticipated Award of Contract	<insert date>
Issuance of Notice to Proceed	<insert date>

INSTRUCTIONS TO PROPOSERS

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All dates set forth above and in this RFP are subject to change, at the Owners sole discretion. To the extent such dates are changed, the Owner shall endeavor to notify Proposers in advance in writing.

1.6 AUTHORIZED REPRESENTATIVE OF OWNER

The Owner has designated Moffatt & Nichol (the “**Engineer**”) to be its authorized representative for the Project. During the procurement process or during the term of the Contract, the Owner may designate other authorized representatives to carry out some or all of the Owner’s obligations pertaining to the Project.

1.7 PROJECT GOALS

The Owner’s primary goals in connection with this procurement and the Project include ensuring that (i) the completed Work and related construction and operation meets high quality standards and, in so doing, achieves an exemplary safety record; (ii) the Contractor successfully completes the Work within the Project budget and time requirements; and (iii) adverse impacts to the public and adjacent landowners are minimized.

2.0 PROCUREMENT PROCESS

2.1 INTERPRETATION OF CONTRACT DOCUMENTS

Proposer shall be responsible for reviewing the Contract Documents prior to the Proposal Due Date, and for requesting clarification or interpretation of any discrepancy, deficiency, ambiguity, error or omission contained therein. Any such request regarding the Contract Documents or the Project must be submitted in writing (via letter or email) to the Owner’s Engineer c/o Moffatt & Nichol , 2001 North Main Street, Suite 360, Walnut Creek, CA 94596, Attention: Mr. Richard M. Rhoads, P.E., no later than 5:00 p.m. Pacific Time on the deadline for questions set forth in Section 1.5. Requests for clarification or interpretation must specifically reference the section and/or page number of the Contract Documents. **Phone requests will not be accepted.** Responses to written questions timely received will be provided to all Proposers. If the Owner determines, in its sole discretion, that such interpretation or clarification requires a change in the Contract Documents, the Owner will prepare and issue Addenda (as defined below). The Owner will not be bound by, and Proposer shall not rely on, any oral communication or representation regarding the Contract Documents, or any written communication except to the extent the same is in the form of addenda and is not superseded by later addenda.

2.2 ADDENDA

The Owner reserves the right to revise the Contract Documents. Such revisions, if any, shall be announced by addenda to the Contract Documents (“**Addenda**” or “**Addendum**”). One set of each Addendum will be furnished to each Proposer. If any Addendum includes changes significantly impacting the Contract Documents, as determined in the Owner’s sole discretion, a new Proposal Due Date may be set by the Owner. Proposer must acknowledge in its Proposal Letter (Form A) receipt of all Addenda. Failure to acknowledge receipt of all Addenda may cause the Proposal to be deemed non-responsive to this RFP and be rejected without further evaluation. The Owner reserves the right to hold group or one-on-one meetings with any or all Proposers to discuss any Addenda or response to requests for clarifications.

2.3 EXECUTION OF PROPOSAL

Each Proposal shall be executed on behalf of the Proposer by its properly authorized representative. The offers made in the Proposal will be binding on the Proposer should the Owner elect to accept it without requesting best and final offers (or any “BAFO’s”, as defined in Section 5.4).

2.4 DESIGNATION OF SUBCONTRACTORS

The Proposer must identify subcontractors and suppliers performing services or providing materials (of all tiers) in its Proposal as specified in the Proposal Forms and Contract Documents wherein the contract value with the subcontractor/supplier is greater than ten percent (10%) of the Total Proposed Amount.

2.5 PROJECT DUE DILIGENCE

In addition to the Contract Documents and other materials that have been made available to Proposers during the procurement process, the Owner intends to undertake additional due diligence activities prior to and/or during the RFP process. In addition, the Owner intends to permit Proposers to undertake additional soil borings and exploratory investigations if requested by a Proposer. Any Proposer entering the right-of-way or conducting such investigations shall coordinate their activities with the Owner, as specified in SP-20. Information obtained as a result of the Owner’s additional due diligence investigations will be made available to Proposers subject to the same limitations applicable to similar information furnished in the Contract Documents.

2.6 INSURANCE

The specific components and requirements for Project insurance and the Proposers obligations with respect thereto are set forth in the General Conditions.

2.7 LANGUAGE IN PROPOSAL

The verbiage used in each Proposal will be interpreted and evaluated based on the level of commitment provided by the Proposer. At the Owner’s sole discretion, tentative commitments will be given no consideration. For example, phrases such as “we may” or “we are considering” may be given no consideration in the evaluation process if determined by the Owner to not indicate a firm commitment.

3.0 PROPOSAL SUBMISSION REQUIREMENTS

3.1 SUBMISSION OF PROPOSALS

Each Proposal shall be clearly identified as a Proposal responding to this RFP and delivered to Moffatt & Nichol offices at 2001 North Main Street, Suite 360, Walnut Creek, CA 94596, Attention: Mr. Richard M. Rhoads, P.E., in sealed boxes prior to 5:00 p.m. Pacific Time on the Proposal Due Date set forth in Section 1.5. Failure to use sealed boxes or to properly identify the Proposal may result in an inadvertent opening of the Proposal before the time and place for the opening of Proposals and may result in disqualification of the Proposal. Proposer shall be entirely responsible for any consequences, including disqualification of the Proposal, resulting from any inadvertent opening of unsealed or improperly identified boxes. It is

Proposers sole responsibility to see that its Proposal is received as required. Proposals received after the time due shall be rejected without consideration or evaluation. Proposers shall provide responses to all information requested in this RFP. Failure to respond or to provide requested information will result in a determination by the Owner, in its sole discretion, that a Proposal is non-responsive. The Owner will not compensate any Proposer for its efforts in preparing a Proposal.

3.2 WITHDRAWAL OF PROPOSALS

The Proposer may withdraw its Proposal at any time prior to the Proposal Due Date by means of a letter signed by the Proposer or its properly authorized representative. Such letter shall be delivered to the address in Section 2.1. A withdrawal of a Proposal will not prejudice the right of a Proposer to file a new Proposal provided that it is received before the time due on the Proposal Due Date. Each Proposal shall include an agreement and acknowledgement by Proposer that no Proposal (including any BAFO) may be withdrawn on or after the Proposal Due Date and that Proposals will remain in full force and effect for 120 calendar days after the Proposal Due Date.

3.3 GENERAL FORMAT

3.3.1 Format

The Proposal shall contain concise written material, tables, figures, schedules and drawings that enable a clear understanding and evaluation of both the construction methods and capabilities of the Proposer. Legibility, clarity, and completeness of the technical approach are essential. The Owner will not impose a page limit on the Proposal. However, the Owner does not commit to review any information in appendices and exhibits other than those required to be provided, and Proposers are strongly encouraged to be concise and to minimize the number of pages in the Proposal. The Proposal evaluation process will focus on the body of the Proposal and any required appendices and exhibits. An 8 ½ x 11-inch format is required for typed submissions and an 11-inch x 17-inch format is required for drawings. Submittals must be bound with all pages sequentially numbered and each section, including appendices, exhibits and forms, must be separately and clearly tabbed. Printed lines may be single-spaced with the type font size being no smaller than 12-point (except that tables, figures and schedules may use 10-point font). The use of 11 by 17-inch foldouts for tables, graphics and maps is acceptable in the main body of the proposal. The use of section summaries is encouraged. Proposals must be written in the English language using English units and measurements.

3.3.2 Number of Copies

Proposer shall provide:

- One bound original (labeled "Original") of the Proposal, with original signatures in black ink.
- Six (6) bound copies of the Proposal.

4.0 PROPOSAL CONTENT REQUIREMENTS

As used in this procurement, the term "**Proposal**" means Proposers complete response to this RFP, with the properly completed Proposal forms and all required supporting documentation.

To assist Proposer in preparing its Proposal, the required contents, as well as any supplied forms, for the Proposal, are listed below. These items shall be organized in the Proposal in the following order, and shall be clearly indexed. Each item listed shall be bound, clearly titled and identified as described below.

Summary of Proposal Contents

Proposal Component	Form (if provided)
A. Proposal Letter	Form A
Identification of Major Subcontractors and Suppliers (Performing Services or Providing Goods Valued At 10% Or Greater Of The Total Proposed Amount)	Form B-1
Information About Proposer	Form B-2
Responsible Proposer Questionnaire	Form C
Price Form	Form D
Surety Letters	(no forms are provided)
B. Management Proposal	(no forms are provided)
C. Technical Proposal	(no forms are provided)

4.1 PROPOSAL LETTER

The Proposal shall include the Proposal Letter in the form of Form A. The Proposer shall attach to the Proposal Letter evidence of the authorization to execute and deliver the Proposal and Contract, and shall identify its authorized representative.

4.2 INFORMATION ABOUT MAJOR SUBCONTRACTORS AND SUPPLIERS

The Proposer shall list on Form B-1 the names, role, licensing information and description of services performed or goods provided for each major subcontractor and supplier with a contract value in excess of 10% of the Total Proposed Amount.

4.3 INFORMATION ABOUT PROPOSER

The Proposal shall include Form B-2 regarding information about the entities that hold an equity interest in the Proposer. The Proposal shall include Form C regarding the responsibility of Proposer.

4.4 PRICE FORM

The Proposal shall include the Pricing Schedule (Form D) completed with all required pricing information.

4.5 SURETY LETTERS

The Proposal shall include the following information regarding the surety bonds:

- Name of surety company (must meet rating requirements set forth in the General Conditions of the Contract), name and address of agent.
- A letter from a licensed surety meeting the requirements stated in the General Conditions of the Contract, signed by an authorized representative as evidenced by a current certified power of attorney committing to provide a Performance Bond for the proposed amount in the form attached to the Contract and a Payment Bond for the proposed amount in the form attached to the Contract. If multiple surety letters are provided, the Proposal shall identify which surety will be the lead surety. The commitment letter may include no conditions, qualifications or reservations for underwriting or otherwise, other than a statement that the commitment is subject to award of the Contract. The bonds required to be provided under the Contract are to name the Proposer as obligor. Accordingly, the surety letter must commit to issuance of a bond in such entity's name.

4.6 MANAGEMENT PROPOSAL

Each Proposer shall provide detailed information describing how it intends to manage the Work. The Management Proposal shall provide information on general management approach and shall address specific Project management services and issues related to the Work.

4.6.1 Project Management

The Management Proposal shall clearly illustrate Proposers approach and capability to: (a) control and coordinate the various subcontractors; (b) interface with the Owner, its consultants, regulatory agencies and other third parties and other various state and local agencies; (c) control the costs and schedules of the Project; (d) comply with applicable regulations (as defined in the Contract Documents); and (e) provide the experienced personnel and facilities required to successfully complete the Project. The Management Proposal shall describe the organizational structure and management methodology for implementation of the Work. The Management Proposal shall also include a chart indicating the basic structure of Proposers organization and the roles and responsibilities of each sub-organization, as they will relate to the Contract. The Management Proposal shall also describe the methods to be used to assure necessary communication among these organizations. In addition to the functional chart, Proposer shall include a staffing chart indicating all key personnel. Resumes shall be included for all key personnel identified in the Proposal.

The Management Proposal and organizational chart(s) shall consider, at a minimum, the following roles: project director, project manager, project engineer, field engineer, quality control manager, surveyor, safety director, general superintendent, pile driving foreman, concrete foreman. The Management Proposal shall include a description of the proposed management approach and controls to be used during the Project. The Management Proposal shall include a brief narrative description on the proposed project control approach, which shall include at least the following:

- Methodology and approach for meeting the completion deadlines.

- Description of Proposers system for preparing and updating schedules and calculating progress.
- Description of Proposers plan to integrate subcontractor and supplier activities into its scheduling and reporting system.
- Description of Proposers plan to approach re-scheduling of its own and subcontractors' activities to achieve schedule recovery objectives and how Proposer will enforce these objectives with its work force and its subcontractors.
- Description of Proposers proposed plan to coordinate Work with the Owner.
- Description of Proposers plans for submittals of Project documentation to the Owner.
- Description of Proposers plan to adhere to permitting and manage third party coordination and approvals.

4.6.2 Quality Control

The Management Proposal shall include a narrative describing how Proposer intends to implement a quality control program that will comply with the quality control requirements described in the Contract Documents. Descriptions shall include the following at a minimum:

- Organizational structure, including an organizational chart, showing how quality control will function in relation to other activities. The organizational structure should describe and identify quality control.
- Basic description of inspection, testing and corrective action procedures, and associated documentation methods.
- The procedure by which inspection/test reports and certificates of compliance for off-the-shelf items will be submitted for examination by the Owner.
- Identification of certified personnel to perform inspection, testing and training.
- The method of document control within the proposed organizational structure including identifying, logging, tracking, filing and retrieving Project documents of all types.
- The method proposed for reporting, tracking and resolving non-conforming work during construction and operation.
- The procedures for obtaining approval of the Engineer for the final resolution and disposition of all non-conforming work.

- The method proposed for coordinating and promptly reporting all quality control issues and resolutions to the Engineer.

4.6.3 Safety Programs

The Management Proposal shall include an outline safety plan demonstrating that Proposer has an established safety program that complies with the RFP Documents and applicable regulations. The outline shall identify and explain Proposers program for training employees performing Work, including compliance with OSHA safety training requirements.

4.7 TECHNICAL PROPOSAL

Each Proposer shall prepare and submit with its Proposal a Technical Proposal. The Technical Proposal shall include an explanation of Proposers approach, specific to this Project, to addressing the various technical aspects of the Project. The information submitted in the Technical Proposal will be used by the Owner to determine the technical capability of the Proposer to perform the Work.

4.7.1 Construction Sequencing Plan

The Construction Sequencing Plan shall include a detailed written description of the proposed construction sequencing plan and order of work, together with a description of the proposed equipment layout; staging configuration; production plan for fabricating / installing / operating / and interim removal and reinstallation of the gate barges and sheet pile barriers; construction and operation of the boat ramps; and other miscellaneous requirements as specified in the Contract Documents.

4.7.2 Coordination with Navigation Interests

Proposer shall provide a detailed description of how the Proposer intends to coordinate its construction and operation activities with other navigation interests (commercial, recreational, and law enforcement) so as to ensure minimal disruption to navigation activities throughout the various stages of the Project.

4.7.3 Preliminary Construction Schedule

The Proposal shall include an initial baseline schedule for construction based on the Construction Sequencing Plan. The Proposer shall prepare its schedule based on the various components of the Work and all other constraints, requirements and limitations set forth in the Contract Documents. The baseline schedule shall show the logical relationships, durations, and timing of the Work breakdown structure for construction.

5.0 EVALUATION PROCESS

5.1 EVALUATION OF PROPOSALS

The Proposals will be evaluated to determine which of them, in the Owners sole discretion, offers the best value to the Owner.

5.2 RESPONSIVENESS EVALUATION

The Proposals will be reviewed for (i) the Proposal's conformance to the RFP instructions regarding organization and format, (ii) the responsiveness of the Proposer to the requirements set forth in the RFP, and (iii) total cost. Those Proposals not responsive to this RFP may be excluded and the Proposer will be so advised. The Owner may also exclude any Proposal containing material misrepresentations.

5.3 REQUESTS FOR CLARIFICATION, ORAL PRESENTATIONS AND DISCUSSIONS

The Owner may issue one or more requests for clarification to the individual Proposers. The Owner may also schedule oral presentations and/or discussion meetings with all Proposers on a one-on-one basis, for the purpose of enhancing the Owner's understanding of the Proposals and obtaining clarifications of the terms contained in the proposals. The Owner may at any time request additional information or clarification from the Proposer or may request the Proposer to verify or certify certain aspects of its Proposal. The scope, length and topics to be addressed shall be prescribed by, and subject to the sole discretion of the Owner. At the conclusion of this process, Proposers shall be required to submit written confirmation of any new information and clarifications provided during an oral presentation. If required, oral presentations shall be scheduled at a later date. At the conclusion of this process, Proposers shall be required to submit written confirmation of any new information and clarifications provided during an oral presentation. Upon receipt of requested clarifications and additional information as described above, if any, the Proposals will be re-evaluated to factor in the clarifications and additional information.

5.4 BEST AND FINAL OFFERS

The Owner does not currently intend to request Best and Final Offers ("BAFO's"), but reserves the right to do so. If any BAFO's are authorized, the Owner will enter into discussions with all responsive Proposers, revise the RFP and request BAFO's. As part of the BAFO, the Owner may issue a change in the Contract Documents. The Proposers shall be offered a reasonable opportunity to respond to the BAFO. The Owner will consider the BAFO submittals and re-evaluate as appropriate in the Owner's sole discretion.

5.5 NOTICE OF AWARD

Award of the Contract will be made by the Owner. If the award has not been made within one-hundred twenty (120) calendar days of the Proposal Due Date, each Proposer who has not previously agreed to an extension of such deadline shall have the right to withdraw its Proposal.

5.6 CONDITIONS TO AWARD; CONTRACT EXECUTION

Promptly following selection by the Owner, the Owner will deliver two (2) sets of execution copies of the Contract to the selected Proposer. The selected Proposer shall execute (in blue ink) and deliver all such execution copies to the Owner within seven (7) calendar days of receipt, together with the required documents described below. The Owner will retain one (1) set of the agreements and return the other executed copy of the Contract to the selected Proposer upon execution by the Owner's governing body.

As a condition to award, the selected Proposer shall deliver the following required documents to the Owner concurrently with the executed copies of the Contract:

- Evidence of authorization to execute the Contract, in the form of a certified resolution of the governing body of the Proposer expressly stating such body's authorization to execute the Contract and, if the Proposer is a partnership, joint venture, unincorporated association or limited liability company, of the governing bodies of the entity's partners or members;
- The insurance policies, endorsements and/or certificates required in the Contract Documents;
- A Performance Bond in the form attached to the Contract issued by the surety listed in the Proposal meeting the requirements stated in the Contract Documents;
- A Payment Bond in the form attached to the Contract issued by the surety listed in the Proposal meeting the requirements stated in the Contract Documents;
- Evidence that Proposer holds all licenses (and that such licenses are in good standing) necessary to perform the Work (if the Proposer is a joint venture, evidence for the Proposer can be provided in the form of licenses for the Proposer or each of the joint venturers).
- Any other documents requested by the Owner.

6.0 OWNER'S RIGHTS

Without limitation, the Owner reserves the right, in its sole discretion, to:

- Investigate the qualifications of any Proposer.
- Require confirmation of information furnished by a Proposer.
- Require additional evidence of qualifications to perform the Work.
- Reject any or all of the Proposals without further obligation or reimbursement to Proposers.
- Issue Addenda to this RFP, the Contract Documents and the RFP process. Addenda to this RFP shall be circulated to all shortlisted teams in advance of the Proposal Due Date and, subject to conditions stated in Section 2.2. the Owner may extend the Proposal Due Date if such extension is deemed by the Owner (in its sole discretion) to be necessary.
- Cancel or withdraw the RFP, or any part hereof.
- Issue a new request for final proposals for the Project.

- Revise and modify, at any time before the Proposal Due Date, the factors it will consider in evaluating Proposals and to otherwise revise or expand its evaluation methodology as set forth herein. If such revisions or modifications are made, the Owner shall circulate an addendum to all shortlisted teams setting forth the changes to the evaluation criteria or methodology. The Owner may extend the Proposal Due Date if such changes are deemed by the Owner (in its sole discretion) to be necessary.
- Hold meetings and conduct discussions and correspondence with Proposers to seek an improved understanding and evaluation of the Proposals.
- Seek or obtain data from any source that has the potential to improve the understanding and evaluation of the Proposals.
- Approve or disapprove particular Proposer identified new subcontractors or changes in the Proposer team.
- Request BAFO's at any time after receipt of the Proposals.
- Waive minor deficiencies, informalities and irregularities in the Proposals; seek and receive clarifications to a Proposal.
- Disqualify any Proposer that changes its Proposal after submission without AMPORTS approval.
- Not issue a notice to proceed after execution of the Contract.
- Exercise any other right reserved or afforded to the Owner under this RFP.

THIS RFP DOES NOT COMMIT THE OWNER TO ENTER INTO A CONTRACT OR PROCEED WITH THE PROCUREMENT DESCRIBED HEREIN. NO PROPOSER SHALL BE ENTITLED TO REIMBURSEMENT FOR ANY OF ITS COSTS IN CONNECTION WITH THIS RFP. ALL SUCH COSTS SHALL BE BORNE SOLELY BY EACH PROPOSER.

IN NO EVENT SHALL THE OWNER BE BOUND BY, OR LIABLE FOR, ANY OBLIGATIONS WITH RESPECT TO THE WORK UNTIL SUCH TIME (IF AT ALL) AS THE CONTRACT, IN FORM AND SUBSTANCE SATISFACTORY TO THE OWNER IN ITS SOLE DISCRETION, HAS BEEN EXECUTED AND AUTHORIZED BY THE OWNER AND APPROVED BY ALL REQUIRED PARTIES AND, THEN, ONLY TO THE EXTENT SET FORTH THEREIN.

PROPOSAL FORMS

DRAFT

PROPOSAL LETTER – FORM A

PROPOSER: _____

Proposal Date: _____, 20__

State Water Contractors (SWC)
c/o: Moffatt & Nichol Engineers
2001 North Main Street, Suite 360
Walnut Creek, CA 94596
Attn: Mr. Richard M. Rhoads, P.E.

The undersigned (“**Proposer**”) submits this proposal (this “**Proposal**”) in response to that certain Request for Proposals (as amended, the “**RFP**”) issued by the State Water Contractors (the “**Owner**”) dated <insert contract document date> to construct and operate the Two Gate Fish Protection Plan Project (the “**Project**”), as more specifically described herein and in the documents provided with the RFP (the “**Contract Documents**”). Initially capitalized terms not otherwise defined herein shall have the meanings set forth in the Contract Documents.

In consideration for the Owner supplying us, at our request, with the Contract Documents and agreeing to examine and consider this Proposal, the undersigned undertakes [jointly and severally]:

a) to keep this Proposal open for acceptance for 120 calendar days after the Proposal Date without unilaterally varying or amending its terms and without any member or partner withdrawing or any other change being made in the composition of the partnership/joint venture/consortium on whose behalf this Proposal is submitted, without first obtaining the prior written consent of Owner, in the Owner’s sole discretion; and

b) if this Proposal is accepted, to provide security for the due performance of the Contract (the “**Agreement**”) as stipulated in the Agreement and the RFP.

If selected by the Owner, Proposer agrees to (a) enter into the Agreement and satisfy all other conditions to award of the Agreement; and (b) perform its obligations as set forth in the Agreement, including compliance with all commitments contained in this Proposal.

Enclosed, and by this reference incorporated herein and made a part of this Proposal, are the following:

- Proposer Information, Certifications, Documents (Forms A-D) and Surety Letters
- Management Proposal
- Technical Proposal

Proposer acknowledges receipt, understanding and full consideration of all materials provided and the following Addenda to the RFP:

Proposer certifies that it has carefully examined and is fully familiar with all of the provisions of all of the Contract Documents, and is satisfied that such provisions provide sufficient detail regarding the Obligations (as defined in the RFP) to be performed and do not contain internal inconsistencies; that it has carefully checked all the words, figures and statements in this Proposal; that it has conducted such other field investigations and additional design development which are prudent and reasonable in preparing this Proposal, including a thorough review of all of the Contract Documents; that it has notified the Owner of any deficiencies in or omissions from any Contract Documents or other documents provided by the Owner and of any unusual site conditions observed prior to the date hereof; and that Owner shall have no liability for the costs and expenses incurred by Proposer as a result of undertaking any of the foregoing tasks.

Proposer understands that the Owner is not bound to accept the Proposer's Proposal, the lowest priced Proposal or any Proposal the Owner may receive.

Proposer further understands that all costs and expenses incurred by it in preparing this Proposal, participating in the RFP process and otherwise complying with the terms and conditions of the Contract Documents prior to the date Owner agrees, in Owner's sole discretion, if at all, to enter into the Agreement with Proposer will be borne solely by the Proposer.

Proposer agrees that the Owner will not be responsible for any errors, omissions, inaccuracies or incomplete statements in this Proposal or the Contract Documents.

This Proposal shall be governed by and construed in all respects according to the laws of the State of California.

Proposer's business address:

(No.)	(Street)	(Floor or Suite)	
(City)	(State or Province)	(ZIP or Postal Code)	(Country)

State or Country of Incorporation/Formation/Organization: _____

Type of legal entity: _____

Proposer's Name: _____

By: _____

Print Name: _____

Title: _____

ADDITIONAL REQUIREMENTS:

A. If the Proposer is a corporation, enter state or country of incorporation in addition to the business address. If the Proposer is a partnership, enter state or country of formation. If the Proposer is a limited liability company, enter state or country of organization.

B. With respect to authorization of execution and delivery of the Proposal and the Agreement, if any signature is provided pursuant to a power of attorney, a copy of the power of attorney shall be provided as well as a certified copy of corporate or other appropriate resolutions authorizing said power of attorney. If the Proposer is a corporation, it shall provide evidence in the form of a resolution of its governing body certified by an appropriate officer of the corporation. If the Proposer is a limited liability company, such evidence shall be in the form of a limited liability company resolution and a managing member resolution providing such authorization, certified by an appropriate officer of the managing member. If the Proposer is a partnership or a joint venture, such evidence shall be provided for the governing body of the Proposer and for the governing bodies of each of its general partners/joint venture members, at all tiers, and in all cases certified by an appropriate officer. If the Proposer is a joint venture, the proposal letter must be executed by all joint venture members.

C. The Proposer must also identify those persons authorized to enter discussions on its behalf with the Owner in connection with this RFP, the Project and the Agreement. The Proposer shall submit with its Proposal a power of attorney executed by the Proposer and each member, partner or joint venturer of the Proposer, appointing and designating one or more individuals to act for and bind the Proposer in all matters relating to the Proposal. If the Proposer is a joint venture, each of the joint venture members shall also affirmatively state in a letter to be included in the Proposal that it will be, if awarded the Agreement, jointly and severally liable for performance of the Contractor's obligations under the Agreement.

D. The Proposer's partnership agreement, limited liability company agreement, and joint venture agreement, as applicable, must include an express provision satisfactory to the Owner, in its sole discretion, stating that, in the event of a dispute between or among joint venturer's, partners or members, as applicable, no joint venturer, partner or member, as applicable, shall be entitled to stop, hinder or delay work on the Project.

INFORMATION ABOUT PROPOSER – FORM B-2

1.0 Name of Proposer: _____

2.0 Type of entity: _____

3.0 Proposer's address: _____

Telephone

Facsimile

4.0 If the Proposer (or any member, general partner or joint venturer of the Proposer) is a corporation or includes a corporation as a joint venturer, general partner or member answer the following (copy this page if necessary for multiple corporations):

4.1 Name of corporation: _____

4.2 Relationship of corporation to the Proposer: _____

4.3 Date of incorporation: _____

4.4 State of incorporation: _____

4.5 President's name: _____

4.6 Vice president's name(s): _____

4.7 Secretary's name: _____

4.8 Treasurer's name: _____

5.0 If the Proposer (or any member, partner or joint venturer of the Proposer) is a partnership or includes a partnership as a joint venturer, partner or member answer the following (copy this page if necessary for multiple partnerships):

5.1 Name of partnership: _____

5.2 Relationship of partnership to the Proposer: _____

5.3 Date and state of formation of partnership: _____

5.4 Full names and addresses of all partners (state whether general or limited partners): _____

6.0 If the Proposer (or any member, partner or joint venturer of the Proposer) is a joint venture or includes a joint venture as a joint venturer, partner or member answer the following (copy this page if necessary for multiple joint ventures):

6.1 Name of venture: _____

6.2 Relationship of venture to the Proposer: _____

6.3 Full names and addresses of all members (at all tiers):

7.0 If the Proposer (or any member, partner or joint venturer of the Proposer) is a limited liability company or includes a limited liability company as a joint venturer, partner or member answer the following (copy this page if necessary for multiple companies):

7.1 Name of company: _____

7.2 Relationship of company to the Proposer: _____

7.3 Date of organization: _____

7.4 State of organization: _____

7.5 President's name: _____

7.6 Vice president's name(s): _____

7.7 Secretary's name: _____

7.8 Treasurer's name: _____

8.0 If the Proposer (or any member, partner or joint venturer of the Proposer) is an entity other than a corporation, partnership, limited liability company or joint venture describe such person or entity and name all principals (copy this page if necessary for multiple entities):

9.0 List all California licenses and license numbers held by the Proposer and any member, general partner or joint venturer of the Proposer. Attach a separate sheet if necessary.

10.0 Surety/Bonding Companies Committing to Provide Bonds (Address, Name of Contact and Phone Number):

(a) Name of bonding company(ies) that will provide the surety bonds required by the Agreement (must meet rating requirements set forth in the Agreement), and name and address of agent.

DRAFT

STATE OF _____)
COUNTY OF _____)SS:

Each of the undersigned, being first duly sworn, deposes and says that _____
is the of _____ and _____ is the _____
of _____, which entity(ies) are the
_____ of _____,

the entity making the foregoing Proposal, and that the answers to the foregoing
questions and all other statements therein are true and correct.

(Signature)

(Name Printed)

(Title)

(Signature)

(Name Printed)

(Title)

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

Notary Public in and for
said County and State

[Seal]

My commission expires: _____

RESPONSIBLE PROPOSER QUESTIONNAIRE - FORM C

1. Questions:

The Proposer shall respond either "yes" or "no" to each of the following questions. If the Proposer's response is "yes" to any question(s), a detailed explanation of the circumstances shall be provided in the space following the questions. The Proposer shall attach additional documentation as necessary to fully explain said circumstances. Failure to either respond to the questions or provide adequate explanations may, in Owner's sole discretion, preclude consideration of the proposal and require its rejection. With respect to the Proposer, the term "**affiliate**" shall mean any firm, corporation, partnership, joint venture, limited liability company or association which is a member, joint venturer or partner of the Proposer or any such entity which owns a substantial interest in or is owned in common with the Proposer or any of its members, joint venturer's or partners, or any such entity in which the Proposer or any of its members, joint venturer's or partners own a substantial interest.

Within the past ten years, has the Proposer, any affiliate of the Proposer, any officer, director, responsible managing officer or responsible managing employee of the Proposer:

- a) Been disqualified, debarred, removed or otherwise prevented from bidding or proposing on or completing a federal, state or local contract anywhere in the United States or any other country because of a violation of law or safety regulation?

If yes, please explain the circumstances. If no, so state.

Yes ____ No ____

- b) Been convicted by a court of competent jurisdiction of any criminal charge of fraud, bribery, collusion, conspiracy or any act in violation of state, federal or foreign antitrust law in connection with the bidding or proposing upon, award of or performance of any contract with any entity?

If yes, please explain the circumstances. If no, so state.

Yes ____ No ____

- c) Had filed against it, him or her, any criminal complaint, indictment or information alleging fraud, bribery, collusion, conspiracy or any action in violation of state or federal antitrust law in connection with the bidding or proposing upon, award of or performance of any contract with any entity?

If yes, please explain the circumstances. If no, so state.

Yes ____ No ____

- d) Had filed against it, him or her, any civil complaint (including but not limited to a cross-complaint) or other claim arising out of a contract, alleging fraud, bribery, collusion, conspiracy or any act in violation of state

or federal antitrust law in connection with the bidding or proposing upon, award of or performance of any contract with any entity?

Yes _____ No _____

- e) Been found, adjudicated or determined by any federal or state court or agency (including, but not limited to, the Equal Employment Opportunity Commission, the Office of Federal Contract Compliance Programs and any applicable California governmental agency) to have violated any laws or Executive Orders relating to employment discrimination or affirmative action, including but not limited to Title VII of the Civil Rights Act of 1964, as amended (42 U.S.C. Sections 2000e et seq.); the Equal Pay Act (29 U.S.C. Section 206(d)); and any applicable or similar California law?

If yes, please explain the circumstances. If no, so state.

Yes _____ No _____

- f) Been convicted of violating a state or federal law respecting the employment of undocumented aliens?

If yes, please explain the circumstances. If no, so state.

Yes _____ No _____

Explain the circumstances underlying any "yes" answers for the aforementioned questions on separate sheets attached hereto.

2. Verification / Declaration

I declare under penalty of perjury under the laws of the State of California that the foregoing declaration is true, correct and accurate. Executed _____, 20__.

(Signature)

(Name Printed)

(Title)

SAMPLE FORMS

DRAFT

OWNER-CONTRACTOR AGREEMENT

This Owner-Contractor Agreement ("Contract"), made this ____ day of _____, 2009, between the State Water Contractors, hereinafter called the "Owner," and _____, or its successors, executors, administrators, and assigns, hereinafter called the "Contractor."

WITNESSETH

For and in consideration of the promises and agreements of the parties hereto hereinafter stated, the receipt and sufficiency of which the parties mutually acknowledge, said parties agree as follows:

1. The Contractor shall, at its sole cost and expense (except to the extent set forth to the contrary in Section 4 of this Contract) do all the work and furnish all supplies, material, labor, skill, equipment, tools, and other things, of every kind and description, specified, needed, or used to manufacture, deliver, erect, construct, or otherwise complete, ready for use, the Work as set forth in the Contract Documents, hereinafter called the "Contract Work."
2. All of the Contract Work shall be performed in strict conformity with the Contract comprised of (a) this Contract; (b) the Request for Proposals; (c) Proposal Forms A-D; (d) the Conditions of the Contract Documents (General, Special, and other Conditions); (e) Technical Provisions (Specifications); (f) Permits; (g) Drawings; (h) Performance and Payment Bonds; (i) all Addenda issued prior to full execution of this Contract; (j) all Modifications issued after execution of this Contract; and (k) the Contractor's Proposal, all of which are attached hereto and made a part of this Contract.
3. The Engineer for the Contract Work will be:

Moffatt & Nichol
2001 North Main Street, Suite 360
Walnut Creek, California 94596
(925) 944-5411

4. The Owner shall pay to the Contractor, as and when the same shall become due and payable in accordance with the Contract Documents, the sum of _____ Dollars (\$ _____) as full compensation for everything to be furnished and done by the Contractor pursuant to this Contract (as per the PRICE FORM – FORM D).

5. All capitalized terms not otherwise defined to the contrary in this Contract shall have the meaning set forth in the Contract Documents.

IN WITNESS WHEREOF the parties hereto have set their respective hand and affixed their respective seals, the day and year first written above.

For the STATE WATER CONTRACTORS

By _____
Chief Executive Officer

For the CONTRACTOR

By _____
Title (Place Corporate Seal)

PERFORMANCE BOND

Assuring execution of a contract for construction of _____

_____.

RECITALS

KNOW ALL MEN BY THESE PRESENTS, That we _____ of _____ hereinafter called the principal (“**Principal**”), and _____, a corporation incorporated under the laws of the State of _____, as surety (“**Surety**”), are held and firmly bound unto the **State Water Contractors**, in the penal sum of _____ Dollars (\$ _____), lawful money of the United States, to be paid to said corporation or to its certain attorneys or assigns, for which sums of money, well and truly to be paid, we bind ourselves and each and every one of us, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents. However, where Surety is composed of corporations acting as co-sureties, we, the cosureties, bind ourselves, our successors and assigns, in such Penal Sum jointly and severally as well as severally only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each co-surety binds itself, jointly and severally with the Principal, for the payment of such sum as appears above its name below, but if no limit of liability is indicated, the limit of such liability shall be the full amount of the Penal Sum.

WHEREAS, Principal has entered into or will enter into a contract with the **State Water Contractors**, which contract is described above, and incorporated herein by reference. The contract and all items incorporated into the contract, together with any and all changes, extensions of time, alterations, modifications, or additions to the contract or to the work to be performed thereunder or to the plans, specifications, and special provisions, or any of them, or

to any other items incorporated into the contract shall hereinafter be referred to as "the Contract".

WHEREAS, it is one of the conditions precedent to the final award of the Contract that these presents be executed.

AGREEMENT

NOW, THEREFORE, the parties hereto mutually agree as follows: the Recitals set forth above shall be incorporated herein as if restated in full, during the original term of said Contract, during any extensions thereto that may be granted by the **State Water Contractors**, and during the guarantee and warranty period, if any, required under the Contract, unless otherwise stated therein, this Performance Bond shall remain in full force and effect unless and until the following terms and conditions are met:

1. Principal shall well and truly perform the Contract; and
2. Principal and Surety shall comply with the terms and conditions contained in this Performance Bond.

Whenever Principal shall be declared by the **State Water Contractors** to be in default under the Contract, the Surety may, within 15 days after notice of default from the **State Water Contractors**, notify the **State Water Contractors** of its election to either promptly proceed to remedy the default or promptly proceed to complete the contract in accordance with and subject to its terms and conditions. In the event the Surety does not elect to exercise either of the above stated options, then the **State Water Contractors** thereupon shall have the remaining contract work completed, without any further obligation to provide notice to Surety at such cost, in such manner and by such parties as determined by the **State Water Contractors** at its sole discretion. Surety to remain liable hereunder for all costs and expenses of completion incurred by the **State Water Contractors** up to but not exceeding the penal sum stated above. It is expressly agreed by the parties hereto that the **State Water Contractors** is intended to be the third party beneficiary of the obligations set forth in this Performance Bond.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any way affect its obligation on this Performance Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

This Performance Bond shall be governed by and construed in accordance with the laws of the State of California and any reference herein to Principal or Surety in the singular shall include all entities in the plural who or which are signatories under the Principal or Surety heading below.

IN WITNESS WHEREOF, Principal and Surety have set their hands and seals to this Performance Bond. If any individual is a signatory under the Principal heading below, then each such individual has signed below on his or her own behalf, has set forth below the name of the firm, if any, in whose name he or she is doing business, and has set forth below his or her title as a sole proprietor. If any partnership or joint venture is a signatory under the Principal heading below, then all members of each such partnership or joint venture have signed below, each member has set forth below the name of the partnership or joint venture, and each member has set forth below his or her title as a general partner, limited partner, or member of joint venture, whichever is applicable. If any corporation is a signatory under the Principal or Surety heading below, then each such corporation has caused the following: the corporation's name to be set forth below, a duly authorized representative of the corporation to affix below the corporation's seal and to attached hereto a notarized corporate resolution or power of attorney authorizing such action, and each such duly authorized representative to sign below and to set forth below his or her title as a representative of the corporation. If any individual acts as a witness to any signature below, then each such individual has signed below and has set forth below his or her title as a witness. All of the above has been done as of the Date of Bond shown below.

Date Bond Executed: _____ 2002

In Presence of: _____ Individual Principal

Witness

..... as to(SEAL)

In Presence of: _____ Co-Partnership Principal

Witness

..... (SEAL)

(Name of Co-Partnership)

..... as to By:(SEAL)

..... as to(SEAL)

..... as to(SEAL)

Corporate Principal

Attest:

(Name of Corporation)

AFFIX

..... By: CORPORATE

Corporate Secretary

President

SEAL

(Surety)

AFFIX

Attest: (SEAL) By: CORPORATE

SEAL

..... Title

Signature

Bonding Agent's Name

..... (Business Address of Surety)

Agents Address

PAYMENT BOND

Assuring execution of a contract for construction of _____

_____.

RECITALS

KNOW ALL MEN BY THESE PRESENTS, That we _____
_____ of
_____ hereinafter
called the principal (“**Principal**”), and _____
_____, a corporation incorporated under
the laws of the State of _____, as surety (“**Surety**”), are
held and firmly bound unto the **State Water Contractors**, for the use and benefit of claimants
as hereinafter defined, in the Penal Sum of this Payment Bond of _____
_____ Dollars (\$ _____),
lawful money of the United States, for the payment of which Penal Sum we bind ourselves, our
heirs, executors, administrators, personal representatives, successors, and assigns jointly and
severally, firmly by these co-sureties, bind ourselves, our successors and assigns, in such Penal
Sum jointly and severally as well as severally only for the purpose of allowing a joint action or
actions against any or all of us, and for all other purposes each co-surety binds itself, jointly
and severally with the Principal, for the payment of such sum as appears above its name below,
but if no limit of liability is indicated, the limit of such liability shall be the full amount of the
Penal Sum.

WHEREAS, Principal has entered into or will enter into a contract with the **State Water Contractors**, which contract is described above, and incorporated herein by reference. The contract and all items incorporated into the contract, together with any and all changes, extensions of time, alterations, modifications, or additions to the contract or to the work to be performed thereunder or to the plans, specifications, and special provisions, or any of them, or

to any other items incorporated into the contract shall hereinafter be referred to as "the Contract".

WHEREAS, it is one of the conditions precedent to the final award of the Contract that these presents be executed.

AGREEMENT

NOW, THEREFORE, the parties agree as follows: the Recitals set forth above shall be incorporated herein as of restated in full, the condition of this obligation is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials furnished, supplied and reasonably required for use in the performance of the Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject to the following conditions:

1. A claimant is defined as one having a direct contract with the principal or with a subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The **State Water Contractors** shall not be liable for the payment of any costs or expenses of any such suit, and Principal and Surety shall indemnify, hold harmless and defend (with counsel reasonable approved by the **State Water Contractors** from and against any claims, costs or other liabilities arising from any such suit. Principal and Surety agree and acknowledge that they are entering into this Payment Bond for the intended

benefit of the **State Water Contractors** and any Obligee as third party beneficiaries of the obligations set forth in this Payment Bond.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligations on this Payment Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

The Payment Bond shall be governed by and construed in accordance with the laws of the State of California and any reference herein to Principal or Surety in the singular shall include all entities in the plural who or which are signatories under the Principal or Surety heading below.

IN WITNESS WHEREOF, Principal and Surety have set their hands and seals to this Payment Bond. If any individual is a signatory under the Principal heading **below**, then each such individual has signed below on his or her own behalf, has set forth below the name of the firm, if any, in whose name he or she is doing business, and has set forth below his or her title as a sole proprietor. If any partnership or joint venture is a signatory under the Principal heading **below**, then all members of each such partnership or joint venture have signed below, each member has set forth below the name of the partnership or joint venture, and each member has set forth below his or her title as a general partner, limited partner, or member of joint venture, whichever is applicable. If any corporation is a signatory under the Principal or Surety heading **below**, then each such corporation has caused the following: the corporation's name to be set forth below, a duly authorized representative of the corporation to affix below the corporation's seal and to attach hereto a notarized corporate resolution or power of attorney authorizing such action, and each such duly authorized representative to sign below and to set forth below his or her title as a representative of the corporation. If any individual acts as a witness to any signature below, then each such individual has signed below and has set forth below his or her title as a witness. All of the above has been done as of the Date of Bond shown below.

Date Bond Executed: _____ 2002

In Presence of:
Witness

Individual Principal

..... as to(SEAL)

In Presence of:

Co-Partnership Principal

Witness

..... (SEAL)

(Name of Co-Partnership)

..... as to By:(SEAL)

..... as to(SEAL)

..... as to(SEAL)

Corporate Principal

Attest:

.....
(Name of Corporation)

Corporate Secretary

By:

President

AFFIX
CORPORATE
SEAL

Attest:

(SEAL)

By:.....

AFFIX
CORPORATE
SEAL

..... Title

Signature
Bonding Agent's Name

.....
(Business Address of Surety)

Agents Address

GENERAL CONDITIONS

DRAFT

GENERAL CONDITIONS

ARTICLE 1

CONTRACT DOCUMENT

1.1 DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Instructions to Proposer's, Owner-Contractor Agreement, Proposal Forms A-D, General Conditions, Special Provisions, Technical Specifications, Reference Specifications, Permits (collectively referred to as the "Specifications"), Drawings, Performance and Payment Bonds, all Addenda issued prior to and all Modifications issued after execution of the Contract, and the Contractor's Proposal. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, or (3) a written interpretation issued by the Engineer and accepted by the Owner pursuant to Subparagraph 2.2.1. The Contract Documents do not include any other documents, unless specifically enumerated in the Owner-Contractor Agreement.

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 Sub-paragraph 1.1.1. Nothing contained in the Contract Documents shall be construed to create any contractual relationship between the Owner and/or Engineer and any Subcontractor or Sub-subcontractor.

1.1.3 THE WORK

The Work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

1.1.4 THE PROJECT

The Project is the total construction of the Project described in the Owner-Contractor Agreement, of which the Work performed under the Contract Documents, may be the whole or only a part.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Owner-Contractor Agreement shall be executed in not less than duplicate by the Owner and Contractor. The Conditions of the Drawings, Specifications, or any of the other Contract Documents, shall be executed by the parties or identified by the Owner.

1.2.2 By executing the Contract, the Contractor represents that it has visited the site, familiarized itself with the local conditions under which the Work is to be performed, and correlated its observations with the requirements of the Contract Documents. Neither the Owner nor Engineer has made any representation or agreement respecting conditions of the site of the Work. The Contractor has examined the site of the Work, informed itself of all conditions affecting the performance of the Work, and assumes all risk and responsibility for all conditions which are apparent on careful examination of the site and that could affect the prosecution of the Work to completion in the time frame and to the level of quality required by 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 in the time frame and to the level of quality required by the Contract Documents. 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 therefrom as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

Whenever the Contractor desires clarifications related to requirements of the Contract Documents, the Contractor shall apply in writing to the Owner and the Engineer in ample time, so that the same may be prepared or given without causing any delay in the execution of Work.

1.2.4 The organization of the Specifications into chapters, divisions, sections and articles, and the arrangement of Drawings 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.

1.2.5 Should conflicts occur within the Contract Documents, the following order of precedence shall govern the determination of which document provisions control:

- 1) Change Orders;
- 2) Addenda;
- 3) Permits;
- 4) Owner-Contractor Agreement;
- 5) Technical Specifications;
- 6) Special Provisions;
- 7) General Conditions;
- 8) Drawings;
- 9) Reference Specifications

1.3 **OWNERSHIP AND USE OF DOCUMENTS**

1.3.1 Contract Documents, and copies thereof, are the property of the Owner, and are not to be used for any other purpose except for this Work. The Owner permits submission or distribution of Contract Documents to meet official regulatory requirements. For other uses necessary in connections with this project, notice shall be given to the Owner to obtain permission for use of the Contract Documents.

ARTICLE 2

ENGINEER

2.1 DEFINITION

2.1.1 The Engineer is the architectural and/or engineering entity identified as such in the Owner-Contractor Agreement, and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Engineer means the Engineer or his authorized representative. If no Engineer is specified in the Owner-Contractor Agreement, the Owner shall be the Engineer.

2.2 SERVICES PROVIDED BY THE ENGINEER

2.2.1 The Engineer shall decide any and all questions that arise as to the interpretation of Contract Documents, subject to review and final decision on the matter by the Owner.

2.2.2 The Engineer shall advise and consult with the Owner. Any Engineer's instructions to the Contractor shall be forwarded through the Owner. The Engineer shall have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument.

2.2.3 The Engineer shall visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of his on-site observations as an engineer, he shall keep the Owner informed of the progress of the Work, and shall endeavor to guard the Owner against defects and deficiencies in the work of the Contractor.

2.2.4 The Engineer shall not be responsible for and shall not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he shall not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Engineer shall not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.

2.2.5 The Engineer and Owner shall at all times have access to the Work and all portions of the project site for any purpose. The Contractor shall provide facilities for such access so the Engineer and Owner may perform their functions under the Contract Documents.

2.2.6 The Engineer shall have the right to correct any errors and omissions in the Contract Documents when such correction is necessary to achieve the purposes of the Contract. The Contractor shall perform in accordance with any such corrections accepted by Owner.

- 2.2.7 The Engineer shall render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with any time limit agreed upon provided that Contractor shall make a timely written request for such. See Subparagraph 4.4.5.
- 2.2.8 The Engineer shall advise the Owner to reject Work that does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he shall recommend that the Owner 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.
- 2.2.9 The Engineer shall review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. Such action shall be taken with reasonable promptness so as to cause minimal delay. The Engineer's acceptance of a specific item shall not indicate acceptance of an assembly of which the item is a component.
- 2.2.10 The Engineer shall conduct inspections to determine the dates of Substantial Completion and Final Completion, shall receive and forward to the Owner for the Owner's review written warranties and related documents required by the Contract Documents and assembled by the Contractor, and shall issue a final Certificate for Payment to Owner upon compliance with the requirements of Paragraph 9.9.
- 2.2.11 If the Owner and Engineer agree, the Engineer shall provide one or more Project Representatives to assist the Owner in carrying out his responsibilities at the site.
- 2.2.12 The duties, responsibilities, and limitations of authority of the Engineer as the Owner's representative during the construction as set forth in the Contract Documents shall not be modified or extended without written consent of the Owner.
- 2.2.13 In case of the termination of the employment of the Engineer, the Owner may, in Owner's sole discretion, appoint another engineer to perform the duties of Engineer under the Contract Documents.

ARTICLE 3

OWNER

3.1 DEFINITION

3.1.1 The Owner is the State Water Contractors (SWC), and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner or his authorized representative.

3.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

3.2.1 Information or services under the Owner's control will be furnished by the Owner with reasonable promptness to minimize delay in the orderly progress of the Work.

3.2.2 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, one reduced copy of the Drawings and Specifications. The originals will be available for additional copies.

3.2.3 The Owner will provide administration of the Contract as hereinafter described.

3.2.3.1 The Work shall be done under the general direction of the Owner and to his satisfaction consistent with the intent of the Contract Documents. The Engineer shall decide any and all questions that may arise as to the quality or acceptability of materials furnished and the Work performed, and the rate of progress of Work, and the fulfillment of the Contract on the part of the Contractor. The Owner may review the Engineer's decision. The Owner shall have authority to enforce and make effective such decisions and orders as the Contractor fails to carry out promptly.

3.2.3.2 The Owner shall not be responsible for and shall not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he shall not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Owner shall not be responsible for or have control or charge over the acts or omissions of the Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.

3.2.3.3 The Owner 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 the Owner may perform his functions under the Contract Documents.

3.2.3.4 The Owner shall be the ultimate judge of the performance under the Contract Documents.

- 3.2.3.5 The Owner's decisions in matters relating to aesthetic effect shall be final if consistent with the intent of the Contract Documents.
- 3.2.3.6 If the Contractor should take exception to any decision, direction, interpretation, or approval or disapproval expressed by the Owner or shall make any claim for extra compensation as a result of such decision, direction, interpretation, or approval or disapproval, a request for hearing shall be made in writing to the Owner within ten (10) calendar days after receipt of such decision, direction, interpretation, or approval or disapproval, and no exceptions or claims made subsequent to this period shall be considered.
- 3.2.3.6.1 The Owner, after notice of time and place of hearing to the Contractor, will promptly determine such exception or claim after hearing evidence thereof.
- 3.2.3.6.2 Nothing in this provision shall be interpreted, however, to permit the Contractor to stop or delay the Work affected by the Owner's decisions, directions, interpretations, or approvals or disapproval's, and he shall proceed with the Work in accordance therewith.
- 3.2.3.7 The Owner shall have authority to reject Work that does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he shall 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.
- 3.2.3.8 The Owner shall prepare Change Orders in accordance with Article 12, and shall have authority to order changes in the Work as provided in Article 12.
- 3.2.3.9 The Owner may utilize one or more of Engineer's personnel as Project Representatives to assist the Owner in carrying out his responsibilities at the site.
- 3.2.4 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those with respect to Work by Owner or by Separate Contractors, Payments and Completion, and Insurance in Articles 6, 9, and 11 respectively.

3.3 **OWNER'S RIGHT TO STOP THE WORK**

- 3.3.1 The Owner will have the option (but not the duty) to suspend any portion of the Work embraced in this Contract whenever in his opinion it would be inexpedient to carry on said portion of the Work. The Owner shall also have the option (but not the duty) to prevent work being performed where he determines that performance under the conditions would probably not meet Specifications.

3.3.2 When Work is suspended by order of the Owner for the benefit of the Project, the Contractor may, within ten (10) calendar days after resumption of the Work, submit a written request for a corresponding extension of the Contract Time. An appropriate extension of time may be granted provided the Work was not suspended because of any acts or omissions of the Contractor.

3.3.3 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 Owner 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 Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. The Owner's rights and privileges under this paragraph are in addition to his other rights and privileges under the law and under Subparagraph 3.4.1 and other paragraphs hereunder.

3.4 **OWNER'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 within seven (7) calendar days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, after seven (7) calendar days following receipt by the Contractor of an additional written notice and without prejudice to any other remedy he 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 Engineer's additional services made necessary by such default, neglect, or failure. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner. The Owner's rights and privileges under this paragraph are in addition to his other rights and privileges under the law and under Subparagraph 3.3.3 and other paragraphs hereunder.

ARTICLE 4

CONTRACTOR

4.1 DEFINITION AND CONTRACTOR'S OBLIGATION

4.1.1 The Contractor is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.

4.1.2 The Contractor shall, in good workmanlike manner, do and perform all Work and furnish all labor, supplies, materials, machinery, equipment, facilities, and means necessary to perform and complete all Work required by the Owner-Contractor Agreement and the Contract Documents within the time herein specified, in accordance with the Contract Documents and in accordance with the authorizations of the Owner as given from time to time during the progress of the Work. Time is of the essence.

4.1.3 When costs are a factor in any determination of a Contract price adjustment pursuant to the changes provision or any other provision of this Contract, the Contractor's financial records shall be open to audit by the Owner in connection with any such price adjustment. Records of all expenses and all other financial records pertaining to the Contract shall be maintained on the basis of generally accepted accounting principles, and shall be made available to the Owner at the office of the Contractor, at all reasonable times, for inspection, audit, or reproduction. Failure to properly maintain or make available such records shall be a basis for denying any claim or any request for Contract price adjustment. Such records shall be maintained for a period of three years from the date of final payment under this Contract or such lesser time as may be permitted in writing by the Owner after final payment, or for such longer period as required by applicable law or by .1 or .2 below:

4.1.3.1 If this Contract is completely or partially terminated, the records relating to the Work terminated shall be available for a period of three years from the date of any resulting final settlement.

4.1.3.2 Records which relate to claims or disputes, or to litigation or the settlement of claims arising out of the performance of this Contract, shall be made available until such claims, disputes, litigation or appeals therefrom, have been disposed of and concluded.

4.2 REVIEW OF CONTRACT DOCUMENTS

4.2.1 The Contractor shall carefully study the Contract Documents and shall report to the Owner and the Engineer any error, inconsistency, or omission he may discover. The Contractor shall not be liable to the Owner or the Engineer for any damage resulting from any such errors, inconsistencies, or omissions in the Contract Documents, provided he notified the Owner and the Engineer of such in time to correct such without causing delay. If the Contractor discovers any errors or omissions in the Contract Documents or in any points, lines, and elevations furnished by the Owner or the Engineer, he shall immediately notify the Owner and the Engineer. If with

knowledge of such error or omission, the Contractor proceeds with the Work affected thereby, he shall do so at his own risk. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, accepted Shop Drawings, Product Data, or Samples for such portion of the Work.

4.2.2 All Work indicated in the Contract Drawings and not mentioned in the Specifications, or vice versa, and all Work and material usual and necessary to make the Work complete in all its parts, whether or not they are indicated in the Contract Drawings or mentioned in the Specifications, shall be furnished and executed the same as if they were called for by both the Contract Drawings and the Specifications. The performance of such work shall not be considered as adequate justification for any claim or extra compensation.

4.3 **SUPERVISION AND CONSTRUCTION PROCEDURES**

4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract.

4.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and all other persons performing any of the Work under the Contract with the Contractor. The Contractor's employees must be satisfactory to the Owner. The Contractor shall provide competent engineering service to execute the Work in accordance with the Contract requirements and shall be responsible for the accuracy of his Work.

4.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner in his administration of the Contract, or by inspections, tests, or no exceptions 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 his employees.

4.4.2.1 All workmen engaged on special Work or skilled Work or in any trade shall have sufficient experience at such Work to perform it properly and satisfactorily and to operate the equipment involved and shall make due and proper effort to execute that portion of the Work in the manner prescribed in these Specifications.

4.4.2.2 Any superintendent, engineer, foreman, or other workman employed by the Contractor or any Subcontractor who, in the opinion of the Owner or

his authorized representative, does not perform his Work in a proper and skillful manner or is disrespectful, intemperate, disorderly, under the influence of alcohol or other drugs, or otherwise objectionable, shall, at the written request of the Owner, be forthwith discharged by the Contractor or Subcontractor employing such superintendent, engineer, foreman, or workman, and shall not be employed again on any portion of the Work without the written consent of the Owner.

- 4.4.2.3 Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient machinery, equipment, or labor force for the proper prosecution of Work, the Owner may withhold all payments which are or may become due to the Contractor, or may suspend the Work until such orders are complied with.
- 4.4.3 The Contractor shall be required to submit to the Owner any information requested concerning materials, equipment, machinery, fixtures, and other items which he proposes to furnish and use under the Contract.
- 4.4.3 All materials and workmanship shall in every respect be in accordance with what, in the opinion of the Owner, is in conformity with the accepted modern practice.
- 4.4.5 Contractor may request a clarification by the Engineer wherever the Contract Documents appear unclear as to what is permissible and/or fail to note the quality of any Work. If the request is in writing and timely made so as to avoid delay in the performance of the Contract, the Engineer shall issue an appropriate clarification in accordance with accepted modern practice to meet the particular requirements of the Contract Documents.
- 4.4.6 The Contractor shall submit samples or specimens of such materials to be furnished or used in the Work as the Owner may require at no cost to the Owner. All materials must be of specified quality and equal to accepted samples and shall be stored so as to ensure the preservation of their quality and fitness for the Work. The Owner may, at his discretion, make test cuts at any point he may select to determine the character of material and workmanship or to check dimensions that otherwise could not be checked.
- 4.4.7 All materials shall be subject to inspection and to tests by an accepted laboratory. The Contractor shall cooperate with the laboratory in furnishing test specimens as required at his own expense.
- 4.4.8 The Contractor shall furnish such facilities and give such assistance for inspection as the Owner may direct and shall secure, for the Owner and his inspectors, free access to all parts of any factory or plant in which any materials are being manufactured or prepared and to all parts of the construction and erection. The Contractor shall give the Owner and the Engineer such advance notice of the preparation or manufacture of any materials as shall enable the Owner or the Engineer to arrange for its inspection at the place of preparation or manufacture.
- 4.4.9 The fact that the inspectors have accepted the material and workmanship shall not relieve the Contractor from his obligation to meet all other requirements of the Specifications and shall not prevent subsequent rejection if such material and

workmanship is later found by Owner or Engineer to be defective. No material shall be shipped from its place of preparation or manufacture before it has been inspected and accepted when the Owner or his representative has requested such inspection.

- 4.4.10 In various paragraphs of these specifications, references are made to certain standards or tentative specifications or methods of various organizations. These references are to be construed as referring to the standard or tentative specifications or method in effect on the date set for opening of proposals for the present Contract.
- 4.4.11 The Contractor shall furnish, erect, maintain, and remove any construction plant and such temporary work as may be required. He alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage, which may result from its operation.
- 4.4.12 The Contractor shall not remove any equipment brought onto the Construction Site for the performance of the Contract from the Construction Site without the consent of the Owner.
- 4.4.13 The citing of certain brand, make, manufacture, or definite specification is to denote the quality standard or article design but it does not restrict the Contractor to specific brand, make, manufacture, or specification named. It is done to set forth and convey to the Contractor the general style, type, character, and quality of the article desired. Any other brand, make, manufacture, or specification which, in the opinion of the Owner, is equal to or better than that specified, shall be considered provided sufficient information is submitted with the request for substitution to allow the Engineer to make a proper determination. Whenever the words "or equal" appear in the Contract Documents, they shall be interpreted to mean an item of material or equipment similar to that named that is suited to the same use, is capable of performing the same function as the named without changing the design and construction sufficiently to increase the cost, and meets the Owner's requirements.
- 4.4.14 The Contractor agrees to indemnify, defend (with counsel approved by Owner) and hold the Owner harmless from payment of all wages including local, state, and federal taxes and contributions levied against wages that are due anyone employed in connection with the Work.

4.5 **WARRANTY**

- 4.5.1 The Contractor warrants to the Owner that all materials and equipment furnished under this Contract shall be new unless otherwise specified, and that all Work shall be of good quality, free from faults and defects and in conformance with the Contract Documents. All materials, equipment and Work not conforming to these requirements, including substitutions not properly accepted and authorized by Owner or Engineer, may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. The provisions of Paragraph 13.2 do not limit this warranty.
- 4.5.2 The Contractor shall guarantee the Work for a period of one (1) year, unless a longer period is specified, after the date of Final Completion, and shall make good all defects arising out of faulty workmanship and defective material which may appear within the said guarantee period, and shall bear all costs for replacement materials

and labor for installation required to correct such defects. The Contractor shall remain responsible for any defective materials or workmanship or other breach of this Contract throughout the period specified in the appropriate statute of limitations. If required by the Owner, the Contractor shall deliver to the Owner a signed affidavit stating that, to the best of his knowledge and belief, the Work has been constructed in accordance with the Contract Documents. If affidavit is required, the Engineer shall not issue the Final Certificate for Payment nor shall the Owner make or authorize final payment until the affidavit has been delivered to the Owner.

4.6 **TAXES**

4.6.1 The Contractor shall pay all taxes associated with the Work, including California sales, use, and income tax, and shall indemnify, defend (with counsel approved by Owner) and hold the Owner harmless in every respect against same.

4.6.2 Every employer making payments of salaries, wages, commissions, or for personal services (including fees) to any non-resident, for services rendered in California, shall withhold according to the applicable withholding tables and statutes.

4.6.3 The Contract Sum shall include taxes and they are not considered basis for extra compensation except by specific express agreement of the parties.

4.7 **PERMITS, FEES AND NOTICES**

4.7.1 The Contractor shall procure all other permits and licenses not identified for procurement by the Owner in SP-21, pay all charges and fees, arrange for all necessary inspections, and give all notices necessary and incidental to the due and lawful prosecution of the Work. Contractor must obtain the consent of the Owner before applying for a permit.

4.7.2 Notwithstanding anything to the contrary set forth in the Contract Documents, the Contractor shall make himself familiar with, and at all times shall observe and comply with all Project related permits, and all other federal, state, and local laws, ordinances, and regulations ("Applicable Regulations") that in any manner affect the conduct of the Work or any right or obligation of Contractor set forth in the Contract Documents and shall indemnify, defend (with counsel approved by Owner) and save harmless the Owner, its members, officers, agents, and employees, and the Engineer, its officers, agents, and employees against any claim arising from the violation of Applicable Regulations by the Contractor, his Subcontractors or their agents, invitees, or employees.

4.8 **ALLOWANCES**

4.8.1 No allowances are involved in the Contract Documents unless specified in the Special Provisions.

4.9 **SUPERINTENDENT**

4.9.1 The Contractor shall employ a competent articulate superintendent and necessary assistants, satisfactory to the Owner, who shall be in attendance at the project site at all times during the progress of the Work. The superintendent shall represent the

Contractor and all communications given to the superintendent by Owner or Engineer shall be as binding as if given to the Contractor.

4.10 PROGRESS SCHEDULE

4.10.1 The Contractor shall prepare and regularly update, at a minimum monthly with each progress payment, for the Owner's information an itemized progress schedule as specified in Section 01320, Progress Schedule and Reports, of the Technical Specifications. When permitted, the Contractor shall work his men overtime and add such additional labor and equipment as is necessary to complete the Work on time or, where impossible to complete on time, to reduce the delay. Contractor must obtain the written consent of the Owner before scheduling overtime work.

4.11 DOCUMENTS AND SAMPLES AT THE SITE

4.11.1 The Contractor shall maintain at the site for the Owner one record copy of all Contract Documents (including, but not limited to, Drawings, Specifications, Addenda, Change Orders and other Modifications) in good order and marked currently to record all changes made during construction (As-Built Drawings), and accepted Shop Drawings, Product Data, and Samples. These documents shall be available to the Owner and the Engineer for review at all times and shall be delivered to the Owner upon completion of the Work.

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. A schedule for submission of these Shop Drawings shall be submitted to the Owner for review as specified in Section 01330, Submittal Procedures, of the Technical Specifications.

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 Owner shall review, as specified in Section 01330, Submittal Procedures, of the Technical Specifications, with reasonable promptness and in such sequence and in accordance with the reviewed schedule as to cause no delay in the Work or in the work of the Contractor or any separate contractor, all Shop Drawings, Product Data, and Samples required by the Contract Documents.

4.12.5 By preparing and submitting Shop Drawings, Product Data, and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of 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 Engineer's review of Shop Drawings, Product Data, or Samples as specified in Section 01330, Submittal Procedures, of the Technical Specifications unless the Contractor has specifically informed the Owner and the Engineer in writing of such deviation at the time of submission and the Owner has given written no exception 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 Engineer's review thereof.

4.12.7 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 Owner or the Engineer on previous submittals.

4.12.8 Any work performed by the Contractor on any portion of the Work requiring submission of a Shop Drawing, Product Data, or Sample commenced before the submittal has been reviewed by the Engineer as specified in Section 01330, Submittal Procedures, of the Technical Specifications, shall be performed at the Contractor's risk. All such portions of the Work shall be in accordance with reviewed submittals and the Contract Documents.

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.

4.13.2 While the Work is in progress, the Contractor is authorized to refuse anyone permission to the premises except the Owner and the Engineer and anyone with written permission from the Owner (see Article 6 hereof) to come on the premises

4.13.3 The Contractor and each Subcontractor shall perform the Contract in such a manner as not to interrupt or interfere unduly with any operation or activity or the Work of the Owner or any other Contractor or Subcontractor at or near the location of the Work and the Contractor and each Subcontractor shall place upon the Work or any part thereof only such loads as are consistent with the safety of the affected portion of the Work.

4.13.4 If the Owner requires the Contractor to relocate materials that have been stored on site, the Contractor shall relocate such materials at no additional cost to the Owner.

4.13.5 The Contractor shall keep roads on and adjacent to the project site free from obstructions that might present a hazard to or interference with traffic. When construction operations necessitate the closing of traffic lanes, the Contractor shall be responsible for arranging such closings in advance with the authorities having jurisdiction, the Owner, and adjacent property owners. The Contractor shall provide adequate barricades, signs, and other devices for traffic guides and public safety.

4.14 **CUTTING AND PATCHING OF WORK**

4.14.1 The Contractor shall be responsible for all cutting, filling, 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 Owner or any Separate Contractor or Subcontractor by cutting, patching, or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any Separate Contractor or Subcontractor except as required by the Contract Documents or with the written consent of the Owner and of such Separate Contractor.

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 his operations. At the completion of the Work he shall, at Contractor's sole cost and expense, remove all his waste materials and rubbish from and about the project site as well as all his tools, construction equipment, machinery, plant, and surplus materials. He shall put the site in a neat orderly condition, thoroughly clean, and shall remove all paint splatters and other defacements. He is not to dispose of waste materials or rubbish by burning on the project site. In addition, he shall, at Contractor's sole cost and expense, remove all temporary buildings and structures from the site.

4.15.2 If the Contractor fails to keep the premises clean or to clean up at the completion of the Work, the Owner may do so as provided in Paragraph 6.3 and the cost thereof shall be charged to the Contractor.

4.16 **COMMUNICATIONS**

4.16.1 The Contractor shall forward all communications to the Owner through the Engineer.

4.17 **ROYALTIES AND PATENTS**

4.17.1 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall indemnify, defend (with counsel approved by Owner) and save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process, or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has reason to believe that the design, process, or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner.

4.18 **INDEMNIFICATION**

4.18.1 To the fullest extent permitted by law, the Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner, and Engineer and their agents and employees from and against all claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from the performance of the Work. Such obligations 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, including the Owner, the Engineer, and the Contractor.

4.18.2 In any and all claims against the Owner or the Engineer 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 4.18 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 Applicable Regulations, including without limitation, workers' or workmen's compensation acts, longshoremen's acts, disability benefit acts, or other employee benefit acts.

4.18.3 The obligations of the Contractor under this Paragraph 4.18 shall not extend to the liability of the Engineer, his agents or employees, arising out of the preparation or review of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or the giving of or the failure to give any directions or instructions by the Engineer, his agents or employees, if the extent that such giving or failure to give is the primary cause of the injury or damage.

4.19 **INDEPENDENT CONTRACTOR**

4.19.1 The Contractor shall be an independent contractor, and the provisions of these conditions and Specifications for this Work which appear to give the Owner the right to direct the Contractor as to the details of doing the Work herein covered or to exercise a measure of control over the Work shall be deemed to mean the Contractor shall follow the desires of the Owner in the results of the Work only, except for those items specifically prescribed in the Contract, and not the means whereby the Work is to be accomplished, and the Contractor shall use his own commercially reasonable discretion and shall have complete and authoritative control over the Work and its employees as to schedules and other routine details of doing the Work and shall assume all rights, obligations, and liabilities applicable to it as an independent contractor.

4.20 **DRUG-FREE WORKPLACE**

4.20.1 Contractor warrants that the Contractor shall maintain a drug-free workplace.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITION

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative. The term Subcontractor does not include any separate contractor or his subcontractors.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site. The term Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a sub-subcontractor or an authorized representative thereof.

5.2 AWARD OF SUBCONTRACTS AND SUPPLIERS FOR PORTIONS OF THE WORK

5.2.1 The Contractor shall notify the Owner in writing of their request to substitute Subcontractors or Suppliers identified in their Proposal and shall make no substitution for any Subcontractor or Supplier without written consent of the Owner.

5.2.2 The Contractor shall perform with his own organization a substantial and appropriate (in Owner's sole discretion) percent of the Work performed at the site.

5.3 SUBCONTRACTOR/SUPPLIER RELATIONS

5.3.1 By an appropriate written agreement the Contractor shall require each Subcontractor and Supplier, to the extent of the Work to be performed by the Subcontractor or Supplier, 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 Owner and the Engineer. Said agreement shall preserve and protect the rights of the Owner and the Engineer under the Contract Documents with respect to the Work to be performed by the Subcontractor or Supplier so that the contracting thereof shall not prejudice such rights, and shall allow to the Subcontractor or Supplier, unless specifically provided otherwise in the Contractor-Subcontractor/Supplier agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor or Supplier to enter into similar agreements with his Sub-subcontractors or Sub-Suppliers. The Contractor shall make available to each proposed Subcontractor or Supplier, prior to the execution of the subcontract/supplier agreement, copies of the Contract Documents to which the Subcontractor or Supplier shall be bound by this Paragraph 5.3, and identify to the Subcontractor or Supplier any terms and conditions of the proposed subcontract/supplier agreement which may be at variance with the Contract Documents. Each Subcontractor or Supplier shall similarly make copies of such Documents available to his Sub-subcontractors or Sub-suppliers.

ARTICLE 6

WORK BY OWNER OR BY SEPARATE CONTRACTORS

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

6.1.1 The Owner reserves the right to perform work related to the Project with his 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 that contract. Therefore, since the parties anticipate that other persons may be engaged in similar operations in the immediate vicinity of the Work, the Contractor shall plan and conduct all his operations so as to work in harmony with others engaged in the work in the vicinity and not to delay, endanger, or avoidably interfere with the operations of others, and to anticipate and make arrangements to cope with any delay, danger, or interference which such others might reasonably be expected to cause Contractor.

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 Whenever the Contractor believes the Owner or other contractors are interfering, delaying, or damaging his work and Contractor is unable to resolve the problem, he shall promptly notify the Owner and give the Owner reasonable opportunity to resolve the problem.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall properly connect and coordinate his work with theirs.

6.2.2 If any part of the Contractor's work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Owner 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 Owner's or separate contractor's work as fit and proper to receive his work, except as to defects which may subsequently become apparent in such work by others and which could not have been discovered by the Contractor's careful examination at the time of such acceptance.

6.2.3 Any costs caused by defective or ill-timed work shall be borne by the Contractor or Subcontractor responsible therefore.

6.2.4 Should the Contractor wrongfully cause damage to the work or property of the Owner, or to any other work on the site, the Contractor shall immediately remedy such damage as provided in Subparagraph 10.2.5. Also should the Contractor wrongfully cause delay to or interfere with the work of the Owner or other work on or

near the site, he shall stand responsible for and indemnify such party for damages suffered therefrom.

- 6.2.5 Should the Contractor wrongfully 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 or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all costs and expenses incurred by Owner as a result thereof, including without limitation, attorneys' fees and court or arbitration costs which the Owner has incurred.

6.3 **OWNER'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 Owner may clean up and charge the costs thereof to the Contractor or any applicable Subcontractor responsible therefor as the Owner shall determine to be just.

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ARTICLE 7

MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 The laws of the State of California shall govern the Contract.

7.2 SUCCESSORS AND ASSIGNS

7.2.1 The Contractor shall not assign the whole or any part of the Contract or any moneys due or to become due hereunder without the written consent of the Owner. In case the Contractor assigns, with the Owner's approval, all or any part of any moneys due or to become due under the Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to the moneys due or to become due the Contractor shall be subject to prior claims of all persons, firms, and corporations for services rendered or materials supplied for the performance of the Work called for in the Contract Documents.

7.3 WRITTEN NOTICE

7.3.1 Any notice, demand, request, consent, approval, disapproval or certificate required to be given in writing under the Contract Documents ("Notice") shall be delivered to the appropriate party at the address given in the Owner-Contractor Agreement by certified mail, return receipt requested, by personal delivery or by Federal Express or a similar nationwide over-night delivery service providing a receipt for delivery. Notices may not be given by facsimile. The date of giving any Notice shall be deemed to be the date upon which delivery is actually made by one of the methods described in this paragraph (or attempted if said delivery is refused or rejected). If a Notice is received on a Saturday, Sunday or legal holiday, it shall be deemed received on the next business day. Either party may change its place for receiving Notice by giving reasonable advance written Notice of its new place for receiving Notice in accordance with the methods described in this paragraph.

7.4 CLAIMS FOR DAMAGES

7.4.1 Should either party to the Contract suffer injury or damage (or be presented with a claim for damage) to person or property because of any act or omission of the other party or of any of his employees, agents, or others for whose acts he is legally liable, notice of such claim shall be made in writing to such party within seven (7) calendar days after such party first becomes aware of such claim or of such injury or damage.

7.4.2 The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

7.4.2.1 Damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

- 7.4.2.2 Damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Contract.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with the Contract. Nothing contained in this subparagraph shall be deemed to preclude an award of actual or liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

7.5 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- 7.5.1 The Contractor must deliver to the Owner, at the time the Contract is delivered, a duly executed Performance Bond with surety or sureties thereon, payable to the Owner, on the form as specified by the Owner, in an amount at least equal to one hundred percent (100%) of the Contract price, conditioned upon the faithful performance of the Work in strict conformity with the Contract Documents and a duly executed Labor and Material Bond with surety or sureties thereon in the same amount payable to the Owner, conditioned upon the payment of all persons who have performed labor, furnished materials, or services in the prosecution of the Work.

- 7.5.2 Each surety on any such bond shall be a corporation which meets all requirements of the State of California and which has a resident agent or agents in the State of California and which is included on the latest list of the United States Treasury Department as a qualified surety acceptable to the United States government. Such bond shall be written within the underwriting limitations of such surety or sureties as stated in such list. The bond shall be executed and countersigned on the part of such surety company or companies by a qualified resident agent or agents thereof, and shall receive his or their full and regular commission on the premium of said bond and shall not be permitted to divide such commission except with agents duly authorized or licensed to do business under the laws of the State of California. No Contract shall be deemed to be in effect until the accompanying Performance Bond has been accepted by the Owner.

7.6 RIGHTS AND REMEDIES

- 7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder 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 waiver of any breach of the Contract shall constitute a waiver of any subsequent breach of any part thereof nor of the Contract.

7.7 TESTS

- 7.7.1 If the Contract Documents, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved, the Contractor shall immediately give the Owner written notice of same and so the Owner and the Engineer may observe such inspection, testing,

or approval process and Contractor's good faith opinion of the probable outcome of such testing, inspection or approval process. The Contractor shall bear all costs of such inspections, tests, or approval process.

- 7.7.2 If the Owner determines that any work requires special inspection, testing, or approval which Subparagraph 7.7.1 does not include, he shall instruct the Contractor to order such special inspection, testing, or approval process, and the Contractor shall give notice as provided in Subparagraph 7.7.1. 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 Engineer's additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.
- 7.7.3 Required certificates of inspection, testing, or approval shall be secured by the Contractor and delivered immediately by him to the Owner.
- 7.7.4 Intentionally omitted.
- 7.7.5 Where materials are specified to conform to the standard specifications of the American Society for Testing and Materials, American Concrete Institute, American Institute of Steel Construction, other recognized technical organizations, or the federal government, but testing is not required in connection therewith, the Contractor shall furnish certificates to the Owner as evidence that the proposed products meet requirements of standard specifications cited.
- 7.7.6 Notices required by this Paragraph 7.7 shall be delivered in writing to the Owner no less than three (3) calendar days prior to inspection, test, or approval date. Notices shall specify the location and time that inspection, test, or approval process shall be made.
- 7.7.7 If any portion of the Work to be inspected, tested, or approved under the observation of the Owner is not ready for such inspections, tests or approval process at the time designated in the Contractor's notice to the Owner, the Contractor shall bear all costs incurred by Owner for additional services made necessary by such delay.
- 7.7.8 Certificates of inspection or testing shall indicate if that portion of the Work inspected or tested meets the minimum requirements of the standard or regulation specified. Certificates shall include the name of Contractor, name of project, and location and date the inspection or test was conducted.
- 7.8 **INTEREST**
- 7.8.1 Payments due and unpaid under the Contract shall bear interest starting from ten (10) calendar days after the date payment is due at the rate of three percent (3%) per annum over the base lending rate from time to time published by the Federal Reserve Bank (but in no event shall a party be obligated to pay any interest in an amount in excess of the maximum rate permitted by Applicable Regulations). The parties' obligation to pay interest and the acceptance thereof shall prejudice any other right or remedy of the parties under law or pursuant to the Contract Documents and shall not relieve either party of any of its obligations under the Contract

Documents, including without limitation, the obligation to make payments timely in accordance with this Contract.

7.9 **ARBITRATION**

7.9.1 All claims, disputes, and other matters in question between the Contractor and the Owner arising out of, or relating to, the Contract Documents or the breach thereof, except for any provision of the Contract Documents specifically allowing for a determination to be made in Owner's sole discretion or as provided in Subparagraphs 3.2.3.5 with respect to the Owner's decisions on matters relating to aesthetic effect, and except for claims which have been waived by the making or acceptance of final payment as provided by Subparagraph 9.9, shall be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then in effect, unless the parties mutually agree otherwise. No arbitration shall include by consolidation, joinder, or in any other manner, parties other than the Owner, the Contractor, and any other persons substantially involved in a common question of fact or law, whose presence is required if complete relief is to be accorded in the arbitration. No person other than the Owner or Contractor shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Any consent to arbitration involving an additional person or persons shall not constitute consent to arbitration of any dispute not described therein or with any person not named or described therein. The foregoing agreement to arbitrate and any other agreement to arbitrate with an additional person or persons duly consented to by the parties to the Owner-Contractor Agreement shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

7.9.2 Notice of the demand for arbitration shall be filed in writing with the other party to the Owner-Contractor Agreement and with the American Arbitration Association. A parties right to demand arbitration shall be subject to and conditioned upon his previous compliance with the time limits specified in Subparagraphs 3.2.3.6, 3.2.3.6.1, and 8.3.2 where applicable; and in all other cases within a reasonable time after the claim, dispute, or other matter in question has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such claim, dispute, or other matter in question would be barred by the applicable statute of limitations.

7.9.3 Unless otherwise agreed in writing, the Contractor shall carry on the Work and maintain its progress during any arbitration proceedings, and the Owner shall continue to make payments to the Contractor in accordance with the Contract Documents.

7.9.4 The Owner shall not be liable for any loss or damage suffered by the Contractor arising out of interruption or cessation of the Work under the Contract or for any loss suffered by the Contractor in the performance of his obligations under the Contract resulting from the application of any Applicable Regulations, any order or act of court of law possessing competent jurisdiction, of any official or agency of the United States government, the California state government, or any local government with proper jurisdiction. See also Subparagraph 14.1.1 hereof.

7.9.5 Additional Miscellaneous Provisions:

No Assignment. The Contract Documents and/or the respective obligations of each party shall not be assignable or otherwise transferred by either party without the express written consent of the other party, which consent may be withheld in such party's sole and absolute discretion.

Successors and Assigns. The Contract Documents shall insure to the benefit of and bind the successors, assigns, heirs, executors and administrators of the parties.

No Waiver. No waiver of any of the provisions of the Contract Documents shall be deemed or shall constitute a waiver of any other provision, whether or not similar, nor shall any waiver constitute a continuing waiver. No waiver shall be binding unless executed in writing by the party making the waiver.

Severability of Provisions. If any term, covenant, condition, or provision of the Contract Documents is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remainder of the provisions shall remain in full force and effect and shall in no way be affected, impaired, or invalidated thereby.

Counterparts. The Contract Documents may be signed in multiple counterparts with the same force and effect as if all original signatures appeared on one copy. In the event the Contract Documents are signed in counterparts, each counterpart shall be deemed an original and all of the counterparts shall be deemed to be one agreement.

Attorneys' Fees. In any arbitration, action or proceeding which a signing party hereto brings to enforce its respective rights hereunder or to enforce any judgement granted in connection therewith, the unsuccessful party shall pay all costs incurred by the prevailing party (whether or not the action or proceeding is pursued to final decision or judgement), including reasonable attorneys' fees, and said costs and attorneys' fees shall be a part of the judgement in said action. For purposes of the Contract Documents, a party shall be considered the "prevailing party" to the extent that (1) such party initiated the action or proceeding and substantially obtained the relief which it sought, whether by decision of an arbitrator, judgement, voluntary agreement or action of the other party, trial or alternative dispute resolution process; 2) such party did not initiate the action or proceeding and did not substantially obtain the relief which it sought; or 3) the other party to the action or proceeding withdrew its claim or action without having substantially received the relief which it was seeking.

Damages Limitation. Except to the extent expressly set forth to the contrary in the Contract Documents, neither party shall be liable to any other party for any consequential, punitive, or loss of profits damages. To the fullest extent permitted by Applicable Regulations, each party hereto hereby waives any claims or actions against all other parties for same, regardless of cause.

Relationship of Parties. Nothing contained herein shall create between the parties hereto, or be relied upon by others as creating, any relationship of partnership,

association, joint venture, or otherwise. The sole relationship of the parties hereto shall be that of Owner and Contractor as set forth herein.

Further Assurances. The parties hereto agree that each of them, upon the request of the other party, shall execute and deliver such further documents, instruments or agreements and shall take such further action that may reasonably be necessary or appropriate to effectuate the purposes of the Contract Documents.

Due Authorization. Each person executing the Contract Documents on behalf of a party hereto represents and warrants that he or she is authorized and empowered to do so and to thereby bind the party on whose behalf he or she is signing.

Headings. All captions and headings in the Contract Documents are for the purposes of reference and convenience and shall not limit or expand the provisions of the Contract Documents.

Exhibits. Except to the extent set forth to the contrary in the Contract Documents, all exhibits and any schedules or riders attached to the Contract Documents are incorporated herein by this reference and made a part hereof, and any reference in the body of the Contract Documents or in the exhibits, schedules or riders to the Contract Documents shall mean the Contract Documents, together with all exhibits, schedules and riders. In the event of any conflict between the terms and conditions set forth in any such exhibit, schedule and/or rider and the terms and conditions set forth in the main body of the Contract Documents, the terms and conditions of the main body of the applicable Contract Documents shall prevail.

No third party Beneficiaries. Except as otherwise expressly provided herein, no person or entity shall be deemed to be a third party beneficiary hereof, and nothing in the Contract Documents (either expressed or implied) is intended to confer upon any person or entity, other than the signing parties hereto (and their respective successors and assigns), any rights, remedies, obligations or liabilities under or by reason of the Contract Documents.

No Party Deemed Drafter. Contractor acknowledges and agrees that it shall have had reasonable opportunity to review fully (and have an attorney review fully) the Contract Documents and request clarification or change to any of the provisions of the Contract Documents and, therefore, the parties agree that in the event of a dispute arising under the Contract Documents, neither party shall be deemed the drafter thereof for purposes of interpreting the contract in a manner more favorable to one party over the other.

**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 and Final Completion of the Work as defined in Subparagraphs 8.1.3 and 8.1.4, including authorized adjustments thereto.
- 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 the date of the Owner-Contractor Agreement or such other date as may be established therein.
- 8.1.3 The Date of Substantial Completion of the Work or designated portion thereof is the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended.
- 8.1.4 The Date of Final Completion of the Work is the date certified by the Owner by when all final releases, documents and manuals have been submitted in accordance with the Contract Documents.
- 8.1.5 The term "day" as used in the Contract Documents shall mean calendar day, unless otherwise specifically designated.

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. He shall carry the Work forward in a good and workmanlike manner expeditiously with adequate forces and shall diligently prosecute the Work to achieve Substantial and Final Completion within the Contract Time stated.

8.3 DELAYS AND EXTENSIONS OF TIME

- 8.3.1 If changes, extra or subtractive work, are required in the Work, as set forth in the Contract Documents, or if the Contractor is delayed at any time in the progress of the Work by an act or neglect of the Owner or the Engineer or by any unusual causes not reasonably foreseeable and avoidable and beyond the Contractor's control (an "Event of Unavoidable Delay"), the Owner shall determine the equitable increase or decrease, if any, in the time of completion based on the conditions of such Work.
- 8.3.2 Any claim for extension of time shall be made in writing to the Owner not more than seven (7) calendar days after the commencement of the delay; otherwise Contractor's right to declare an Event of Unavoidable Delay has occurred shall be waived. In the case of a continuing delay, only one claim is necessary. The Contractor's notice shall provide an estimate of the probable effect of such delay on the progress of the Work and shall include Contractor's proposed method of minimizing any delay caused thereby.

8.3.3 If no agreement is made stating the dates upon which interpretations shall be furnished, then no claim for delay shall be allowed on account of failure to furnish such interpretations until fifteen (15) calendar days after written request is made for them, and not then unless such claim is reasonable.

8.3.4 If the Work is not completed within the allowed Contract Time, there shall be deducted from any moneys due, or that may become due to Contractor the sums set forth in the Special Provisions, per day, for each and every day, including Sundays and holidays, that the Work remains incomplete. The sum shall be considered and treated not as a penalty but as a fixed and agreed measure of liquidated damages for added engineering supervision and loss of use of the structures, resulting from the Contractor's failure to complete the work within the Contract Time as extended by any additional days allowed. The liquidated damages prescribed by this Article do not cover nor include any damages caused by delay or interference with other work of the Owner or other contractors on or near the site; damages for such delay or interference shall be the actual damages sustained, if any.

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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 thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents. The Contract Sum shall be paid in installment payments.

9.1.2 The Contractor shall receive and accept the compensation provided for in the Owner-Contractor Agreement as full payment for furnishing all material, labor, tools, and equipment, and for performing the Work contemplated and embraced under the Contract in a complete and acceptable manner and in accordance with the Contract; for all loss or damage arising out of the nature of the Work or from the acts of the elements; for all expenses incurred by, or in consequence of the suspension or discontinuance of said prosecution of the Work as herein specified, or from any unforeseen difficulties or obstructions which may arise or be encountered during the prosecution of the Work; and for all risks of every description connected with the prosecution of the Work until its final acceptance by the Owner. Any Installment payment (hereinafter defined) or the acceptance of any portion of the Work as provided in the Contract shall to no degree affect the obligation of the Contractor, who, at his own cost and expense, shall correct any defects or omissions in the Work under the Contract and any Installment Payment shall in no way affect his responsibility for all damages due or attributable to such defects or imperfections which may be discovered before the final acceptance of the whole Work and the Owner shall be the judge of such defects and imperfections.

9.2 **NOT USED**

9.3 **APPLICATIONS FOR PAYMENT**

9.3.1 On or before forty-five (45) calendar days prior to the due date of each Installment Payment the Contractor shall submit to the Owner an Application for Installment Payment, on a form invoice designated by Owner, notarized if required, supported by such data as the Owner or Engineer may require, and reflecting ten percent (10%) retainage.

9.3.2 The Contractor's Application for Progress Payment shall be accompanied by an updated Progress Schedule and current estimate on the proportionate values of materials in place in the Work and the amount of work performed during the preceding month or period ("Estimate"). Such Estimate may include materials and equipment suitably stored (on site or in bonded storage). Estimates shall be submitted on forms provided by the Contractor and in as many copies as the Owner may direct. The Engineer shall review the Estimates for completeness and accuracy. Estimates will be approximate only and all partial or monthly Estimates shall be subject to corrections in the Estimates rendered following the discovery of any errors in any previous Estimates. Contractor's submittal of an Application for Progress Payment shall constitute a representation and warranty by Contractor that title to all work, materials, and equipment covered by an Estimate shall pass to the Owner by

incorporation in the construction, free and clear of all liens, claims, security interests, or encumbrances, hereinafter referred to in this Article 9 as "liens" or "claims"; and that no work, materials, or equipment covered by an Estimate shall have been acquired by the Contractor, or by any other person performing the Work at the site or furnishing materials and equipment for the Project.

9.3.3 Not later than the first (1st) of each month, provided that the conditions that both the Owner received the Application as per Article 9.3.1 hereof, and the Application is certified by the Contractor, the Owner shall pay the Installment Payment due. The Owner's obligation to pay by the first (1st) of the month shall not apply to revised and resubmitted invoices as provided in Paragraph 9.6.1 hereinafter.

9.4 **CERTIFICATION OF ESTIMATES**

9.4.1 The Contractor shall certify his Estimates.

9.4.2 The issuance of a Certification of Estimate shall constitute a representation and warranty by the Contractor to the Owner, that the Work has progressed to the point indicated and, that the quality of the Work is in accordance with the Contract Documents.

9.5 **PAYMENTS TO SUBCONTRACTORS**

9.5.1 Irrespective of Installment Payments received from the Owner the Contractor shall promptly pay each Subcontractor, when due, the amounts to which such Subcontractors are entitled. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractor in similar manner.

9.5.2 The Owner may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding any Estimate and the action taken, if any, thereon by the Owner on account of work done by such Subcontractor.

9.5.4 The Owner shall have no obligation to pay or to see to the payment of any moneys to any Subcontractor.

9.5.5 No Installment Payment nor any partial or entire use or occupancy of the Project by the Owner shall constitute an acceptance of any work not in accordance with the Contract Documents. The payment of any monthly Installment Payment shall not in any respect be taken as an admission that the Work is done or that the quality is satisfactory, nor as a release of the Contractor from the responsibility for any portion thereof. The whole Work and all particulars relating thereto shall be subject to revision and adjustment by the Owner at the time of final acceptance of the Work and the payment of the final amounts therefore.

9.6 **PAYMENTS WITHHELD**

9.6.1 The Owner may withhold any Installment Payment, or the Owner may nullify the whole or any part of any Installment Payment to such extent as may be necessary in the opinion of the Owner to protect the Owner from loss, because of the following (without limitation):

- 9.6.1.1 an estimate clearly demonstrates a lack of performance;
 - 9.6.1.2 defective work not remedied;
 - 9.6.1.3 third party claims filed or reasonable evidence indicating probable filing of such claims;
 - 9.6.1.4 failure of the Contractor to make payments properly to Subcontractors, or for labor, materials, or equipment;
 - 9.6.1.5 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
 - 9.6.1.6 damage to the Owner, another contractor; a third party, or to property;
 - 9.6.1.7 reasonable evidence that the Work will not be completed within the Contract Time;
 - 9.6.1.8 failure to carry out the Work in accordance with the Contract Documents;
 - 9.6.1.10 the Contractor is not suitably performing his Contract or making satisfactory progress in the work;
 - 9.6.1.11 failure to maintain current record drawings;
 - 9.6.1.12 a reasonable doubt arises as to the integrity of any part of the Work completed previous to the final acceptance and payment;
 - 9.6.1.13 reduction of contract amounts due to Contract modifications;
 - 9.6.1.14 provisions of law that enable or require the Owner to withhold such payments in whole or in part; or
 - 9.6.1.15 payments due the Owner from the Contractor.
- 9.6.2 Intentionally omitted.
- 9.6.3 The Contractor agrees that he shall indemnify, defend (with counsel approved by Owner) and save the Owner harmless from all claims of any character whatsoever growing out of the lawful demands of abutting property owners, Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies incurred in the further performance of the Contract. Contractor shall, on demand, furnish evidence satisfactory to the Owner that all obligations of the nature heretofore designated have been paid, discharged, or waived to the date of a demand notice.
- 9.6.3.1 If the Contractor fails to do so, then the Owner may, at Owner's sole discretion, after having served three (3) days written notice upon the Contractor, either pay unpaid bills direct, pay an invoice or invoices with a check made payable to Contractor and claimant as co-payee, or withhold

from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged; whereupon payments to the Contractor shall be resumed, in accordance with the terms of the Contract, but in no event shall the provisions of this sentence be construed to impose upon the Owner any obligation to either the Contractor, or his surety or any claimant of Contractor.

- 9.6.3.2 Unless such Installment Payment is withheld for good cause as permitted by the Contract Documents, in paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor and any payments so made shall be considered as a payment made under the Contract by the Owner to the Contractor, and the Owner shall not be liable to the Contractor for any such payment made in good faith.

9.7 **FAILURE OF PAYMENT**

- 9.7.1 If the Owner does not pay the Contractor any Installment Payment within forty-five (45) calendar days after the date established in the Contract Documents, then the Contractor may, upon fifteen (15) additional calendar days' written notice to the Owner, stop the Work until payment of the amount owing has been received. The Contract sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay, and start-up, which shall be effected by appropriate Change Order in accordance with Paragraph 12.3.

9.8 **SUBSTANTIAL COMPLETION**

- 9.8.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Subparagraph 8.1.3, the Contractor shall prepare for submission to the Owner 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 Owner on the basis of an inspection determines that the Work or designated portion thereof is substantially complete, he will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof, unless otherwise provided in the Certificate of Substantial Completion, whichever is appropriate, and extend to the first anniversary of the Substantial Completion of Contractor's work under this Agreement or to such other time as is specified in Contract Documents. The Certificate of Substantial Completion shall be executed by both the Owner and the Contractor to record their written acceptance of the responsibilities assigned to them in such Certificate.
- 9.8.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor, the Owner shall determine what payment or adjustment is due. If the Owner determines that payment is due, he shall make

payment, reflecting adjustment in retainage, if any, for such work or portion thereof, as provided in the Contract Documents.

9.9 FINAL COMPLETION AND FINAL PAYMENT

- 9.9.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance, the Owner will promptly make such inspection and; when he finds the Work acceptable under the Contract Documents and the Contract fully performed, the Contractor will promptly issue a Certificate of Final Completion stating that the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the retainage due the Contractor, and noted in said final Certificate, is due and payable. The Owner shall then promptly decide whether and to what extent retainage payment is due by Owner to Contractor.
- 9.9.2 The retainage shall not become due until the Contractor submits to the Owner: (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied; (2) the warranties and guarantees required; and (3) other data establishing payment or satisfaction of other obligations such as receipts, releases, waivers of liens, certificates and/or affidavits of no claims arising out of the Contract, all to the extent and in such form as may be designated by the Owner.
- 9.9.3 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the Certification of Final Completion.

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 including that of Subcontractors. The Contractor shall be responsible for safety 24 hours per day continuously during the term of this Contract. The Contractor's Safety Program shall incorporate the practices, procedures, and requirements described in this Article as well as the requirements of any Applicable Regulations. This shall include compliance to all navigational and maritime laws and regulations. Machinery, equipment, materials (including without limitation, hazardous or environmentally sensitive materials and substances) and other potential hazards shall be guarded in accordance with Applicable Regulations.

10.1.2 The Contractor shall submit a copy of the Contractor's safety and loss program within fifteen (15) calendar days of Notice of Award.

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:

10.2.1.1 all employees on the Work and all other persons who may be affected thereby;

10.2.1.2 all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody, or control of the Contractor or any of his Subcontractors or Sub-subcontractors; and

10.2.1.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, watercraft, and utilities not designated for removal, relocation, or replacement in the course of construction.

10.2.2 The Contractor shall give all notices and comply with all Applicable 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 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 owners and users of adjacent utilities.

10.2.4 When the use or storage of explosives or other hazardous materials or substances equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care, shall provide reasonable advance notice to Owner of at least twenty four (24) hours, shall carry on such activities under the supervision of properly qualified personnel, and shall comply with all Applicable Regulations pertaining thereto.

- 10.2.5 The Contractor shall promptly remedy all damage or loss (other than damage or loss insured under Paragraph 11.3) to any property referred to in Subparagraphs 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, any Subcontractor, and Sub-subcontractor, their agents or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible under Subparagraphs 10.2.1.1, 10.2.1.2, and 10.2.1.3, except to the extent the damage or loss is attributable to the gross negligence or willful misconduct of the Owner or Engineer, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to his obligations under Paragraph 4.18.
- 10.2.6 The Contractor shall designate a responsible member of his organization at the site whose duty shall be safety compliance and prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Engineer.
- 10.2.7 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger the safety of Contractor, Owner, Engineer or any third party.
- 10.2.8 The Contractor shall provide at the several locations of active Work such equipment and medical facilities as are necessary for first-aid treatment of anyone who may be injured on the Project. He shall have standing arrangements for the removal and hospital treatment of any person who shall be injured while engaged in the performance of the Work.
- 10.2.9 The Contractor shall report promptly in writing to the Owner all accidents occurring in the performance of the Work whether on, adjacent to, or remote from the site that caused death, personal injuries, or property damage, and shall give full details and statements of witnesses.
- 10.2.10 The Contractor shall furnish as required by any Applicable Regulations, safe shoring, scaffolding, and protection against accidents. Failure on the part of the Contractor to carry out the above regulations after notification by the Owner shall be just cause for the Owner to afford all necessary protection and charge the cost of the same to the Contractor.
- 10.2.11 Should hurricane warnings be issued during the construction period, the Contractor shall take every precaution to minimize danger to persons and damage to the Work and property. He shall take similar and appropriate action in the event of warnings of other such natural occurrences, storms, earthquakes, etc.
- 10.2.12 The Contractor shall employ on the Work only such persons, as are physically fit and free from contagious and communicable diseases.
- 10.2.13 During the construction period, the Contractor shall provide and maintain at all times in a neat and sanitary condition, at his expense, such toilet accommodations, for the use of his employees as are necessary to comply with the requirements of any Applicable Regulations. All such accommodations and connections shall be removed upon completion of the Contract and the premises shall be left clean.

10.2.14 Care shall be taken to keep all parts of the Work in a sanitary condition and free from refuse and decaying or other objectionable, unsafe, or unhealthy matter.

10.2.15 Failure to perform and meet the requirements of this Article 10 and/or any apparent danger to persons or property shall be grounds for the Owner or the Engineer to suspend the Work until the condition creating the hazard has been removed. Such suspension of work shall be at the Contractor's expense.

10.3 **EMERGENCIES**

10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his reasonable discretion, to prevent threatened damage, injury, or loss.

10.4 **COSTS**

10.4.1 Except to the extent expressly set forth to the contrary, all cost and expenses associated with Contractor's obligations set forth in this Article 10 shall be solely those of Contractor, and Owner shall have no liability therefor.

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ARTICLE 11

INSURANCE

11.1 **CONTRACTOR'S LIABILITY INSURANCE**

11.1.1 The Contractor shall not commence Work under this Contract until he has obtained all insurance required under this article and the Contract Documents and such insurance has been accepted by the Owner. Nor shall the Contractor allow any Subcontractor to commence Work on his Subcontract until all similar insurance required of the Subcontractor has been so obtained and accepted. All insurance shall be placed with an insurance company or companies authorized by the State of California to write insurance of the type required under the succeeding articles and reasonably acceptable to Owner. Such insurers must have a current rating by A. M. Best & Co. of no less than A:VII.

11.1.2 If a Subcontractor of any tier does not provide insurance as required under this article and the principal Contractor wishes to provide insurance protection under all applicable federal and State of California statutes for such Subcontractor as said Subcontractor's employer, a rider must be attached to the principal Contractor's policy, identifying the persons or parties thereby covered; or the principal Contractor must provide appropriate policies in the name of the Subcontractor.

11.1.3 The Contractor shall purchase and maintain such insurance protecting the Contractor from the claims set forth below, which may arise out of or result from the Contractor's operations under the Contract, whether such operations are performed by the Contractor or by any Subcontractor or anyone for whose acts any of them may be liable under Contract or otherwise:

11.1.3.1 Claims under Workers' or Workmen's Compensation, and, if applicable to the Work to be performed, United States Longshoremen's and Harbor Workers' Act, Jones Act, disability benefit and any other similar state or federal employee benefit act;

11.1.3.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

11.1.3.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

11.1.3.4 Claims for damages because of personal injury offenses, including false arrest, detention or imprisonment, malicious prosecution, wrongful entry into, or eviction of a person, from a room, dwelling or premises that the person occupies, oral or written publication of material that slanders or libels a person or organization or disparages a person's or organization's goods, products or services; or oral or written publication of material that violates a person's right of privacy;

11.1.3.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom, and loss of use to tangible property that is not physically injured;

- 11.1.3.6 Claims for damages because of bodily injury or death of persons or property damage arising out of the ownership, maintenance or use of any motor vehicle in the performance of work under this Contract;
- 11.1.3.7 Claims under any employee liability insurance coverage for the protection of the Contractor's employees not otherwise protected;
- 11.1.3.8 Claims for Contractor's contingent liability if some part of the Work is sublet to other Contractors;
- 11.1.3.9 Claims for damages because of advertising injury, including oral or written publication of material that slanders or libels a person or organization or disparages a person's or organization's goods, products or services, oral or written publication of material that violates a person's right of privacy, misappropriation of advertising ideas or style of doing business, or infringement of copyright, title or slogan; and
- 11.1.3.10 Claims for damages because of bodily injury or death of persons or property damage arising out of the ownership, maintenance or use of any watercraft or aircraft in the performance of work under this Contract.
- 11.1.4 The insurance required by Subparagraphs 11.1.1, 11.1.2, and 11.1.3 shall be written for not less than any limits of liability specified in the Contract Documents or required by law, whichever is greater, but in no case less than the following:
- Comprehensive General Liability:** \$5,000,000 combined single limit, per occurrence, for bodily injury, including death, and property damage liability.
- Pollution Liability:** \$1,000,000 per occurrence and \$10,000,000 aggregate.
- Automobile Liability:** \$1,000,000 per each accident, for bodily injury, including death, and property damage liability.
- Workmen's Compensation Insurance:** Statutory, as required by Federal and State worker's compensation and occupational disease laws.
- Employer's Liability:** Coverage of \$100,000, except in States where worker's compensation may not be written by private carriers.
- Others:** As required by Applicable Regulations.
- 11.1.5 The insurance required by Subparagraphs 11.1.3.3, 11.1.3.4, 11.1.3.5, 11.1.3.6, 11.1.3.8, and 11.1.3.9 shall include contractual liability insurance applicable to the Contractor's obligations under Paragraph 4.18.
- 11.1.6 The insurance required by Subparagraphs 11.1.3.3, 11.1.3.4, 11.1.3.5, 11.1.3.6, 11.1.3.8, 11.1.3.9, and 11.1.3.10 shall be amended to include the Owner and Engineer as Additional Insured's.

- 11.1.7 The insurance required by Subparagraph 11.1.3.1 shall be amended to waive the insurer's right of subrogation against the Owner.
- 11.1.8 The insurance required by Subparagraph 11.1.3.5 shall include coverage for explosion, collapse and underground hazards.
- 11.1.9 The insurance required by Subparagraphs 11.1.3.3 and 11.1.3.5 shall include coverage for Products/Completed Operations, extending for three (3) years after completion of the Work and acceptance by the Owner.
- 11.1.10 The insurance required by Subparagraph 11.1.3.5 shall include Broad Form Property Damage.
- 11.1.11 The insurance required by Subparagraph 11.1.3.4 shall be amended to delete any employee exclusion or exclusions relating to liability assumed by Contract.
- 11.1.12 The insurance required by Subparagraph 11.1.3 shall be primary and no insurance coverage of the Owner shall be called upon to contribute to the payment of any losses that would otherwise be paid by the Contractor or the Contractor's insurer.
- 11.1.13 The Contractor shall furnish the Owner with Certificates of Insurance and copies of endorsements effecting coverage required by this Contract as a condition to Contract Award. These Certificates shall contain a provision that coverage afforded under the policies shall not be cancelled or materially changed until at least thirty (30) calendar days prior written notice has been given by Certified Mail to the Owner. The Owner reserves the rights to require complete, certified copies of all required insurance policies at any time.

11.2 **OWNER'S LIABILITY INSURANCE**

- 11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims, which may arise from operations under the Contract.

11.3 **PROPERTY INSURANCE**

- 11.3.1 The Contractor shall have and maintain broad coverage property insurance upon the entire Work and all components and other materials to be incorporated into the finished project, while at original manufacture sites, in transit and at the work site, for the full replacement value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work and shall insure against the perils of physical loss or damage, including earthquake, flood and risks of transit. The scope, limits and other terms of such insurance shall be subject to the Owner's prior approval. Contractor shall furnish the Owner with the Certificates of Insurance and with original endorsements effecting coverage required by this subparagraph. The certificates and endorsements for each insurance policy are to be executed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements are to be received and accepted by the Owner as a condition to Contract Award. The Owner reserves the right to require complete certified copies of all required insurance policies, at any time.

- 11.3.2 Any loss insured under Subparagraph 11.3.1 is to be adjusted with the Contractor and made payable to the Contractor as trustee for the insured, as their interests may appear, subject to the requirements of any applicable mortgagee clause. The Contractor shall pay each Subcontractor a just share of any insurance moneys received by the Contractor, and by appropriate written agreement, shall require each Subcontractor to make payments to his Sub-subcontractors in similar manner.
- 11.3.3 Each insurance policy required by this subparagraph 11.3 shall be endorsed to state that coverage shall not be suspended, voided, cancelled by either party, reduced in coverage or in limits, except after thirty (30) calendar days' prior written notice by certified mail, return receipt requested, has been given to the Owner.
- 11.3.4 If the Owner requests in writing that insurance for risks other than those described in Subparagraph 11.3.1 or other special hazards be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate Change Order.
- 11.3.5 During the performance of the Work, the Contractor shall procure and maintain insurance to cover the physical loss or damage to any tools, equipment, or watercraft used in the performance of the Work, whether located at the site or some other location. The Contractor shall also require its Subcontractors of any tier to carry such insurance.
- 11.3.6 The Owner and Contractor waive all rights against each other and the Subcontractors, Sub-subcontractors, agents and employees each of the other, and the Engineer and separate contractors, if any, and their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by insurance obtained pursuant to this Paragraph 11.3 or any other property insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance held by the Owner as trustee. The foregoing waiver afforded the Engineer, his agents, and employees shall not extend to the liability imposed by Paragraph 4.18. The Owner and the Contractor, as appropriate, shall require of separate contractors, subcontractors and sub-subcontractors by appropriate written agreements, similar waivers each in favor of all other parties enumerated in this Subparagraph 11.3.5.
- 11.3.7 If the Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion thereof, such occupancy or use shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the insurance company or companies providing the property insurance have consented in the policy or policies or by endorsement thereto. This insurance shall not be cancelled or lapse on account of such partial occupancy or use. Consent of the Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld, conditioned or delayed.

ARTICLE 12

CHANGE IN THE WORK

12.1 CHANGE ORDERS

12.1.1 A Change Order is a written order to the Contractor signed by the Owner issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum and/or the Contract Time. The Contract Sum and the Contract Time may be changed only by a Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including adjustment in the Contract Sum or the Contract Time.

12.1.2 The Contract Work shall be performed in accordance with the Contract Documents. If, during the progress of the Work it should be necessary, in order to complete the Contract fully and satisfactorily, to provide for substitutions or make alterations in the character or limits of the Work or materials called for in the Contract Documents, a change in Contract (Change Order) shall be prepared by the Owner under prescribed form and shall be executed by the Owner and the Contractor. Such change in Contract (Change Order) shall not become effective or binding until accepted by the Owner, in writing.

12.1.2.1 The Owner, without invalidating the Contract may, in Owner's sole discretion, order changes within the general scope of the Contract consisting of additions, deletions, 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.

12.1.3.1 The basis for any equitable adjustment of the Contract for extra or reduced work authorized shall be as follows:

12.1.3.1.1 When changes are made in the character or limits of the Work or materials called for in the Contract Documents to provide for extra Work ordered by the Owner that cause an increase in the amount due to the Contractor and such changes consist of work that is similar to that called for in the Contract Documents and for which unit prices are quoted in the Proposal, or for which unit prices were previously submitted to Owner and accepted by Owner, the additional cost for such Work shall be paid for on the basis of said unit prices quoted by the Contractor's Proposal or accepted price list for the item of Work affected. Any reduction of the Contract Sum for subtracted charges shall be computed on the same basis.

12.1.3.1.2 When any change which, in the opinion of the Owner, is dissimilar to that called for in the Contract Documents and for which unit prices were not quoted in the Proposal, causes such increase or decrease in the amount due the Contractor the increase or decrease in the Contractor's compensation shall be determined as follows:

- (a) to the direct cost of labor and materials incorporated in the extra or subtractive Work and a rental cost for equipment used in the prosecution thereof there shall be added sixteen percent (16%) to cover indirect costs and the Contractor's profit [when items of Work are subcontracted, the profit and indirect cost of such items are to be apportioned with nine percent (9%) to the Subcontractor and seven percent (7%) to Contractor], all as hereinafter stipulated.
- (b) the items used in Subparagraph 12.1.3.1.2 of this numbered Article only are defined as follows:
- (1) "Labor" means laborers, mechanics, and workmen directly engaged in the performance of the extra or subtractive Work, whether employed by the Contractor or by the Subcontractor.
 - (2) "Cost of labor" means the proportion of the wages that will actually be or would have actually been paid to or received by such laborers, mechanics, and workmen and the proportion of the premiums that would actually be or would have actually been paid for worker's compensation insurance or longshoremen's and harbor workers insurance upon the basis of such wages.
 - (3) "Cost of materials" means the prices for which materials are sold by the manufacturers or producers thereof, or by regular dealers therein, whether or not such materials are purchased directly from the manufacturer, producer, dealer, or (if the Contractor is a manufacturer or producer thereof), the reasonable cost to the Contractor for the manufacture or production, plus the reasonable cost of delivering such materials to the site of the Work in the event that the price paid to the manufacturer, producer, or dealer does not include delivery. If such state or other taxes are applicable to materials, the cost of this tax shall be added to the above cost.
 - (4) "Rental of equipment" means the total rental for the time the equipment will be or would have been used in the prosecution of the extra or subtractive Work, computed in accordance with the State of California Department of Transportation (Caltrans) "Labor Surcharge & Equipment Rental Rates" schedule. Only equipment having value in excess of \$1,000.00 will be considered. Equipment having value less than \$1,000.00 is considered small tools and compensation

for small tools and consumables is provided for in paragraph (5) "Indirect Costs".

(5) "Indirect costs" means overhead, superintendence, insurance (other than workmen's compensation or longshoremen's and harbor workers' insurance), taxes (other than taxes on materials), materials used for temporary structures, allowances made by the Contractor to the Subcontractor, additional premiums on the Contractor's bond and all miscellaneous items of cost and expense to the Contractor.

12.1.3.2 In computing increases and decreases in the Contractor's compensation to cover such extra or subtractive Work, no consideration shall be given to any items of cost or expense not specifically set forth in Subparagraph 12.1.3.1, and it is expressly agreed that the percentage addition of sixteen percent (16%) herein before provided covers all items of indirect cost and expense with fair and reasonable profit to the Contractor and any Subcontractor for the performance or omission of performance of such extra or subtractive Work. Upon claim for payment under a change in Contract (Change Order), the Owner may call for and shall be furnished with paid bills or other supporting data that may be required.

12.1.3.3 No compensation shall be allowed under a change in Contract (Change Order) for any person not actively or exclusively engaged in the performance of the specified Work.

12.1.3.4 No work shall be started or performed under the accepted change in Contract (Change Order) until the Owner directs the Contractor to commence work thereon. The Owner shall keep, in triplicate, on the forms provided (if no forms are provided on appropriate forms devised by the Engineer), a record of the character and amount of the Work performed each day, which form shall be executed at the end of each day by the Contractor and the Engineer or by their representatives. The original shall be filed with the Owner, one copy given to the Contractor, and one copy retained by the Engineer. Costs are to be calculated as set out in Subparagraph 12.1.3.1. Failure of the Contractor or his representative to sign or receive a copy shall not affect the result if the finding is made on such forms.

12.1.3.5 Any change in the Time of Completion shall be computed in accordance with Article 8, TIME, and this change in Time of Completion shall be shown on the change in Contract (Change Order) and shall be accepted by the Owner. If no adjustment is made on the change in Contract (Change Order) form, any increase or decrease in the Time of Completion shall be considered waived by the Contractor.

12.1.4 If none of the methods set forth in Subparagraph 12.1.3.1 is agreed upon, the Contractor, provided he receives a written order executed by the Owner which directs him to proceed, shall promptly proceed with the changed work involved. The cost of such work shall then be determined by the Owner on the basis of the

reasonable expenditures and 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 Subparagraph 12.1.3.4 above, the Contractor shall present, in such form as the Owner may prescribe, an itemized accounting 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, workers' or workmen's compensation insurance; bond premiums; rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change. Pending final determination of cost to the Owner, payments on account shall be made on the Engineer's Certificate for Payment. The amount of credit to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in the Contract Sum shall be the amount of the actual net cost as confirmed by the Engineer. 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 on the basis of the net increase, if any, with respect to that change.

12.1.5 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are 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 Owner or the Contractor, the applicable unit prices shall be equitably adjusted.

12.2 **CONCEALED CONDITIONS**

12.2.1 Should concealed conditions be encountered in the performance of the Work below the surface of the ground or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure- of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, and when the condition could not have been determined by the Contractor by careful examination of the site or the structure prior to commencement of the Contract, the Contract Sum shall be equitably adjusted by Change Order upon claim by either party made within seven (7) calendar days after such party first becomes aware of the conditions.

12.3 **CLAIMS FOR ADDITIONAL COST**

12.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the Owner written notice thereof within seven (7) calendar days after the occurrence of the event, giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 10.3. No such claim shall be valid unless so made. The amount of the adjustment in the Contract Sum shall be determined by the Owner. Any change in the Contract Sum resulting from such claim must be authorized by Change Order.

12.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation pursuant to Subparagraph 2.2.8; (2) any order by the Owner to stop the Work pursuant to Paragraph 3.3 where the Contractor was not at fault; (3) failure of payment by the Owner pursuant to Paragraph 9.7, the Contractor shall make such claim as provided in Subparagraph 12.3.1.

12.3.3 Failure to maintain and make available documentation as required by the Contract Documents, or failure to provide appropriate supporting data requested under the provisions of the Contract Documents, shall be a basis for denying any claim for additional cost.

12.4 **OTHER CHANGES IN THE WORK**

12.4.1 Except as herein before specified, any extra work done or any changes made without written authority on the prescribed change in Contract (Change Order) form shall be considered unauthorized unless otherwise directed by Owner, and at the expense of the Contractor, and shall not be paid for by the Owner. At the option and direction of the Owner work so done may be ordered removed, or removed and replaced, at the Contractor's expense.

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ARTICLE 13

UNCOVERING AND CORRECTION OF WORK

13.1 UNCOVERING OF WORK

13.1.1 If any portion of the Work should be covered contrary to the request of the Owner or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Owner be uncovered for his 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 Owner has not specifically requested to observe prior to being covered, the Owner 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 charged to the Owner. 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 Owner or a separate contractor as provided in Article 6, in which event the Owner 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 Owner as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected work, including compensation to the Owner for the Engineer's additional costs made necessary thereby.

13.2.1.1 All materials not conforming to the requirements of these Specifications shall be considered defective and all such materials, whether in place or not, shall be rejected and shall immediately be removed from the site of the Work unless otherwise directed by the Owner. No rejected materials, the defects of which have been subsequently corrected, shall be used until approval has been given by the Owner or Engineer. All work that has been rejected shall be remedied or removed and replaced in acceptable manner by the Contractor at his own expense and no compensation shall be allowed him for such remedy or removal and replacement. Upon failure of the Contractor to comply with any order of the Owner or Engineer made under the provisions of this Article, the Owner may at his option remedy or remove and replace the defective material and work and to deduct the cost of remedy or removal and replacement from any moneys due or to become due Contractor.

13.2.1.2 The Contractor shall commence such corrective measures within a period of not more than seven (7) calendar days after written notice from the Owner that such defects exist, unless a condition of emergency exists. If a condition of emergency exists and the Contractor is unable to take immediate action then the Owner reserves the right to proceed

immediately with corrective measures, the cost of which shall be borne by the Contractor.

- 13.2.2 If, within one year after the Date of Final Completion of the Work or designated portion thereof or within one year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is 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 Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.
- 13.2.3 The Contractor shall remove from the site all portions of the Work which are defective or nonconforming and which have not been corrected under Subparagraphs 4.5.1, 4.5.2, 13.2.1, and 13.2.2, unless removal is waived by the Owner.
- 13.2.4 If the Contractor fails to correct defective or nonconforming work as provided in Subparagraphs 4.5.1, 4.5.2, 13.2.1, and 13.2.2, the Owner 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 Owner or Engineer, the Owner 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 (10) calendar days thereafter, the Owner may upon ten (10) additional calendar days' written notice sell such work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for any additional engineering 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 Owner.
- 13.2.6 The Contractor shall bear the cost of making good all work of the Owner 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 period of one year after the Date of Final Completion 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 his obligation to comply with the Contract Documents maybe sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the Work.

13.3 **ACCEPTANCE OF DEFECTIVE OR NONCONFORMING WORK**

- 13.3.1 If the Owner prefers to accept defective or nonconforming work, he may do so instead of requiring its removal and correction, in which case a Change Order shall be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.
- 13.3.2 The Owner reserves the right should an error be discovered in the estimate or the conclusive proof of defective work or materials used by or on the part of the Contractor be discovered, either before or after the Project has been accepted, or even after Final Payment has been made, to claim and recover by process of law such sums as may be sufficient to correct the error or make good the defects in the Work or the materials.

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ARTICLE 14

TERMINATION OF THE CONTRACT

14.1 **TERMINATION BY THE CONTRACTOR**

14.1.1 If the Work is stopped for a period of one year 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 the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, or because the Owner has not made payment thereon as provided in Paragraph 9.7, then the Contractor may, upon thirty (30) additional calendar days written notice to the Owner and the Engineer, terminate the Contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit for that portion of the Work substantially completed by Contractor (but excluding any claim for future or unearned profits).

14.2 **TERMINATION BY THE OWNER**

14.2.1 If the Contractor fails to begin the performance of his Contract within the time specified, or fails to make delivery or to provide sufficient workmen and equipment or sufficient material to ensure completion within the Contract Time, or shall sublet any part or all of the Contract without the previous written approval of the Owner, or shall perform the Contract unsuitably, or shall neglect or refuse to remove materials or correct such work as shall have been rejected as defective or unsuitable, or shall discontinue the prosecution of the Work, or if the Contractor shall become insolvent or be declared bankrupt, or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or shall fail to comply with any Applicable Regulations, or from any other cause whatsoever shall not carry on the Work or perform the Contract in an acceptable manner, the Owner may, at his option, give notice in writing to the Contractor and his surety of such delay, neglect or default and if the Contractor, within a period of seven (7) calendar days after such notice, shall not proceed in accordance therein, then the Owner may, at his option, without violating the Contract, take the prosecution of the Work out of the hands of the Contractor or his surety, appropriate or use any or all materials or equipment on the ground as may be suitable and acceptable, and enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods as, in the Owner's opinion, shall be required for the completion of said Contract in an acceptable manner.

14.2.1.1 All costs and charges incurred by the Owner, together with additional compensation to the Engineer for his extra services, the cost of completing the Work and also all liquidated damages in conformity with the terms of the Contract shall be deducted from any moneys due or which may become due the Contractor.

14.2.1.2 In case the cost and expense so incurred by the Owner, together with the assessment of liquidated damages, shall be less than the sum which

would have been payable under the Contract if it had been completed by the said Contractor, then the Contractor shall be entitled to receive the difference. In case such expense and damages shall exceed the sum that would have been payable under the Contract, then the Contractor and the surety shall be liable and pay to the Owner the amount of said excess.

14.2.2 The Owner reserves the right to terminate the Work for its convenience upon notice in writing to the Contractor.

14.2.2.1 The Contractor shall be paid its actual costs for that portion of the Work performed to the date of termination and for all costs of termination, including demobilization and any termination charges by vendors and subcontractors, plus fifteen percent (15%) of all such costs for overhead and profit. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits.

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SPECIAL PROVISIONS

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SPECIAL PROVISIONS

SP-1 SCOPE AND GENERAL DESCRIPTION OF THE WORK

The work to be performed under this contract consists of the furnishing of all material and equipment and the performance of all labor to complete the work as specified in Section 01100, Summary of Work of the Technical Provisions.

SP-2 SCHEDULE OF WORK

- A. During the period of work, it is necessary that existing vessel traffic not be interrupted. Therefore, the Contractor is required to facilitate the passage of all vessel traffic without disruption, unless specifically approved in writing by the Engineer.
- B. From the date designated in a written Notice to Proceed, all shop drawings and other submittals shall be delivered to the Owner in a timely manner for acceptance in accordance with the Technical Provisions. Work requiring shop drawings shall not be constructed without written acceptance from the Engineer.
- C. Substantial Completion shall take place prior to 12:00 a.m. local time, December 1, 2009.
- D. From the date designated in a written Notice to Proceed, all manufacturer warranties, record drawings and other submittals shall be delivered for acceptance and Final Completion shall be completed no later than thirty (30) calendar days following Substantial Completion.
- E. Contractor's sequence of construction shall conform to that set forth in the Contract Documents, unless accepted otherwise by the Engineer.

SP-3 BID ALTERNATES AND AWARD OF CONTRACT

No bid alternates are designated for this Contract.

SP-4 LIQUIDATED DAMAGES

Work defined under this Contract shall be completed within the time frame stipulated in Paragraphs SP-2 (C) and (D). Failure of the Contractor to comply with this schedule, taking into account contract extensions granted by the Owner due to change orders, shall result in the assessment of liquidated damages. Accordingly, the Owner and Contractor agree that as liquidated damages for delay the Contractor shall pay the Owner:

- A. Ten Thousand Dollars (\$10,000.00) for each day that expires after the time specified herein for the Contractor to achieve Substantial Completion of the work as specified in SP-2.C;
- B. Two Thousand Five Hundred Dollars (\$2,500.00) for each day that expires after the time specified herein for the Contractor to achieve Final Completion of the work as specified in SP-2.D.

These measures of liquidated damages shall apply cumulatively and shall be presumed to be the damages suffered by the Owner resulting from delay in completion of the Work.

THE PARTIES AGREE THAT OWNER'S ACTUAL DAMAGES AS A RESULT OF CONTRACTOR'S FAILURE TO COMPLETE THE WORK WITHIN THE TIMEFRAME SET FORTH HEREIN WOULD BE DIFFICULT OR IMPOSSIBLE TO DETERMINE, AND THE AMOUNT OF LIQUIDATED DAMAGES SET FORTH HEREIN IS THE BEST ESTIMATE OF THE AMOUNT OF DAMAGES OWNER WOULD SUFFER AS A RESULT OF SUCH FAILURE, PROVIDED, HOWEVER, THAT THIS PROVISION SHALL NOT LIMIT OWENR'S RIGHT TO OBTAIN REIMBURSEMENT FOR ATTORNEY'S FEES AND COSTS, AFFECT CONTRACTOR'S OBLIGATION TO COMPLETE THE WORK, OR WAIVE OR AFFECT CONTRACTOR'S INDEMNITY OBLIGATIONS AND OWNER'S RIGHTS TO THOSE INDEMNITY OBLIGATIONS UNDER THE CONTRACT. THE PAYMENT BY CONTRACTOR OF THE AMOUNTS SET FORTH HEREIN AS LIQUIDATED DAMAGES IS NOT INTENDED AS A FORFEITURE OR PENALTY UNDER APPLICABLE LAWS, BUT IS INTENDED TO CONSTITUTE LIQUIDATED DAMAGES TO OWNER PURSUANT TO APPLICABLE LAWS AND CONTRACTOR HEREBY WAIVES THE BENEFIT OF ANY PROVISION OF APPLICABLE LAW TO THE CONTRARY.

SP-6 SUBSURFACE CONDITIONS AND HISTORY

No subsurface conditions and history are provided, except as may be indicated in other parts of the Contract Documents. The Geotechnical Site Investigation Report is available at Owner's sole discretion to Contractors for information purposes only and are not a specified requirement or considered part of the Contract Documents.

SP-7 CONTRACT DRAWINGS

Work shall be executed in accordance with the Contract Documents. Drawings which accompany and form a part of the Contract Documents bear the general title as follows:

**TWO GATE FISH PROTECTION PLAN
BACON ISLAND, CALIFORNIA**

SP-8 CONTRACT DOCUMENTS FURNISHED TO CONTRACTOR

Owner shall supply the Contractor with one (1) printed copy of the Contract Documents (half-size drawing size) and one (1) CD of the Contract Documents at no cost to the Contractor.

SP-9 CORRESPONDENCE

Owner will not entertain any correspondence or submittals by fax. Only hard copies will be accepted. However, fax will be accepted as advance information, but no action will, in Owner's sole discretion, be required or taken as a result thereof until a hard copy is received.

SP-10 FIELD OFFICES

A. CONTRACTOR FIELD OFFICE

The Contractor shall provide for his own use, and at Contractor's sole cost and expense, a suitable field office in an accepted location convenient to the site.

B. OWNER FIELD OFFICE

Contractor shall, at Contractor's sole cost and expense, provide for Owner's use a minimum 200 square foot field office in an accepted location convenient to the site. Contractor shall, at Contractor's sole cost and expense, be responsible to furnish the office with furniture deemed acceptable by the Engineer.

The furniture shall include: one (1) executive size desk; one (1) 4-drawer file cabinet; (1) 4-shelve bookcase; (1) executive office chair; one (1) 6-foot conference table; six (6) conference table chairs; one (1) photocopier with document feeder, multi-document collator, 8.5x11, 8.5x14 and 11.x17 paper capacity, including monthly service plan and all copier supplies and paper; one (1) fire extinguisher; and one (1) fax machine.

Contractor shall, at Contractor's sole cost and expense, be responsible for providing weekly janitorial service, security and insurance for the Owner Field Office and all furnishings against theft and/or vandalism.

SP-11 TEMPORARY WATER SUPPLY

- A. Contractor shall provide and maintain, at Contractor's sole cost and expense, a temporary potable water supply for building purposes. The area around the water connection shall be maintained in a clean and safe condition. No undue waste of water shall be permitted.
- B.
- C. Contractor shall provide and maintain, at Contractor's sole cost and expense, a potable water supply for the Owner Field Office.

SP-12 TEMPORARY SANITARY PROVISIONS

- A. Contractor shall provide and maintain in a neat and sanitary condition temporary sanitary provisions for the use of his employees.
- B. Contractor shall provide and maintain in a neat and sanitary condition temporary sanitary provisions for the Owner Field Office.

SP-13 TEMPORARY ELECTRIC AND COMMUNICATION SERVICES

- A. Contractor shall, at Contractor's sole cost and expense, furnish all temporary electrical service required. It shall be the responsibility of the Contractor to coordinate this work with the Owner and to obtain the Engineer's acceptance to secure service. Contractor shall maintain the temporary electrical system in a safe and proper condition for the duration of the Contract.
- B. Contractor shall furnish any communication service required for his own use.

C. Contractor shall, at Contractor's sole cost and expense, furnish the Owner Field Office with suitable temporary electrical service. It shall be the responsibility of the Contractor to coordinate this work with the Owner and to obtain the Engineer's acceptance to secure service. The Contractor shall maintain the temporary electrical system in a safe and proper condition for the duration of the Contract.

D.

SP-14 COORDINATION WITH UTILITY COMPANIES

The Contractor is responsible for all coordination with utility companies as required, except as otherwise specified in the Contract Documents.

SP-15 PHOTOGRAPHS

- A. As evidence of work completed, the Contractor shall, at Contractor's sole cost and expense, furnish the Engineer with color photographs of the project. Photographs shall be 8" x 10" prints and shall be taken by a Photographer accepted by the Engineer. Photographs shall be taken using a zoom digital camera with a resolution of 2240x1500 pixels. Insofar as possible, the photographs shall be taken from the same location each time, the locations to be determined by the Engineer. Six (6) photographs shall be taken before the start of work and upon completion of the Contract. Six (6) photographs of the site shall be taken each week, and the Engineer shall be furnished with the digital data of all photographs, as well as two (2) prints of each photograph. Each photograph shall be loaded into an 8-1/2" x 11" archival quality polypropylene sheet protector with non-glare finish, reinforced binding edge and three hole punched. The following information shall be typed on a permanent label mounted on the back of each photograph: 1) Contract title and location; 2) Brief description of picture including direction of view; 3) Date picture taken; 4) The Photographer's name, address and phone number. Digital data shall have the file name extension (jpg) and shall be provided on compact disk. Electronic files shall include a text file to link the photograph description to the file name for each digital image.
- B. All photographs and digital data shall be the property of the Owner. No rights of possession or distribution shall be reserved for the Photographer, Contractor or any other person, firm or corporation.

SP-16 NOT USED

SP-17 MATERIAL TESTING

- A. All sources of supply and materials used in the work will be inspected, sampled and tested by a qualified independent testing laboratory, except as otherwise specified in the Contract Documents. The selection of such a laboratory/testing service shall be subject to the Owner's acceptance as determined in Owner's sole discretion.
- B. In preparing schedules for delivery of materials, the Contractor shall allow reasonable time for inspecting, sampling and testing by the independent laboratory.
- C. Contractor shall, at Contractor's sole cost and expense, submit samples of all materials to the independent laboratory for review as directed by the Engineer.

SP-18 SURVEYS AND LEVELS

- A. Contractor shall, at Contractor's sole cost and expense, employ and pay for the services of a third party California Registered Land Surveyor to be accepted by the Engineer. The Surveyor shall lay out the lines of work, stake out the location of all utilities, test the levels of all construction and furnish the Engineer, as the work progresses, with certificates (including copies of survey notes and grade sheets) that each of the said levels is as required by the Contract Drawings. As-built survey, complete, in AutoCAD digital format shall be submitted to the Engineer upon job completion.
- B. All layout and survey work, both horizontal and vertical, shall be tied into a grid system established by the Contractor, and subject to the approval of the Engineer. Survey control points are shown on the Contract Drawings.
- C. Where calculation of pay quantities require measurement of lines, grades, elevations or surface areas, the Engineer will require that such items be measured and such quantities be calculated by an accepted California Registered Land Surveyor employed by the Contractor at the Contractor's expense. The survey notes, grade sheets and calculations shall be furnished to the Engineer upon request and shall be in a form accepted by the engineer.

SP-19 CONTRACTOR'S ACCESS

- A. Contractor's landside access for equipment and materials to the area shall be as shown on the Contract Drawings. The Contractor shall not allow privately owned vehicles outside the limits/area(s) designated on the contract documents.
- B. The Contractor and his employees shall park company and personal vehicles within the areas designated by the Engineer. Personal vehicles may be required to be parked at a remote site from the work area.

SP-20 SITE INSPECTION

Proposer's may make arrangements to visit the project site prior to the Proposal Due Date by contacting <to be determined> at telephone number <to be determined>, Monday through Friday, between the hours of 8:00 a.m. and 5:00 p.m.

SP-21 PERMITS

The Owner shall obtain permits from the U.S. Army Corps of Engineers, Central Valley Regional Water Quality Control Board, and the Delta Protection Commission. The Contractor shall be responsible for preparing and submitting any amendments to the accepted permits, which may become necessary due to their operations.

SP-22 SPECIAL HEALTH AND ENVIRONMENTAL PRECAUTIONS

- A. All work practices and environmental safeguards shall be employed consistent with Federal, State, and local requirements.

- B. Contractor shall be responsible for implementing all necessary procedures to safeguard the health and safety of workers and the environment.

SP-23 ADDED OR CHANGED WORK

The Contractor shall submit, for each added or changed work to be performed a price proposal which shall include detailed material, equipment and labor costs with quantities and unit prices for each item. For any work to be performed by a subcontractor, the Contractor shall submit the detailed price proposal including material, equipment and labor prepared by the subcontractor on their letterhead. Overhead and profit shall be added as specified in the General Conditions.

SP-24 VALUE ENGINEERING

- A. This Provision applies to those Value Engineering Change Proposals (VECP's) which are initiated and developed by the Contractor to change the Contract Documents.

In order to be accepted under this Provision each VECP shall:

1. Be identified by the Contractor at the time of submission to the Owner as submitted pursuant to this Provision.
2. Require a change to this Contract.
3. Decrease the Contract Price; and,
4. Maintain the items required functions such as service life, reliability, economy of operation, ease of maintenance, and necessary standardized features and appearance, and not require an unacceptable extension of Contract Time.

- B. Any VECP the Contractor submits shall be in sufficient detail to clearly define the proposed change, including:

1. A description of the difference between the existing and the proposed Contract requirements; and the comparative advantages and disadvantages of each.
2. Contract requirement(s) recommended to be changed if the proposal is accepted.
3. A detailed estimate of the amount of net savings, as defined in Paragraph E, that will result from acceptance of the proposal.
4. A prediction of any effects the proposed change would have on costs of maintenance of operation.
5. A statement of the time by which the proposal must be accepted so as to obtain the maximum price reduction, noting the effect upon the Contract Time.

- C. Owner, in Owner's sole discretion, may accept or reject part or all of any VECP by giving the Contractor written notice thereof. Until such notice is issued, the Contractor shall remain obligated to perform in accordance with the terms of the Contract. VECP's will be processed expeditiously; however, the Owner shall not be liable for any delay in acting upon any proposal submitted pursuant to this Section. The decision of the Owner as to

acceptance of any such proposal shall be final and shall not be subject to the "Disputes" provisions of this Contract.

- D. Contractor has the right to withdraw part or all of any VECP at any time prior to acceptance by the Owner. The withdrawal shall be made in writing to the Owner. Each VECP submitted by the Contractor shall remain valid for a period of sixty (60) calendar days from date submitted. If the Contractor desires to withdraw the proposal prior to the expiration of this period, he shall be liable for the cost incurred by the Owner in reviewing the proposal.
- E. When a VECP submitted pursuant to this provision is accepted:
1. An equitable adjustment in the Contract price and in any other affected provisions of the Contract shall be made and the Contract modified in accordance with this Provision and the "Changes" or other applicable sections of this Contract.
 2. The net savings resulting from the change shall be shared between the Contractor and the Owner on the following basis:
 - a. When only the Prime Contractor is involved, he shall receive 50% and the Owner 50% of the net savings resulting from the change.
 - b. When a First-Tier Subcontractor is involved, he shall receive 30%, the Prime Contractor 30% and the Owner 40% of the net savings resulting from the change. Other Subcontractor savings shall be in accordance with the terms of their contract with the First-Tier Subcontractor.
 3. Net savings shall be determined by deducting from the estimated gross savings, the Contractor's cost of developing and implementing the proposal (including any amount attributable to a Subcontractor) and the estimated amount of increased costs to the Owner resulting from the change, such as implementation, inspection, the related items, and Owner furnished equipment or property. Estimated gross savings shall include Contractor's labor, material, equipment, overhead, profit and bond. The Contract price shall be reduced by the sum of the Owner's costs and share of the net savings.
 4. The Contractor is entitled to share in Instant Contract savings only, to the full extent provided for in this Section. For purposes of sharing, the term "Instant Contract" shall not include any Change Orders or other modifications to this Contract executed subsequent to acceptance of the particular VECP, by which the Owner increases the quantity of any item or adds any item.
- F. The Contractor shall include the provisions of this Provision, with the predetermined sharing arrangements contained herein, in all first-tier subcontracts in excess of the Contract value of \$25,000 and any other subcontracts which, in the reasonable judgement of the Contractor, is of such nature as to offer reasonable likelihood of Value Engineering cost reductions. At the option of the First-Tier Subcontractor, this Provision may be included in lower tier subcontracts. The Contractor shall encourage submission of VECP's from Subcontractors; however, it is not mandatory that VECP's be submitted nor is it mandatory that the Contractor accept or transmit to the Owner VECP's proposed by his Subcontractors.

- G. A VECP identical to one submitted under any other contract by this or any other Contractor may also be submitted under this Contract.
- H. Contractor may restrict the Owner's right to use any VECP data by marking it with the following statement:

"This data, furnished pursuant to the Value Engineering Provision of this Contract, shall not be duplicated, used or disclosed in whole or in part, for any purpose except to evaluate the VECP, unless the proposal is accepted by the Owner. This restriction does not limit the Owner's right to use information contained in this data if it is or has been obtained, or is otherwise available from the Contractor or accepted by the Owner, the Owner shall have the right to duplicate use, and disclose any data in any manner and for any purpose whatsoever, and have others do so whether under this or any other Owner Contract."

SP-25 SUBCONTRACTORS - PROMPT PAYMENT

- A. The Contractor is responsible for making timely payments to all subcontractors and suppliers.
- B. The Owner has established the following time frame for subcontractor payment: Once the monthly progress estimate is processed and payment is received by the Contractor, payment is to be made to all subcontractors within fifteen (15) calendar days.
- C. Each month, the Engineer will review the current pay items with the Contractor and all involved subcontractors, to ensure that all work satisfactorily completed within Technical Provisions is included in the monthly progress payment. For payment purposes, the same quantity totals used to compute the payment to the Contractor will be the basis for payment to subcontractor.
- D. If the subcontractor does not receive payment within the required fifteen (15) calendar days, the subcontractor shall notify the Engineer in writing of the amount in dispute including item numbers and payment quantity for each. The Engineer will then notify the Owner of the dispute. The Engineer will verbally contact the Contractor within forty-eight (48) hours to ascertain whether or not a performance dispute exists which necessitates nonpayment to the subcontractor. If a performance dispute exists, the Contractor must demonstrate to Engineer's reasonable satisfaction that there exists a valid basis to withhold payment from the subcontractor.
- E. If the Contractor withholds payment from a subcontractor, the Contractor shall provide to the subcontractor written notice of the withholding of payment. The notice shall detail the reasons for withholding payment as well as the amount. A copy of the notice shall be provided to the Contractor's surety and the Engineer.
- F. If no valid dispute exists, the Contractor shall be required to make immediate payment to the subcontractor. The subcontractor will be responsible for notifying the Engineer if this payment is not made. Upon receipt of notification, the Engineer will schedule a meeting to verify and discuss the nonpayment issue.

- G. The meeting will be held at the Owner's office within forty-eight (48) hours (two (2) working days) of the Engineer's contact with the subcontractor.
- H. The Contractor, the subcontractor, the Owner and the Engineer shall attend the meeting. The purpose of the meeting will be to establish why payment was not made to the subcontractor in the required fifteen (15) calendar days. If it is determined that the Contractor is delinquent in payment to the subcontractor, further progress payments to the Contractor may be withheld until the subcontractor is paid.
- I. If the next monthly estimate becomes due and payment to the subcontractor has not been corrected by the Contractor, the monthly estimate will NOT be processed and another meeting will be held at the Owner's office to correct the problem. Should the results of this second meeting reveal that payment to the subcontractor continues to be delinquent, the Engineer may order a suspension of work based upon the failure of the Contractor to carry out the provisions of the Contract or the Engineer may allow work to continue and withhold future estimate payments as stated above.
- J. If the issue cannot be resolved and work is suspended, the Contractor may appeal the decision of the Engineer to the Owner. The Owner will render a final decision on this issue determined in Owner's sole discretion.
- K. It will be the responsibility of the Contractor to notify the Engineer when payment has been made. The Engineer will verify the payment with the subcontractor to ensure payment was received.
- L. The Contractor shall not withhold more than ten (10) percent retainage from subcontractors.
- M. Any administrative costs incurred by the Owner or Engineer will be deducted from the Contractor's retainage at the conclusion of the project.
- N. Nothing in these Special Provisions will prevent the subcontractor from pursuing a claim with the surety under the Contractor's payment bond at any time.

SP-26 INSURANCE REQUIREMENTS

Insurance requirements are specified within the General Conditions.

SP-27 NOT USED

SP-28 NOT USED

SP-29 SPECIAL WARRANTY PROVISIONS

The warranty of construction for this Contract is for one (1) year from the date of Final Completion as specified in SP-2. Warranties or guarantees of longer duration for specific products or work specified in the Technical Provisions of this Contract shall be for the period of time for same set forth in the Technical Provisions. If any conflict exists between the time frame specified in the Warranty GP-4.5 and warranties or guarantees in the Technical Provisions, the time frames in the Technical Provisions shall apply.

END OF SPECIAL PROVISIONS

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TECHNICAL PROVISIONS

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100% SUBMITTAL
TWO GATE FISH PROTECTION PLAN
BACON ISLAND, CALIFORNIA

TECHNICAL SPECIFICATION INDEX

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DIVISION 2 – SITE WORK

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DIVISION 3 – CONCRETE

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* Specification sections pending additional definition

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SECTION 01100

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The Two Gate Fish Protection Plan Project is intended to provide temporary demonstration of delta species protection during pumping operations in the San Joaquin River Delta. The two gate facilities are located as shown on the drawings at the Old River Branch of the San Joaquin River and Connection Slough between Mandeville Island and Bacon Island.

The project consists of the provision and installation, operation, and subsequent removal of barges with top mounted butterfly gates to temporarily control water circulation to benefit certain delta fish species while permitting passage of private and commercial watercraft through the area. The project entails dredging and constructing suitable bedding for the barges, providing and placing of the barges with the gate assemblies, construction of sheet pile walls between the shorelines and the barges and the construction of suitable small craft haul-out facilities for crossing the barrier when the gates are closed. The project also includes the provision and construction of all necessary ancillary improvements including electrical generation and distribution, hydraulic gate operating systems, operator house and facilities, lighting, signage and fencing all as shown on the contract plans.

The base contract for the project includes the furnishing, installation, operation (year one), and removal of the two gate facilities. Optional bid items include interim removal, reinstallation, manning, and operation of the project as described in the Pricing Schedule.

1.1.2 Location

The work is located at Bacon Island in the Sacramento-San Joaquin River Delta, California, as indicated on the plans.

1.2 CONTRACT DRAWINGS

The following drawings accompany this specification and are a part hereof.

Drawings titled TWO GATE FISH PROTECTION PLAN

Electronic copies (pdf) of the contract drawings and specifications will be furnished to the Contractor without charge. Reference publications will not be furnished.

Contractor shall immediately check furnished drawings and notify the Owner of any discrepancies.

1.3 OCCUPANCY OF PREMISES

Before work is started, the Contractor shall arrange with the Owner a means of access, space for storage of Contractor's materials and equipment, and use of adjacent properties, and roadways and waterways.

1.4 ON-SITE PERMITS

Contractor is responsible for complying with all regulatory and local jurisdictional permits necessary for the performance of the work.

Permits shall be posted at a conspicuous location in the construction area.

Any burning of trash or rubbish shall be done in strict compliance with requirements established by the authority having jurisdiction.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 PAYMENT ITEMS

Payment items for the work of this contract will be made as listed in the PRICING SCHEDULE and described below, however, payment will only be made for the primary payment items specified herein (i.e. items number 1 - 14 only). Payment will not be made for all sub-items shown on the PRICING SCHEDULE (i.e. items number 1.1 - 1.3, 2.1 - 2.13, 3.1 - 3.2, 4.1 - 4.7, 5.1 - 5.3, 6.1 - 6.14, 7.1 - 7.2, 8.1 - 8.7, 9.1 - 9.5, 10.1 - 10.5, 11.1 - 11.2, 12.1 - 12.5, 13.1 - 13.5, and 14.1 - 14.2). All sub-item pricing is required for contract negotiation purposes and will not be used as a basis for payment. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.2 BASE BID PAYMENT ITEMS

Base Bid payment items for the work of this contract will be made as listed in the PRICING SCHEDULE and described below.

1.2.1 Item #1 - Barge Construction (sum 1.1 - 1.3)

1.2.1.1 Payment

Payment will be made for costs associated with equipment, materials and labor necessary for construction of the Old River barge, including all required barge modifications, gates, appurtenances, and delivery to the project site.

1.2.1.2 Unit of Measure

Unit of measure: lump sum.

1.2.2 Item #2 - Site Installation - Old River (sum 2.1 - 2.13)

1.2.2.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for site installation at the Old River location, including all barge installation, and all other construction shown on the plans.

1.2.2.2 Unit of Measure

Unit of measure: lump sum.

1.2.3 Item #3 - Gate Operation (sum 3.1 - 3.2)

1.2.3.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for gate operation at the Old River location, including barge rental from completion of Site Installation and prior to barrier removal (final or interim).

1.2.3.2 Unit of Measure

Unit of measure: lump sum.

1.2.4 Item #4 - Complete Barrier Removal (sum 4.1 - 4.7)

1.2.4.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for complete barrier removal at the Old River location, including all removal activities shown on the plans.

1.2.4.2 Unit of Measure

Unit of measure: lump sum.

1.2.5 Item #5 - Barge Construction (sum 5.1 - 5.3)

1.2.5.1 Payment

Payment will be made for costs associated with equipment, materials and labor necessary for construction of the Connection Slough barge, including all required barge modifications, gates, appurtenances, and delivery to the project site.

1.2.5.2 Unit of Measure

Unit of measure: lump sum.

1.2.6 Item #6 - Site Installation - Connection Slough (sum 6.1 - 6.14)

1.2.6.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for site installation at the Connection Slough location, including all barge installation, and all other construction shown on the plans.

1.2.6.2 Unit of Measure

Unit of measure: lump sum.

1.2.7 Item #7 - Gate Operation (sum 7.1 - 7.2)

1.2.7.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for gate operation at the Connection Slough location,

including barge rental from completion of Site Installation and prior to barrier removal (final or interim).

1.2.7.2 Unit of Measure

Unit of measure: lump sum.

1.2.8 Item #8 - Complete Barrier Removal (sum 8.1 - 8.7)

1.2.8.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for complete barrier removal at the Connection Slough location, including all removal activities shown on the plans.

1.2.8.2 Unit of Measure

Unit of measure: lump sum.

1.3 OPTIONAL PAYMENT ITEMS

Optional payment items for the work of this contract will be made as listed in the PRICING SCHEDULE and described below.

1.3.1 Item #9 - Interim Removal - Old River (sum 9.1 - 9.5)

1.3.1.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for interim barrier removal at the Old River location, including all removal and storage activities shown on the plans.

1.3.1.2 Unit of Measure

Unit of measure: per each.

1.3.2 Item #10 - Interim Reinstallation - Old River (sum 10.1 - 10.5)

1.3.2.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for interim reinstallation at the Old River location, including all barge installation, and all other construction shown on the plans.

1.3.2.2 Unit of Measure

Unit of measure: per each.

1.3.3 Item #11 - Interim Gate Operation - Old River (sum 11.1 - 11.2)

1.3.3.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for interim gate operation at the Old River location, including barge rental from completion of site installation (initial or interim) and prior to barrier removal (final or interim).

1.3.3.2 Unit of Measure

Unit of measure: per each.

1.3.4 Item #12 - Interim Removal - Connection Slough (sum 12.1 - 12.5)

1.3.4.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for interim barrier removal at the Connection Slough location, including all removal and storage activities shown on the plans.

1.3.4.2 Unit of Measure

Unit of measure: per each.

1.3.5 Item #13 - Interim Reinstallation - Connection Slough (sum 13.1 - 13.5)

1.3.5.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for interim reinstallation at the Connection Slough location, including all barge installation, and all other construction shown on the plans.

1.3.5.2 Unit of Measure

Unit of measure: per each.

1.3.6 Item #14 - Interim Gate Operation - Connection slough (sum 14.1 - 14.2)

1.3.6.1 Payment

Payment will be made for costs associated with equipment, material, and labor necessary for interim gate operation at the Connection Slough location, including barge rental from completion of site installation (initial or interim) and prior to barrier removal (final or interim).

1.3.6.2 Unit of Measure

Unit of measure: per each.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01320

PROJECT SCHEDULE

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Project Schedule

Scheduling Engineer Qualifications

1.2 QUALITY ASSURANCE

Designate an authorized representative to be responsible for the preparation of the schedule and all required updating (activity status) and preparation of reports. The authorized representative shall be experienced in scheduling for projects similar in nature and complexity to this project and shall be experienced in the use of the scheduling software that meets the requirements of this specification.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Prepare for approval a Project Schedule, as specified herein. Show in the schedule the sequence in which the Contractor proposes to perform the work and dates on which the Contractor contemplates starting and completing all schedule activities. The scheduling of the entire project, including the design and construction sequences, is required. The scheduling of design and construction is the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Designers, Subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. Provide a schedule that is a forward planning tool as well as a project monitoring tool.

3.1.1 Approved Project Schedule

Use the approved Project Schedule to measure the progress of the work and to aid in evaluating time extensions. Make the schedule activity coded. If the Contractor fails to submit any schedule within the time prescribed, the Owner may withhold approval of progress payments until the Contractor submits the required schedule.

3.1.2 Schedule Status Reports

Provide a Schedule Status Report on at least a monthly basis, accompanying progress payments. If, in the opinion of the Owner, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress including those that may be required by the Owner, without additional cost to the Owner. In this circumstance, the Owner may require the Contractor to increase the number of shifts, overtime operations, days of work, and to submit for approval any supplementary schedule or schedules as the Owner deems necessary to demonstrate how the approved rate of progress will be regained. In the event schedule revisions are directed by the Owner and those revisions have not been included in subsequent revisions or updates, the Owner may hold retainage up to the maximum allowed by contract, each payment period, until such revisions to the Project Schedule have been made.

3.1.3 Default Terms

Failure of the Contractor to comply with the requirements of the Owner shall be grounds for a determination, by the Owner, that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Owner may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

3.2 PROJECT SCHEDULE DETAILED REQUIREMENTS

The computer software system utilized to produce and update the Project Schedule shall be capable of meeting all requirements of this specification. Failure of the Contractor to meet the requirements of this specification will result in the disapproval of the schedule.

3.2.1 Critical Path Method

Use the Critical Path Method (CPM) of network calculation to generate the Project Schedule. Prepare the Project Schedule using the Precedence Diagram Method (PDM).

3.2.2 Level of Detail Required

Develop the Project Schedule to an appropriate level of detail. Failure to develop the Project Schedule to an appropriate level of detail, as determined by the Owner, will result in its disapproval. The Owner will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

3.2.2.1 Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods.

3.2.2.2 Design and Permit Activities

Include design and permit activities with the necessary conferences and follow-up actions and design package submission dates. Include the design schedule in the project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period.

This shall be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. The schedule shall include review and correction periods associated with each item.

3.2.2.3 Procurement Activities

The schedule must include activities associated with the submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days. A typical procurement sequence includes the string of activities: submit, approve, procure, fabricate, and deliver.

3.2.2.4 Mandatory Tasks

The following tasks must be included and properly scheduled:

- a. Submission, review and acceptance of design packages.
- b. Submission of mechanical and electrical systems layout drawings.
- c. Submission and approval of O & M manuals.
- d. Submission and approval of as-built drawings.
- e. Submission and approval of installed equipment lists.
- f. Submission and approval of testing.
- g. Controls testing.
- h. Performance Verification testing.
- i. Other systems testing, if required.
- j. Contractor's pre-final inspection.
- k. Correction of punch list from Contractor's pre-final inspection.
- l. Final inspection.

3.2.2.5 Owner Activities

Show Owner and other agency activities that could impact progress. These activities include, but are not limited to: approvals, design reviews, environmental permit approvals by State regulators, inspections, Owner Furnished Equipment (OFE) and Notice to Proceed (NTP) for phasing requirements.

3.2.3 Scheduled Project Completion and Activity Calendars

The schedule interval shall extend from Notice to Proceed (NTP) date to the required contract completion date. The contract completion activity (End Project) shall finish based on the required contract duration in the accepted contract proposal, as adjusted for any approved contract time extensions. The first scheduled work period shall be the day after NTP is

acknowledged by the Contractor. Schedule activities on a calendar to which the activity logically belongs. Activities may be assigned to a 7 day calendar when the contract assigns calendar day durations for the activity such as an Owner Acceptance activity. If the Contractor intends to perform physical work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and holidays. Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive. Original durations must account for anticipated normal adverse weather. The Owner will interpret all work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform work during those periods.

3.2.3.1 Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. Include as the first activity in the project schedule an activity called "Start Project"(or NTP). The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, and zero day duration.

3.2.4 Milestones

The schedule must include milestone activities for each significant project event including but not limited to: start and completion of dredging at each site, barge modification start and completion, barge deliver and placement, pile and sheet pile driving start and completion, upper works fabrication and installation, concrete works start and completion and electrical works start and completion. The beginning and completion of the placement of toe berm material and disposal of dredged material shall also be shown as well as all other significant work milestones.

3.3 PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below.

3.3.1 Preliminary Project Schedule Submission

Submit the Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days for approval within 15 calendar days after the NTP is acknowledged. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Owner acceptance of the associated design package(s) and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (FOW1, FOW2, FOW3).

3.3.2 Design Package Schedule Submission

With each design package submitted to the Owner, submit a schedule extracted from the then current schedule which covers the activities associated with that Design Package including construction, procurement and permitting activities.

3.3.3 Periodic Schedule Updates

Submit monthly schedule updates. These submissions will enable the Owner to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Owner or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made. Update the schedule to include detailed, lower WBS level construction activities as the design progresses, but not later than the submission of the final, un-reviewed design submission for each separate design package. The Owner may require submission of detailed schedule activities for any distinct construction that is started prior to submission of a final design submission, if such activity is authorized.

3.4 SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, and every Periodic Schedule Update throughout the life of the project:

3.4.1 Network Diagram

The network diagram is required for the Preliminary, Initial and Periodic Updates. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Owner will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.4.1.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

3.4.1.2 Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.4.1.3 Critical Path

Clearly show the critical path.

3.5 WEEKLY PROGRESS MEETINGS

- a. The Owner and the Contractor shall meet weekly (or as otherwise mutually agreed to) for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. The then

current and approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The Contractor's Project Manager and the Authorized Representative of the Owner shall attend. The weekly progress meeting will address the status of RFI's, RFP's and Submittals.

- b. Provide a bar chart produced by the scheduling software, organized by Total Float and Sorted by Early Start Date, and a two week "look-ahead" schedule by filtering all schedule activities to show only current ongoing activities and activities schedule to start during the upcoming two weeks, organized by Work Area Code (AREA) and sorted by Early Start Date.
- c. The Owner and the Contractor shall jointly review the reports. If it appears that activities on the longest path(s) which are currently driving the calculated completion date (driving activities), are not progressing satisfactorily and therefore could jeopardize timely project completion, corrective action must be taken immediately. Corrective action includes but is not limited to: increasing the number of work crews; increasing the number of work shifts; increasing the number of hours worked per shift; and determining if Owner responsibility coded activities require Owner corrective action.

-- End of Section --

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SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

The Owner may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's shall check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to a notice to proceed commencing work on site. Submittals required prior to the start of the next major phase of the construction on a multi-phase contract. Schedules or tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to contract notice to proceed or next major phase of construction.

Certificates of insurance
Surety bonds
List of proposed subcontractors
List of proposed products
Construction Progress Schedule
Submittal register
Schedule of prices
Health and safety plan
Work plan
Quality control (QC) plan
Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.1.2 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2 SUBMITTALS

Submit the following in accordance with this section.

SD-01 Preconstruction Submittals

Submittal register

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1 Designer of Record Approved

Designer of Record approval is required for extensions of design, critical materials, any deviations from the solicitation, the accepted proposal, or the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Owner. Contractor to provide the Owner with the number of copies designated hereinafter of all Designer of Record approved submittals. The Owner may review any or all Designer of Record approved submittals for conformance to the Solicitation and Accepted Proposal. The Owner will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below.

1.3.2 Owner Approved

Owner approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Owner. Owner approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Owner.

1.3.3 Information Only

Submittals not requiring Owner approval will be for information only.

1.4 PREPARATION

1.4.1 Transmittal Form

Submittals shall be transmitted with cover form and numbering system approved by the owner.

1.5 QUANTITY OF SUBMITTALS

1.5.1 Number of Copies of Shop Drawings

Submit four 4 copies of all submittals of shop drawings.

1.5.2 Number of Copies of Operation and Maintenance Data

Submit three 3 copies of O&M Data to the Owner for review and approval.

1.6 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned.

1.7 VARIATIONS / SUBSTITUTION REQUESTS

Variations from contract requirements require Owner approval and will be considered where advantageous to the Owner.

1.7.1 Considering Variations

Discussion with Owner prior to submission will help ensure functional and quality requirements are met and minimize rejections and re-submittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the Owner requiring rejection and removal of such work at no additional cost to the Owner.

1.7.2 Proposing Variations

When proposing variation, deliver written request to the Owner, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to the Owner. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.7.3 Warranting That Variations Are Compatible

When delivering a variation for approval, Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.7.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Owner of submittals with variations.

1.8 SUBMITTAL REGISTER

Prepare and maintain a submittal register, as the work progresses. The register format shall be agreed to by the owner prior to first submittal.

1.9 SCHEDULING

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

- a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential re-submittal of requirements.
- b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in

the register and annotate it "N/A" with a brief explanation. Approval by the Owner does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A".

- c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.
- d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."
- e. Allow 10 working days for Owner's review of all submittals.

1.10 DISAPPROVED OR REJECTED SUBMITTALS

Contractor shall make corrections required by the Owner. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes" is to be given to the Owner. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Owner requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.11 APPROVED/ACCEPTED SUBMITTALS

The Owner's approval or acceptance of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist.

1.12 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, the Contractor to assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Owner reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

Approval of the Contractor's samples by the Owner does not relieve the Contractor of his responsibilities under the contract.

1.13 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained. No payment for materials incorporated in the work will be made if all required Owner approvals have not been obtained.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01343

SAFETY PROGRAM REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

The contractor shall develop a project safety program as necessary to maintain and perform the project in a safe manner in accordance with the California State Labor Code and Cal-OSHA standards. Further, for the periods of construction, installation and removal, the contractor shall assign a project safety representative meeting the requirements of paragraph 1.3 below.

1.2 REFERENCES

California State Labor Code 62.7 and 6314.1.

1.3 SAFETY REPRESENTATIVE

a. Requirements:

The contractor shall employ and shall designate a Safety Representative who is qualified and has received an OSHA Certificate evidencing a minimum of 8 hours of OSHA-Competent Person Training. This Representative may also have collateral duties onsite, and shall be Capable of:

1. Identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and the general public, and
2. who has authorization to take prompt corrective measures to eliminate them, and
3. aggressively and effectively implement and maintain the Contractor's Safety Program or site-specific Injury and Illness Prevention Program and
4. shall spend 100% of their time present during all work on site in overseeing field

SECTION 01400

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 SCOPE

Contractor shall provide quality control for all materials and workmanship during the construction of the Two Gate Fish Protection Facility. This quality control shall be provided through a combination of contractor's staff inspection and contracted inspection and testing services as appropriate and necessary to provide a complete quality project meeting all applicable codes and specific contract requirements.

1.2 REFERENCES

- a. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2007a.
- b. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2004a.
- c. ASTM E 329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2007a.
- d. ASTM E 543 - Standard Specification for Agencies Performing Nondestructive Testing; 2008.

1.3 SUBMITTALS

As further described in SECTION 01330 Submittal Procedures, contractor shall submit the following:

- a. Testing Agency Qualifications:
 - (1) Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - (2) Submit copy of report of laboratory facilities inspection made during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- b. Contractor's Staff Inspector - Submit resume of any staff performing inspection services for the project. Resume should indicate years of experience and recent projects where similar inspection services were performed.
- c. Test Reports: After each test/inspection, promptly submit copies of reports to the Owner.
 - (1) Include:
 - a. Date issued.
 - b. Project title and number.

- c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
- (2) Test report submittals are for the Owner's information only.
- d. Certificates: When specified in individual specification sections, submit certification by the manufacturer, Contractor, or installation/application subcontractor to Owner.
 - (1) Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate. Include chemical composition, mechanical properties or other characteristics of materials.
 - (2) Certificates may be recent or previous test results on material or product, but must be acceptable to the Owner.
 - e. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
 - f. Manufacturer's Field Reports: Submit reports for Owner.
 - (1) Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
 - g. Erection Drawings: Submit drawings for Owner.
 - (1) Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.5 REFERENCES AND STANDARDS

- a. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- b. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by

applicable code.

- c. Obtain copies of standards where required by product specification sections.
- d. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- e. Should specified reference standards conflict with Contract Documents, request clarification from Owner before proceeding.

1.6 TESTING AND INSPECTION AGENCIES

- a. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform specified testing.
- b. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- c. Contractor Employed Agency:
 - (1) Testing agency: Comply with requirements of ASTM E 329, ASTM E 543, ASTM C 1021, ASTM C 1077, and ASTM C 1093.
 - (2) Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - (3) Laboratory: Authorized to operate in California.
 - (4) Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - (5) Testing Equipment: Calibrated at reasonable intervals under a laboratory measurement quality assurance program.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

- a. Monitor quality control over employees, staff, suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- b. Comply with manufacturers' instructions, including each step in sequence.
- c. Should manufacturers' instructions conflict with Contract Documents, request clarification from Owner before proceeding.
- d. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

- e. Have Work performed by persons qualified to produce required and specified quality.
- f. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- g. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.3 TOLERANCES

- a. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- b. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Owner before proceeding.
- c. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

- a. See individual specification sections for testing required.
- b. Testing Agency Duties:
 - (1) Test samples of mixes submitted by Contractor.
 - (2) Provide qualified personnel at site. Cooperate with Owner and Contractor in performance of services.
 - (3) Perform specified sampling and testing of products in accordance with specified standards.
 - (4) Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - (5) Promptly notify Contractor of observed irregularities or non-conformance of Work or products.
 - (6) Perform additional tests and inspections required by Owner.
 - (7) Attend preconstruction meetings and progress meetings.
 - (8) Submit reports of all tests/inspections specified.
- c. Limits on Testing/Inspection Agency Authority:
 - (1) Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- d. Contractor Responsibilities:
 - (1) Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - (2) Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

- (3) Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
- (4) Notify laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
- (5) Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- e. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Owner.
- f. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.5 MANUFACTURERS' FIELD SERVICES

- a. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.
- b. Submit qualifications of observer to Owner 30 days in advance of required observations.
 - (1) Observer subject to approval of Owner.
- c. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.6 DEFECT ASSESSMENT

- a. Replace Work or portions of the Work not conforming to specified requirements.
- b. If, in the opinion of Owner, it is not practical to remove and replace the Work, Contractor will provide suggested remedy for Owner's consideration. Any such remedy will not proceed without Owner's approval.

- END OF SECTION -

SECTION 01574
ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

The work of this section consists of furnishing all transportation, labor, materials, engineering controls, equipment and incidentals necessary to institute and maintain proper environmental protection measures in accordance with local, State and Federal Regulations.

1.02 MEASUREMENT PROCEDURES

No separate measurement will be made for any items in this section. They will be considered incidental to and included in the prices for other items provided in the Proposal and Bid.

1.04 SUBMITTALS

- a. Submittals shall be in accordance with Section 01330 (01 33 00) - Submittal Procedures, and include the following information:
 - 1. Pre-construction survey report noting any environmental conditions of concern that differ from those reflected on the contract drawings.
 - 2. Storm Water Pollution Prevention Plan (SWPPP) as described in Article 3.03.

1.05 ENVIRONMENTAL PROTECTION REQUIREMENTS

- a. Furnish and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, state, and local regulations pertaining to the environment, including but not limited to water, air, and noise pollution.
- b. Pre-construction Survey
 - 1. Prior to commencing on-site work, perform a preconstruction survey of the project site with the Owner and site property owners and take photographs showing existing environmental conditions in and adjacent to the site. Prepare and submit a report documenting the observed conditions and specifically identifying any conditions that differ from those reflected on the contract drawings.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 PROTECTION OF NATURAL RESOURCES

- a. Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.
- b. Water Resources
 1. Prevent oily or other hazardous substances from entering the ground, drainage areas, or harbor. All temporary petroleum storage tanks, paint and chemical storage or transformers shall be maintained within impervious containment structures of sufficient size and strength to contain the contents of the tanks and containers in the event of leakage or spillage.

3.02 HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

If during construction activities, items are observed that may have historic or archaeological value, human remains or associated objects are discovered, such observations shall be reported immediately to the Engineer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall prevent his employees from trespassing on, removing, or otherwise disturbing such resources.

3.03 EROSION, SEDIMENT AND STORMWATER CONTROL MEASURES

- a. The Contractor shall prepare a Stormwater Pollution Prevention Plan (SWPPP) and implement those Best Management Practices (BMP's) described within the Plan at all times. The City has developed a standard construction SWPPP Checklist which provides checklists and a "fill in the blank" format that can be adapted for use at the construction project site. A copy of the SWPPP checklist is provided in the Appendix _____. Contractor may make additions to the SWPPP as he deems appropriate to address the work.
- b. A copy of the completed SWPPP checklist shall be submitted to the Engineer 14 days prior to the start of construction activities. Upon approval of the SWPPP checklist, the Contractor shall be responsible for installing, constructing, implementing, and maintaining all control measures described in the SWPPP. The Contractor shall perform visual observations, as required to verify that all control measures are implemented and performing properly. If control measures being implemented by the Contractor are inadequate to control water pollution effectively, the Engineer may require the Contractor to revise the operations and amend the SWPPP. All records shall remain on site and shall be readily accessible for review by the City and any responsible state or federal agencies.

- c. The Contractor shall submit to the Engineer an amended SWPPP whenever there is a change in construction or operations which may affect the discharge of significant quantities of pollutants to surface waters, ground waters, or a municipal storm water management system. The Contractor shall give immediate notice to the Engineer of any planned changes in construction activity that may result in noncompliance.

3.04 CONTROL AND DISPOSAL OF SOLID AND SANITARY WASTES

- a. Pick up solid wastes, rubbish, debris and garbage and place in containers which are regularly emptied offsite. Prevent contamination of the site or other areas when handling and disposing of wastes. On completion, leave the areas clean.
- b. Sewage, Odor, and Pest Control - Provide sanitary facilities for the use of persons employed on the work. Include provisions for pest control and elimination of odors.

3.05 DUST CONTROL

The Contractor shall prevent the generation of airborne dust particles and comply with all regulatory air quality requirements. Keep dust down at all times, including during non-working periods and during work performed by third parties.

3.06 NOISE

Contractor shall be aware of the proximity of private residences in the area and therefore control noise so as to avoid adversely impacting these private residences.

3.07 HAZARDOUS WASTE GENERATION AND DISPOSAL

Handle and dispose of generated hazardous waste in accordance with all applicable local, state and federal laws and regulations.

END OF SECTION

SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SUBMITTALS

SUBMITTAL PROCEDURES:

SD-03 Product Data

As-Built Record of Equipment and Materials

Two 2 copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

Warranty Management Plan

One set of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

Spare Parts Data

Two 2 copies of list that indicates manufacturer's name, part number, nomenclature, and stock level recommended for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

SD-08 Manufacturer's Instructions

Preventative Maintenance and Condition Monitoring (Predictive Testing) and Inspection schedules with instructions that state when systems should be retested.

SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals in accordance with paragraph entitled, "Operation and Maintenance," of this section.

SD-11 Closeout Submittals

Record Drawings

Drawings showing final as-built conditions of the project. The final CADD record drawings must consist of one set of electronic CADD drawing files in the specified format and one set of the approved working Record drawings.

1.2 PROJECT RECORD DOCUMENTS

1.2.1 Record Drawings

This paragraph covers record drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working record drawings" and "final record drawings" refer to contract drawings which are revised to be used for final record drawings showing as-built conditions.

1.2.1.1 Working Record and Final Record Drawings

Revise 1 set of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings after the completion of each definable feature of work. The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Owner and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final record drawings as specified herein, the Owner will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the record drawings. This monthly deduction will continue until an agreement can be reached between the Owner and the Contractor regarding the accuracy and completeness of updated drawings. Show on the working and final record drawings, but not limited to, the following information:

- a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.
- b. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.
- c. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
- d. Changes or modifications which result from the final inspection.
- e. Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.

- f. Modifications (include within change order price the cost to change working and final record drawings to reflect modifications) and compliance with the following procedures.
- (1) Follow directions in the modification for posting descriptive changes.
 - (2) Place a Modification Delta at the location of each deletion.
 - (3) For new details or sections which are added to a drawing, place a Modification Delta by the detail or section title.
 - (4) For minor changes, place a Modification Delta by the area changed on the drawing.
 - (5) For major changes to a drawing, place a Modification Delta by the title of the affected plan, section, or detail at each location.
 - (6) For changes to schedules or drawings, place a Modification Delta either by the schedule heading or by the change in the schedule.
 - (7) The Modification Delta size shall be 1/2 inch diameter unless the area where the delta is to be placed is crowded. Smaller size delta shall be used for crowded areas.

1.2.1.2 Drawing Preparation

Modify the record drawings as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project and must be returned to the Owner after approval by the Owner. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Owner.

1.2.1.3 Computer Aided Design and Drafting (CADD) Drawings

Only employ personnel proficient in the preparation of CADD drawings to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CADD files. The Contractor will be furnished "as-designed" drawings in AutoCAD 2004 format compatible with a Windows XP operating system. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). Provide all program files and hardware necessary to prepare final record drawings.

The Owner will review final record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

- a. Provide CADD "base" colors of red, green, and blue. Color code for changes as follows:
 - (1) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.
 - (2) Additions (Green) - Added items, lettering in notes and leaders.
 - (3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.
- b. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Mark all other contract drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date original contract drawings in the revision block.
- c. Within 20 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic files on compact disc, read-only memory (CD-ROM), one set of Mylar's, two sets of blue-line prints and one set of the approved working record drawings. They must be complete in all details and identical in form and function to the contract drawing files supplied by the Owner. Any transactions or adjustments necessary to accomplish this are the responsibility of the Contractor. The Owner reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Owner upon final approval. Failure to submit final record drawing files and marked prints as specified will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made to the Contractor.

1.2.1.4 Payment

No separate payment will be made for record drawings required under this contract, and all costs accrued in connection with such drawings are considered a subsidiary obligation of the Contractor.

1.2.2 As-Built Record of Equipment and Materials

Furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2days after final inspection with Owner comments. Submit 2 sets of final record of equipment and materials 10 days after final inspection. Key the designations to the related area depicted on the contract drawings. List the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used
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1.2.3 Real Property Equipment

Furnish a list of installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. In the "EQUIPMENT-IN-PLACE LIST" include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Furnish a draft list at time of transfer. Furnish the final list 30 days after transfer of the completed facility.

1.3 SPARE PARTS DATA

Indicate manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

Supply 1 item of each part for spare parts inventory. Provision of spare parts does not relieve the Contractor of responsibilities listed under the contract guarantee provisions.

1.4 PREVENTATIVE MAINTENANCE

Submit Preventative Maintenance and Condition Monitoring and Inspection schedules with instructions that state when systems should be retested.

Define the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a signoff blank for the Contractor and Owner for each test feature; e.g., gpm, rpm, psi. Include a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventative maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair.

Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.5 WARRANTY MANAGEMENT

1.5.1 Warranty Management Plan

Include within the warranty management plan, but not limited to, the following:

- a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the contractors, sub-contractors, manufacturers or suppliers involved.
- b. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include balancing, pumps, motors, transformers, and for all commissioned systems.
- c. A list for each warranted equipment, item, feature of construction, or system indicating:
 - (1) Name of item.
 - (2) Model and serial numbers.
 - (3) Location where installed.
 - (4) Name and phone numbers of manufacturers or suppliers.
 - (5) Names, addresses and telephone numbers of sources of spare parts.
 - (6) Warranties and terms of warranty. Include one-year overall warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
 - (7) Cross-reference to warranty certificates as applicable.
 - (8) Starting point and duration of warranty period.
 - (9) Summary of maintenance procedures required to continue the warranty in force.
 - (10) Cross-reference to specific pertinent Operation and Maintenance manuals.
 - (11) Organization, names and phone numbers of persons to call for warranty service.
 - (12) Typical response time and repair time expected for various warranted equipment.
- d. Procedure and status of tagging of all equipment covered by extended warranties.
- e. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.5.2 Performance Bond

The Contractor's Performance Bond must remain effective throughout the contract period.

- a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Owner will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Owner while performing the work, including, but not limited to administrative expenses.
- b. In the event sufficient funds are not available to cover the construction warranty work performed by the Owner at the Contractor's expense, the Owner will have the right to recoup expenses from the bonding company.

- c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Owner to proceed against the Contractor.

1.6 OPERATION AND MAINTENANCE MANUALS

Operation and Maintenance Manuals must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Bind information in manual format and grouped by technical sections. Test data must be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for vendor data and manuals must have 0.3937-inch holes and be bound in 3-ring, loose-leaf binders. Organize data by separate index and tabbed sheets, in a loose-leaf binder. Binder must lie flat with printed sheets that are easy to read. Caution and warning indications must be clearly labeled.

Submit classroom and field instructions in the operation and maintenance of systems equipment where required by the technical provisions. Owner will be given 7 calendar days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor, such as lists, static exhibits, and visual aids, must be made available to the Owner.

Submit 2 copies of the project operation and maintenance manuals 30 calendar days prior to testing the system involved. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

1.7 CLEANUP

Provide final cleaning in accordance with ASTM E 1971. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning and bathroom cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project. Promptly and legally transport and dispose of any trash. Do not burn, bury, or otherwise dispose of trash on the project site.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01800

BARRIER OPERATING AND PERSONNEL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

The work under this section of the Specifications consists of furnishing labor, materials, appliances, tools and equipment to operate the two barriers during the contract period.

1.2 REFERENCES

- a. All Regulatory Agency Permits and their conditions.
- b. U.S. Coast Guard Notice-to-Mariners

1.3 SUBMITTALS

General:

- a. Resumes for all on-site staff including work experience and results of recent medical check-up including sight and hearing test results.
- b. Listing of all service companies including but not limited to generator supplier, fuel supplier and sanitary service provider.
- c. Specifications and description of boat ramp vehicle and trailer.
- d. Telephone numbers and service provider for 24-hr. toll-free phones.

1.4 OPERATING PERIODS

The barriers will be in operation 24 hours a day, 7 days a week generally from date of installation through June, at which time they will be removed and possibly reinstalled later that year prior to December 1st. Following installation, and during the period of December through June, prior to removal, the barriers will be manned and operated 24 hours a day, 7 days per week.

1.5 OPERATING REQUIREMENTS

During the period of operations, the contractor shall provide the following:

- a. Full-time staffing at each barrier site in order to operate the gate and the boat ramp vehicle and trailer simultaneously.
- b. Electrical generators, maintenance and required fuel at each barrier site. Suitable fuel capacity shall be provided to assure 24 hour, 365 day per year electrical operation with sufficient surplus to assure that the generators will not run out of fuel.

- c. Boat ramp vehicle and trailer at each barrier site. Vehicle shall be capable towing a 24 foot long, 10,000 lb. vessel up the each ramp in a safe manner. The trailer shall be universally capable of adjusting to handle a variety of different hull shapes and sizes. One vehicle and trailer shall be furnished at each barrier site.
- d. Sanitary facilities at each barrier site for the use of the operator including appropriate service. Facility shall include wash facilities.
- e. 24 hour, manned toll-free telephone service for boaters to request service or gate opening and regulatory agencies to direct gate operations.
- f. Site security as necessary.
- g. Cleaning and maintenance service to assure that no unsightly debris accumulates at either site on land or in the water.
- h. Maintenance service for all electrical and hydraulic systems including manufacturer's recommended test operations of the generator and mechanical systems.
- i. Full records of each and every gate operation and boat transfer including date, time and description of activity.

1.2 PERSONNEL REQUIREMENTS

Personnel assigned to the facilities shall be capable of operating the gates as intended, safely trailer and tow personal marine vessels, operate hailer, spot light and computer controlled message sign. Personnel shall also maintain lookout for marine traffic, acknowledge sound and visual signals and communicate with boaters and regulatory agency personnel.

It should be noted that access to both sites is through private property and any and all restrictions and requests made by the property owners must be complied with.

The personnel must have the ability to:

- a. Work without close supervision
- b. Learn the operation of the gate facilities
- c. Work harmoniously with the public
- d. Understand and communicate clearly in the English language, both written and oral.
- e. Use proper telephone procedures
- f. Keep records and logs
- g. Legally operate a motor vehicle in the State of California

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

DRAFT

SECTION 02231

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z133.1 (2001) Arboricultural Operations -- Safety Requirements for Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. The Contractor shall apply approved herbicide in accordance with the manufacturer's label to the top surface of stumps designated not to be removed.

3.2 TREE REMOVAL

Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING.

3.3 PRUNING

Upon approval by the Owner, minimal pruning of existing vegetation may occur. Trees designated to remain shall be trimmed only to facilitate construction operations and only to avoid damage to the trees. Limbs and branches to be trimmed shall be pruned according to ANSI-A300 and ANSI Z133.1 standards.

3.4 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing

areas. Material to be grubbed, together with logs and other organic or debris, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for earthwork. Depressions made by grubbing shall be filled with suitable on-site material, as approved by the Owner, and compacted to make the surface conform to the original adjacent surface of the ground.

3.5 DISPOSAL OF MATERIALS

All materials from clearing and grubbing shall become the property of the Contractor, and shall be removed from the project site and disposed of according to applicable requirements.

-- End of Section --

DRAFT

SECTION 02300

EARTHWORK, TOE BERM AND AGGREGATE MATERIALS

PART 1 GENERAL

This work shall consist of all earthwork including but not limited to the conditioning, transport, placement and consolidation of dredged material used as toe berm and furnishing; placing and compacting of aggregate base material on the levee road to protect electrical conduits, and other areas as shown on the plans; furnishing and placing of barge bedding material; and furnishing and placing of rock fill material.

1.1 DEFINITIONS

1.1.1 Satisfactory Materials

Satisfactory materials comprise any materials meeting AASHTO or Caltrans criteria.

1.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter.

1.1.3 Degree of Compaction

Degree of compaction required, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

1.1.4 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits.

1.1.5 Unstable Material

Unstable materials are too wet to properly compact to specified compaction.

1.1.6 Aggregate Base

Material to be placed as roadway surfacing and used as backfill/cover for utilities lines, as indicated on the plans.

1.1.7 Barge Bedding Material

Material to be placed in dredged pocket to provide bedding for barge placement.

1.1.8 Toe Berm Fill

Material placed along the landside toe of the Connection Slough levee as indicated on the plans.

1.1.9 Rock Fill

Rock fill material shall be graded rock material placed to buttress barges in place as indicated on the plans.

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Testing

Within 24 hours of conclusion of physical tests, two copies of test results.

SD-07 Certificates

Certification

Submit certification from the supplier stating that all aggregate materials meet the requirements of this section.

Weigh Tickets

Submit certified weight tickets for each load of aggregate material delivered and placed at the project site.

PART 2 PRODUCTS

2.1 AGGREGATE BASE

Aggregate base material shall meet State Standard Specifications, Section 26-1.02A, Class 2 Aggregate Base, 3/4 inch maximum.

2.1.1 Toe Berm

Mineral soils (not peat) dredged from the Old River site, if any, can be properly moisture conditioned and used as Toe Berm Fill. The material shall be conditioned to meet water content suitable for placement and compaction to 90%.

2.1.2 Barge Bedding

Barge bedding material shall meet State Standard Specifications, Section 19-3.065, Pervious Backfill Material.

2.1.3 Rock Fill

Rock fill material shall be meet State Standard Specifications, Section 72-2.02, Facing Class Rock Slope Protection.

PART 3 EXECUTION

3.1 UNDERGROUND UTILITIES

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.

3.2 GROUND SURFACE PREPARATION

3.2.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Owner, in surfaces to receive fill or in excavated areas. Scarify the surface to a depth of 6 inch before the fill is started.

3.3 TOE BERM MATERIAL

Place toe berm material and compact to at least 90 percent laboratory maximum density. Place material in layers of 12 inches maximum uncompacted thickness. Prepare ground surface on which backfill is to be placed as specified in paragraph GROUND SURFACE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.4 AGGREGATE BASE

Place and compact aggregate base materials to minimum 95 percent laboratory maximum density. Prepare ground surface on which backfill is to be placed as specified in paragraph GROUND SURFACE PREPARATION. Finish compaction by pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.5 FINISHING

Finish the surface of all earthwork to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated. Repair graded or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.6 TESTING

3.6.1 In-Place Densities

- a. For toe berm and aggregate base, one test per 10,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

3.6.2 Check Tests on In-Place Densities

If ASTM D 2922 is used, check in-place densities by ASTM D 1556 at a location already tested by ASTM D 2922 and at least one additional test using ASTM D 1556 for every 10 tests performed with a nuclear device.

3.7 DISPOSITION OF SURPLUS MATERIAL

Remove from the site surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber. Disposal of all the above material shall be at the responsibility of the Contractor in accordance with local, State, and Federal laws and regulations.

-- End of Section --

DRAFT

SECTION 02325

DREDGING

PART 1 GENERAL

1.1 MATERIAL TO BE REMOVED

The material to be removed is unclassified excavation material, consisting of silt, peat and mud.

1.2 ARTIFICIAL OBSTRUCTIONS

Prior to dredging, the Contractor shall rake the dredge areas and shall remove debris encountered. Debris removed from the dredged area shall be removed from the water. Disposal shall be the responsibility of the Contractor and disposal shall be outside the limits of Owner property.

1.3 QUANTITY OF MATERIAL

The total amount of material to be removed has been estimated based on the limits shown on the plans.

1.4 OVERDEPTH DREDGING

No additional payment will be made for overdepth dredging.

1.5 SIDE SLOPES

Although quantities have been calculated based on vertical side slopes, Contractor should be aware that natural sloping will occur. No additional payment will be made for naturally occurring side slopes.

1.6 PERMIT

The Contractor shall comply with conditions and requirements of the Corps of Engineers Permit and other State or Federal permits.

1.7 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain during the life of the contract, environmental protective measures. Also, provide environmental protective measures required to correct conditions, such as oil spills or debris that occur during the dredging operations. Comply with Federal, State, and local regulations pertaining to water, air, and noise pollution.

1.8 NOT USED

1.9 DREDGE DEPTH

Area shall be dredged to the depths shown on the drawings. All peat material shall be removed from the dredged zone and no projections are permitted above the minimum elevation shown.

PART 2 PRODUCTS

2.1 DREDGING PLAN

Contractor shall submit a dredging plan including sequence of work, dredging equipment and method of handling, transporting, and placing of material.

PART 3 EXECUTION

3.1 INSPECTION

Inspect the work, keep records of work performed, and ensure that gages, targets, ranges, and other markers are in place and usable for the intended purpose. Furnish, at the request of the Owner, boats, boatmen, laborers, and materials necessary for inspecting, supervising, and surveying the work. When required, provide transportation for the Owner and inspectors to and from the disposal area and between the dredging plant and adjacent points on shore.

3.2 CONDUCT OF DREDGING WORK

3.2.1 Order of Work

The Old River Site shall be dredged first. Any peat at that site shall first be removed and placed in the disposal area. All dredged mineral soils (non-peat) from the Old River site will be transported to the disposal site, moisture conditioned, and transported and placed in the toe berm area of the Connection Slough site and placed in accordance with Section 02300 EARTHWORK, TOE BERM AND AGGREGATE MATERIALS.

3.2.2 Interference with Navigation

Minimize interference with the use of channels and passages. The Contractor shall shift or move equipment so as to accommodate the movement of other commercial, law enforcement, and recreational vessels.

3.2.2.1 Compensation for Interruption of Operations

No compensation will be paid for interruption of contractors operations.

3.2.3 Lights

Each night, between sunset and sunrise and during periods of restricted visibility, provide lights for floating plants, pipelines, ranges, and markers. Also, provide lights for buoys that could endanger or obstruct navigation. When night work is in progress, maintain lights from sunset to sunrise for the observation of dredging operations. Lighting shall conform to United States Coast Guard requirements for visibility and color.

3.2.4 Ranges, Gages, and Lines

Furnish, set, and maintain ranges, buoys, and markers needed to define the work and to facilitate inspection. Establish and maintain gages in locations observable from each part of the work so that the depth may be determined. Suspend work when the gages or ranges cannot be seen or followed.

3.2.5 Plant

Maintain the plant, scows, coamings, barges, pipelines, and associated equipment to meet the requirements of the work.

3.2.6 Disposal of Excavated Material

Provide for safe transportation and disposal of dredged materials. Transport and dispose of dredged material in the disposal area designated on the plans for disposal of dredged material. The deposit of dredged materials in unauthorized places is forbidden. Comply with rules and regulations of all project permits.

3.2.7 Safety of Structures

The prosecution of work shall ensure the stability of bulkheads, dikes, levees and other structures lying on or adjacent to the site of the work, insofar as structures may be jeopardized by dredging operations. Repair damage resulting from dredging operations, insofar as such damage may be caused by variation in locations or depth of dredging, or both, from that indicated or permitted under the contract.

3.2.8 Plant Removal

Upon completion of the work, promptly remove plant, including ranges, buoys, piles, and other markers or obstructions.

3.3 MEASUREMENT

3.3.1 Method of Measurement

Dredging will be paid as part of the lump sum items specified in Section 01270 MEASUREMENT AND PAYMENT. No measurement of materials will be made.

3.3.2 Surveys During Progress of Work

Contract depth will be determined by soundings or sweepings taken behind the dredge as work progresses. The Contractor shall take progress soundings or sweepings as directed by the Owner.

3.4 FINAL EXAMINATION AND ACCEPTANCE

As soon as practicable after the completion of areas, which in the opinion of the Owner, will not be affected by further dredging operations. Contractor shall provide evidence that dredging is complete either by final soundings or probings to show all peat is removed and required grade has been achieved. Remove shoals and lumps by dragging the bottom or by dredging.

-- End of Section --

SECTION 02464

STEEL SHEET PILING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 572/A 572M (2007) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal Sheet Piling; G

Detail drawings for sheet piling, including fabricated sections, shall show complete piling dimensions and details, driving sequence and location of installed piling. Detail drawings shall include details of top protection, special reinforcing tips, tip protection, lagging, splices, fabricated additions to plain piles, cut-off method, corrosion protection, and dimensions of templates and other temporary guide structures for installing piling. Detail drawings shall provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.

SD-03 Product Data

Driving; G

Records of the completed sheet piling driving operations. These records shall provide a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling. The format for driving records shall be as directed.

Pile Driving Equipment; G

Complete descriptions of sheet piling driving equipment including hammers, extractors, protection caps and other installation appurtenances, prior to commencement of work.

Pulling and Redriving

The proposed method of pulling sheet piling, prior to pulling any piling.

SD-06 Test Reports

Materials Tests

Certified materials tests reports. Reports showing that sheet piling and appurtenant metal materials meet the specified requirements shall be submitted for each shipment and identified with specific lots prior to installing materials.

SD-11 Closeout Submittals

Pile Driving Record

Record for each sheet pile driven, as specified.

1.3 DELIVERY, STORAGE AND HANDLING

Materials delivered to the site may be new or used and undamaged and shall be accompanied by certified test reports. The manufacturer's logo and mill identification mark shall be provided on the sheet piling as required by the referenced specifications. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities and prevent damage to coatings and corrosion prior to installation.

1.4 QUALITY ASSURANCE

1.4.1 Material Certificates

For each shipment, submit certificates identified with specific lots prior to installing piling. Identification data should include piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.

1.5 EQUIPMENT

Submit descriptions of pile driving equipment and floating plant to be employed in the work to the Owner for approval. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet, templates, and jetting equipment.

Equipment shall be properly lighted and positioned to avoid any impact to navigation in the area.

PART 2 PRODUCTS

2.1 METAL SHEET PILING

Metal sheet piling shall be hot-rolled steel sections conforming to ASTM A 572/A 572M, Grade 50 and shall have 2 section modules of at least 24.2

lineal feet. Used sheet piling shall not exhibit significant pitting or corrosion damage. Used sheet piling shall not have extensive unrepaired cutouts or welding damage and shall not exhibit signs of buckling or bulging. Used piling shall be subject to inspection and approval by the Owner prior to delivery to the site

2.1.1 Interlocks

The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed.

2.1.2 General Requirements

Sheet piling including special fabricated sections shall be full-length sections of the dimensions shown. Fabricated sections shall conform to the requirement and the piling manufacturer's recommendations for fabricated sections.

2.2 APPURTENANT METAL MATERIALS

Metal plates, shapes, bolts, nuts, rivets and other appurtenant fabrication and installation materials shall conform to manufacturer's standards and to the requirements specified in the respective sheet piling standards.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Pile Driving Equipment

Pile driving equipment shall conform to the following requirements.

3.1.1.1 Driving Hammers

Hammers shall be steam, air, or diesel drop, single-acting, double-acting, differential-acting or vibratory type. The driving energy of the hammers shall be as recommended by the manufacturer for the piling weights and subsurface materials to be encountered. Repair any damage to piling caused by improper pile hammer.

3.1.1.2 Jetting Equipment

Jetting will not be permitted.

3.1.2 Interference with Navigation

Minimize interference with the use of channels and passages. The Contractor shall shift or move equipment so as to accommodate the movement of other commercial, law enforcement, and recreational vessels.

3.1.3 Compensation for Interruption of Operations

No compensation will be paid for interruption of contractors operations.

3.1.2.4 Lights

Each night, between sunset and sunrise and during periods of restricted visibility, provide lights for floating plants, pipelines, ranges, and markers. Also, provide lights for buoys that could endanger or obstruct navigation. When night work is in progress, maintain lights from sunset to sunrise for the observation of dredging operations. Lighting shall conform to United States Coast Guard requirements for visibility and color.

3.1.2.5 Ranges, Gages, and Lines

Furnish, set, and maintain ranges, buoys, and markers needed to define the work and to facilitate inspection. Establish and maintain gages in locations observable from each part of the work so that the depth may be determined. Suspend work when the gages or ranges cannot be seen or followed.

3.1.2.6 Plant

Maintain the plant, scows, coamings, barges, pipelines, and associated equipment to meet the requirements of the work.

3.1.3 Placing and Driving

3.1.3.1 Placing

Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings. Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

a. Pilings shall be carefully located as shown. Pilings shall be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to line. Place the pile so the face will not be more than 2 inches from the king pile alignment. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Redrive all heaved piles to the required tip elevation.

b. Temporary wales, templates, or guide structures shall be provided to insure that the pilings are placed and driven to the correct alignment. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the sheet piling until design tip elevation is achieved. Templates shall not move when supporting sheet piling. Fit templates with wood blocking to bear against the web of each alternate sheet pile and hold the sheet pile at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the sheets from warping or wandering from the alignment. Mark template for the location of the leading edge of each alternate sheet pile. If in view, also mark the second level to assure that the piles are vertical and in position. If two guide marks cannot be seen, other means must be used to keep the sheet pile vertical along its leading edge.

3.1.3.2 Driving

Prior to driving, a horizontal line shall be painted on both sides of each piling at a fixed distance from the bottom so that it shall be visible after installation. This line shall indicate the profile of the bottom elevation

of installed pilings and potential problem areas can be identified by abrupt changes in its elevation. Pilings shall be driven with the proper size hammer and by approved methods so as not to subject the pilings to damage and to ensure proper interlocking throughout their lengths.

a. Driving hammers shall be maintained in proper alignment during driving operations by use of leads or guides attached to the hammer. Caution shall be taken in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid interlock-melt or damages. The use of vibratory hammers should be discontinued and impact hammers employed when the penetration rate due to vibratory loading is 1 foot or less per minute.

b. A protecting cap shall be employed in driving when using impact hammers to prevent damage to the tops of pilings. Use cast steel shoe to prevent damage to the tip of the sheet piling. Pilings damaged during driving or driven out of interlock shall be removed and replaced at the Contractor's expense. Owner furnished pilings damaged during driving shall be stored at the site as directed.

c. Pilings shall be driven without the aid of a water jet.

d. Adequate precautions shall be taken to insure that pilings are driven plumb. Where possible, drive Z-pile with the ball end leading. If an open socket is leading, a bolt or similar object placed in the bottom of the interlock will minimize packing material into it and ease driving for the next sheet. If at any time the forward or leading edge of the piling wall is found to be out-of-plumb in the plane of the wall the piling being driven shall be driven to the required depth and tapered pilings shall be provided and driven to interlock with the out-of-plumb leading edge or other approved corrective measures shall be taken to insure the plumbness of succeeding pilings. The maximum permissible taper for any tapered piling shall be 1/8 inch per foot of length.

e. Piles shall be installed using the panel-driving technique or staggered driving. For staggered driving, pilings in each run or continuous length of piling wall shall be driven alternately in increments of depth to the required depth or elevation. No piling shall be driven to a lower elevation than those behind it in the same run except when the pilings behind it cannot be driven deeper. Incrementally sequence driving of individual piles such that the tip of any sheet pile shall not be more than 4 feet below that of any adjacent sheet pile. When the penetration resistance exceeds 1 foot or less per minute with a vibratory hammer, the tip of any sheet pile shall not be more than 2 feet below any adjacent sheet pile.

f. If obstructions restrict driving a piling to the specified penetration the obstructions shall be removed or penetrated with a chisel beam. If the Contractor demonstrates that removal or penetration is impractical the Contractor shall make changes in the design alignment of the piling structure as directed to insure the adequacy and stability of the structure. Pilings shall be driven to depths shown and shall extend up to the elevation indicated for the top of pilings. A tolerance of 2 inches above the indicated top elevation will be permitted.

3.1.4 Cutting-Off and Splicing

Pilings driven to refusal or to the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed at no additional cost to the Owner.

a. The tops of pilings excessively battered during driving shall be trimmed when directed, at no cost to the Owner. Piling cut-offs except for Owner furnished pilings shall become the property of the Contractor and shall be removed from the site.

b. The Contractor shall cut holes in pilings for bolts, rods, drains or utilities as shown or as directed. All cutting shall be done in a neat and workmanlike manner. A straight edge shall be used in cuts made by burning to avoid abrupt nicks. Bolt holes in steel piling shall be drilled or may be burned and reamed by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted.

3.1.5 Inspection of Driven Piling

Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Owner. The Contractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at the Contractor's expense.

3.2 INSTALLATION RECORDS

Maintain a pile driving record for each sheet pile. Indicate on the installation record: installation dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, rates of penetration, final driving resistance, pile locations, tip elevations, ground elevations, cut-off elevations, and any reheading or cutting of piles. Record any unusual pile driving problems during driving. Submit complete records to the Owner.

-- End of Section --

SECTION 02489

BOARDING FLOATS

PART 1 GENERAL

1.1 SECTION INCLUDES

- a. Design, fabrication and installation of boarding float comprised of 8 feet x 20 feet (nominal dimensions) float units.
- b. Aluminum Gangway with toe plate.
- c. Anchor and restraining cables and connection hardware.
- d. Accessories.

1.2 BOARDING FLOAT DESIGN REQUIREMENTS

- a. Floatation: 1) Support total dead load of boarding float including permanently attached accessories, plus a uniform live load of 20 psf., or 2) a vertical live point load of 400 lb. applied at any point on the boarding float deck, but not closer than 12 inches from an edge or end of float, whichever live load controls design. Provide 2 inches minimum freeboard to top of floatation at full live load as reserve buoyancy.
- b. Horizontal Design Load: Provide structure and deck capable of resisting a lateral load of 110 lb. per foot of length to account for wind and water current loads.
- c. Hinge for Dock Modules: Provide structure capable of supporting a horizontally applied bending moment of 30,000 ft. lbs.
- d. Deck and Structural Components: Do not exceed allowable stresses specified in ASTM B 221 for Aluminum Structures, IBC for wood members, AISC Manual of Steel Construction Part 5 for Steel Members.
- e. The walking surface shall be provided with an aggressively non-skid surface. Static coefficient of friction 0.6.
- f. Restraining cable shall be installed at two points:
 - (1) At the offshore end to the float above the toe of the ramp.
 - (2) At the shore end of the shore float.

Connection hardware shall be capable of supporting all anticipated dead, live, wind, and impact loads.

g. Freeboard:

- (1) Dead Load Plus Uniform Live Load: 10 inches minimum at any location.

(2) Dead Load Plus Live Point Load: 8 inches minimum.

(3) Dead Load Only: 16 inches maximum, 14 inches minimum.

h. Allowable Tolerances:

(1) Boarding floats are to float level in water within the following limits:

a. Length: 1/8 inch per foot over the length of an individual boarding float section.

b. Width: 1 inch maximum over the width of the boarding float.

(2) All decking, walers, spacers or other member subject to foot traffic shall be flush with the walking surface (+ 1/4 inch).

(3) Each float shall be flush with the adjacent float (+ 1/4 inch).

1.3 GANGWAY DESIGN REQUIREMENTS

a. The gangway ramps shall be fitted with a bull rail on each side of the walking surface having the same length as the walking surface.

b. The toe plate shall make a smooth, gap-free transition between the ramp deck and the landing. The toe plate shall be a minimum 1/4 inch material. The plate shall be the full width of the ramp and have a maximum slope not in excess of the maximum slope that occurs on the ramp itself.

c. An Ultra-High Molecular Weight (UHMW) polyethylene skid shall be installed at the lower edge of the land-side end of the toe plate. The skid shall have an allowable load rating greater than that required by the combination of dead and live loads. The skid shall extend the full width of the toe plate and shall be a minimum of 12 inches wide. The skid shall have a thickness of 1/2 inch and shall be replaceable.

d. The gangway shall be designed to safely support a vertical uniformly distributed live load of 40 psf with a maximum deflection of $L/180$ where L is the span of the gangway.

1.4 SUBMITTALS

a. Submit shop drawings and product data.

b. Indicate materials, component profiles, fastening methods, anchorage methods, dimensions, finishes, hardware and accessories.

c. Submit manufacturer's installation instructions.

d. Submit evidence of period of experience called for in Section 1.5, Quality Assurance.

1.5 QUALITY ASSURANCE

- a. Manufacturer: Company specializing in marine float manufacturing with five years documented experience.
- b. Foam for Floatation Pontoons: Manufactured by a company with a minimum of two years continuous experience in the production of polystyrene foam floatation.

PART 2 PRODUCTS

2.1 MATERIALS

- a. Structural Steel: ASTM A 36, hot-dip galvanized after fabrication with a minimum of 2 ounces Zinc per square foot of surface.
- b. Wood: Rough sawn Douglas Fir, No. 2 grade or better, incised and preservative treated with Ammoniacal Cooper Zinc Arsenate (ACZA), with a minimum retention of 0.40 lb/cu. ft in accordance with IBC.
- c. Plywood: Exterior grade, CDX or better, pressure treated with CCA preservative of .40 pcf minimum. Fasten with #10 x 3 1/4 inch stainless steel dock screw or approved equal.
- d. Machine Bolts: ASTM A 307, 1/2 inch minimum diameter, Grade A, galvanized to conform to ASTM A 153.
- e. Anchor Cable and Restraining Cable (wire rope): All cable shall be 6 x 37 wire rope classification, made from improved plow steel and galvanized. Cable connection hardware shall be galvanized.
- f. Expanded Polystyrene (EPS): Shall meet Federal Specifications C-578-85 with a maximum absorption of 3 percent in volume as tested by ASTM C 272.

2.2 COMPONENTS

- a. Dock Bumper: Extruded vinyl (Henderson No. 302 or approved equal), with a minimum weight of 03.850 lb/ft
- b. Floatation Pontoons: Fabricate from material indicated on the drawings closed metal pontoons or polyethylene tub pontoons, completely filled with polystyrene foam with a density of approximately 1 lb/cu. ft. Pontoons shall be connected to the dock structure as recommended by the manufacturer.
- c. Float Unit Hinge Connections: Connect float units with a continuous hinge, the full width of the float unit. Hinge pin and pin keepers may not extend beyond the face of fender.
- d. Restraining Anchor Hardware: The drawings show general components of the connection to the pile hoops and the boarding float. Specific components will be required from the fabricator.
- e. Dissimilar Materials: Where dissimilar metals are in contact, or where aluminum is in contact with concrete, masonry, wet or pressure-treated wood, absorptive materials subject to wetting, the

surfaces shall be protected with a coat of bituminous paint conforming to Federal Specification TT-V-51 to prevent corrosive action.

PART 3 EXECUTION

3.1 WELDING

- a. Clean parts to be welded to provide surfaces free of dirt, grease and other contaminants.
- b. Surfaces to be welded may not be cut with oxygen.
- c. Perform welding with an inert gas shielded arc process. Develop machine settings by making test welds using the same material ally and geometry as the work pieces, and test sample welds destructively.
- d. Make welds using a filler metal alloy compatible in corrosion resistance with the base metal.
- e. Welding: To be performed only by welders certified in accordance with AWS using certified procedures, materials and equipment appropriate to the work. Conform to ANSI/AWS D 1.1 or 1.2.

3.2 INSTALLATION

- a. Install in accordance with the drawings and the reviewed and accepted shop drawings.
- b. Use only mechanics skilled in the installation of this type of work.
- c. Structural steel fabrication and installation shall conform to the requirements of AISC Manual of Steel Construction.
- d. All float accessories shall be installed in accordance with the drawings and the manufacturer's recommended method of installation.

3.3 GUARANTEE

- a. Contractor shall guarantee for a period of 12 months after acceptance of work that all materials and assembly shall be free from defects in design and workmanship.
- b. In the event a component fails to perform or is proven defective in service during the guarantee period; the Contractor shall repair the defective item or provide a replacement at no cost.

3.4 SHIPMENT AND DELIVERY

All equipment shall be shipped in a manner to assure timely delivery and protection of materials. Any item damaged during shipping or delivery shall be rejected and repaired or replaced by the Contractor at Owner's discretion, at no cost to Owner.

-- End of Section --

SECTION 02500

STEEL PIPE PILES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 5L (2007) Specification for Line Pipe

ASTM INTERNATIONAL (ASTM)

ASTM A 252 (1998; R 2002) Welded and Seamless Steel Pipe Piles

1.2 SUBMITTALS

Submit the following in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Pile placement plan

Submit pile placement plan at least 30 days prior to delivery of piles to the job site.

SD-03 Product Data

Pile driving equipment

Submit descriptions of pile driving equipment at least 30 days prior to commencement of work.

Pile driving records

Submit certificates for all pipe pile product from manufacturer showing material compliance with ASTM A 252

Certifications for pipe

Submit certificates for all pipe pile product from manufacturer showing material compliance with ASTM A 252 or API Spec 5L

SD-11 Closeout Submittals

Pile driving records

Submit to the Owner complete and accurate job pile driving records as specified in paragraph entitled "Records" of this section, within 15 calendar days after completion of driving.

1.3 DELIVERY, STORAGE, AND HANDLING

Materials delivered to the site may be new or used and undamaged and shall be accompanied by certified test reports. The manufacturer's logo and mill identification mark shall be provided on the pipe piling as required by the referenced specifications.

1.3.1 Delivery and Storage

Pipe piles shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage. Storage of pipe piling should also facilitate required inspection activities and prevent damage to coatings and corrosion prior to installation.

1.3.2 Handling

Do not drag piles across the ground. Inspect piles for damage before transporting them from the storage area to the driving area and immediately prior to placement in the driving leads.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Pipe Piles

Steel pipe piles shall all meet API Spec 5L. Used pipe piles shall not exhibit significant pitting or corrosion damage. Used piles shall not have extensive unrepaired cutouts or welding damage and shall not exhibit signs of buckling or bulging. Used piles shall be subject to inspection and approval by the Owner prior to delivery to the site.

2.1.2 FABRICATION

Fabrication must conform to the requirements shown and as specified herein and in Section 05500 METAL: MISCELLANEOUS AND FABRICATIONS.

PART 3 EXECUTION

3.1 PILE DRIVING EQUIPMENT

Select the proposed pile driving equipment, including hammers and other required items, and submit complete descriptions of the proposed equipment in accordance with paragraph SUBMITTALS. Changes in the selected pile driving equipment will not be allowed after the equipment has been approved except as directed. No additional contract time will be allowed for Contractor proposed changes in the equipment.

3.1.1 Pile Driving Hammers

Provide impact or vibratory type pile driving hammers.

3.1.1.1 Impact Hammers

Provide steam, air, or diesel-powered impact pile hammers of the single-acting, double-acting, or differential-acting type. The size or capacity of hammers must be as recommended by the hammer manufacturer for the total pile weight and the character of the soil formation to be penetrated. In accordance with paragraph SUBMITTALS, submit the following information for each impact hammer proposed:

- a. Make and model.
- b. Ram weight (pounds).
- c. Anvil weight (pounds).
- d. Rated stroke (inches).
- e. Rated energy range (foot-pounds).
- f. Rated speed (blows per minute).

3.1.1.2 Vibratory Hammers

The size or capacity of hammers must be as recommended by the hammer manufacturer for the total pile weight and the character of the soil formation to be penetrated. In accordance with paragraph SUBMITTALS, submit the following information for each vibratory hammer proposed:

- a. Make and model.
- b. Eccentric moment (inch-pounds).
- c. Dynamic force (tons).
- d. Steady state frequency or frequency range (cycles per minute).
- e. Vibrating weight (pounds).
- f. Amplitude (inches).
- g. Non-vibrating weight (pounds).
- h. Power pack description.

3.1.2 Pile Driving Leads

Support and guide hammers with fixed extended leads or fixed underhung leads.

3.2 INSTALLATION

Inspect piles when delivered and when in the leads immediately before driving. Cut piles by an approved method. Where cutoff is below existing ground or mudline elevation, complete excavation, sheeting, and dewatering before driving pile to cutoff elevation.

3.2.1 Pile Driving Records

Develop a form for compiling pile driving records, which must be approved, for recording pile driving data.

Compile and submit accurate records of the pile driving operations on the approved form in accordance with paragraph SUBMITTALS. Include in driving records for each pile date driven, pile identification number, cross section shape and pile dimensions, location, deviations from design location, original length, ground elevation, top elevation, tip elevation, description of hammer used, number of blows required for each foot of penetration throughout the entire length of the pile and for each inch of penetration in the last foot of penetration, total driving time in minutes and seconds, and any other pertinent information as required or requested such as unusual driving conditions, interruptions or delays during driving, damage to pile resulting from driving, heave in adjacent piles, re-driving, weaving, obstructions, predrilling, and depth and description of voids formed adjacent to the pile.

Additional data required to be recorded for impact hammers includes the rate of hammer operation, make, size, and the length of the bounce hose. Additional data required to be recorded for vibratory hammers includes hammer power pack description, make, size, horsepower applied to pile, and hammer operating frequency.

3.2.2 Pile Placement and Tolerances in Driving

Develop and submit a pile placement plan which shows the installation sequence and the methods proposed for controlling the location and alignment of piles. Accurately place piles in the correct location and alignments, both laterally and longitudinally, and to the vertical lines indicated. Establish a permanent base line to provide for inspection of pile placement by the Owner during pile driving operations prior to driving and maintain during the installation of piles.

A final lateral deviation from the correct location at the cutoff elevation of not more than 3 inches in any direction will be permitted for long piles. Manipulation of piles will not be permitted. A variation of not more than 0.25 inch per foot of pile length from the vertical for vertical piles will be permitted.

3.2.3 Pile Driving

Notify the Owner 30 days' prior to the date pile driving is to begin. Operate hammers at all times at the speed and under the conditions recommended by the manufacturer. Where heave is anticipated, the sequence of installation must be such that pile heave is minimized by starting pile driving at the center of the group and proceeding outward. Prior to driving and with the pile head seated in the hammer, check each pile to ensure that it has been aligned correctly. Once pile driving has begun, keep conditions such as alignment constant. Drive each pile continuously and without interruption until the required tip elevation has been attained. Deviation from this procedure will be permitted only when driving is stopped by causes that reasonably could not have been anticipated. A pile that can not be driven to the required depth because of an obstruction, as indicated by a sudden unexplained change in blow count and drifting, must be pulled and re-driven or cut off and abandoned, whichever is directed.

-- End of Section --

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SECTION 02600

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 116	(2005) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A 153/A 153M	(2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 702	(1989; R 2006) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A 780	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 90/A 90M	(2007) Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM C 94/C 94M	(2007) Standard Specification for Ready-Mixed Concrete
ASTM F 1043	(2006) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
ASTM F 1083	(2008) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F 567	(2007) Standard Practice for Installation of Chain Link Fence
ASTM F 626	(1996a; R 2003) Standard Specification for Fence Fittings

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Submit Manufacturer's catalog data for the following items:

Fence Assembly
Gate Assembly
Gate Hardware and Accessories

SD-07 Certificates

Submit Certificates of compliance in accordance with the applicable reference standards and descriptions of this section for the following items:

Zinc Coating
Fabric
Stretcher Bars
Gate Hardware and Accessories
Concrete

SD-08 Manufacturer's Instructions

Submit Manufacturer's instructions for the following items:

Fence Assembly
Gate Assembly
Hardware Assembly
Accessories

1.3 ASSEMBLY AND INSTALLATION INSTRUCTIONS

Contractor must provide manufacturer's instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

Submit Erection/Installation drawings along with manufacturer's catalog data for complete fence assembly, gate assembly, hardware assembly and accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

1.5 QUALITY ASSURANCE

1.5.1 Required Report Data

Submit reports of listing of chain-link fencing and accessories regarding weight in ounces for zinc coating.

PART 2 PRODUCTS

2.1 GENERAL

Provide fencing materials that conform to the requirements of ASTM A 116, ASTM A 702, ASTM F 626, and as specified.

2.2 ZINC COATING

Ferrous-metal components and accessories, except as otherwise specified, must be hot-dip galvanized after fabrication.

Provide zinc coating of weight not less than 1.94 ounces per square foot, as determined from the average result of two specimens, when tested in accordance with ASTM A 90/A 90M.

Provide zinc coating that conforms to the requirements of the following:

Pipe: FS RR-F-191/3 Class 1 Grade A in accordance with ASTM F 1083 Grade B in accordance with ASTM F 1043.

Hardware and accessories: ASTM A 153/A 153M, Table 1

Surface (ASTM F 1043):

External: Type B-B surface zinc with organic coating, 0.97 ounce per square foot minimum thickness of acrylated polymer.

Internal: Surface zinc coating of 0.97 ounce per square foot minimum.

Provide galvanizing repair material that is cold-applied zinc-rich coating conforming to ASTM A 780.

2.3 FABRIC

FS RR-F-191 and detailed specifications as referenced and other requirements as specified.

FS RR-F-191/1; Mesh size, 2 inches. Fabric must consist of No. 9-gage wires woven into a 2-inch diamond mesh, with dimensions of fabric and wire conforming to ASTM A 116, ASTM A 702 and ASTM F 626, with 1.29 ounces per square foot zinc galvanizing.

Fence heights to 12 feet must have one-piece fabric widths.

2.4 TOP AND BOTTOM SELVAGES

Fabric with 2 inch mesh and up to 60 inches high must be knuckled on both top and bottom selvages, over if 60 inches high, it must be twisted and barbed on the top selvage and knuckled on the bottom selvage.

2.5 POSTS, TOP RAILS , BOTTOM RAILS AND BRACES

FS RR-F-191/3 line posts; Class 1, steel pipe, Grade A. End, corner, and pull posts; Class 1, steel pipe, Grade A. Braces and rails; Class 1, steel pipe, Grade A, in minimum sizes listed in FS RR-F-191/3.

2.6 LINE POSTS

Minimum acceptable line posts must be as follows:

Grade A: 1.900 inch O.D. pipe weighing 2.72 pounds per linear foot.

2.7 END, CORNER, AND PULL POSTS

Provide minimally acceptable end, corner, and pull posts as follows:

Grade A: 2.375 inch O.D. pipe weighing 3.65 pounds per linear foot.

2.8 BOTTOM RAIL

Bottom Rail must conform to minimum sizes specified in FS RR-F-191/3 for each class and grade.

2.9 POST-BRACE ASSEMBLY

Bracing must consist of 1.660 inches O.D. pipe Grade A weighing 2.27 pounds per linear foot and 3/8 inch adjustable truss rods and turnbuckles.

2.10 TENSION WIRE

Wire must be galvanized, No. 7-gage, coiled spring wire, provided at the bottom of the fabric only. Provide Zinc Coating that weighs not less than 1.6 ounces per square foot.

2.11 STRETCHER BARS

Provide bars that have one-piece lengths equal to the full height of the fabric with a minimum cross section of 3/16 by 3/4 inch, in accordance with ASTM A 116, ASTM A 702 and ASTM F 626.

2.12 POST TOPS

Provide tops that are steel, wrought iron, or malleable iron designed as a weather tight closure cap. Provide one cap for each post, unless equal protection is provided by a combination post-cap and barbed-wire supporting arm. Caps must have an opening to permit through passage of the top rail.

2.13 STRETCHER BAR BANDS

Provide bar bands for securing stretcher bars to posts that are steel, wrought iron, or malleable iron spaced not over 15 inches on center. Bands may also be used in conjunction with special fittings for securing rails to posts. Provide bands with projecting edges chamfered or eased.

2.14 GATE POSTS

Provide a gate post for supporting each gate leaf as follows:

2.875 inch O.D. pipe Grade A weighing 5.79 pounds per linear foot.

2.15 GATES

Perimeter gate frames must be 1.66 inch O.D. pipe Grade A weighing 2.27 pounds per linear foot.

Provide gate frame assembly that is welded or assembled with special malleable or pressed-steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges; stretcher bars may also be used at top and bottom edges. Attach stretcher bars and fabric to gate frames on all sides at intervals not exceeding 15 inches. Attach hardware with rivets or by other means which provides equal security against breakage or removal.

Diagonal cross-bracing, consisting of 3/8-inch diameter adjustable-length truss rods on welded gate frames, must be provided where necessary to obtain frame rigidity without sag or twist. Provide non-welded gate frames with diagonal bracing.

2.16 GATE HARDWARE AND ACCESSORIES

Provide gate hardware and accessories that conforms to ASTM A 116, ASTM A 702, ASTM F 626, and be as specified:

Provide malleable iron forged steel pressed steel hinges to suit gate size, non-lift-off type, offset to permit 180-degree opening.

Provide latch that permits operation from either side of the gate, with a padlock eye provided as an integral part of the latch.

Provide stops that automatically engage the gate and hold it in the open position until manually released.

2.17 MISCELLANEOUS HARDWARE

Provide miscellaneous hot-dip galvanized hardware as required.

2.18 WIRE TIES

Wires for tying fabric to line posts must be 16-gage galvanized steel wire spaced 12 inches on center. For tying fabric to rails and braces, wire ties must be spaced 24 inches on center. For tying fabric to tension wire, 0.105-inch hog rings must be spaced 24 inches on center.

Manufacturer's standard procedure will be accepted if of equal strength and durability.

2.19 CONCRETE

Provide concrete conforming to ASTM C 94/C 94M. Concrete mix must obtain a minimum 28-day compressive strength of 3,000 psi.

PART 3 EXECUTION

Completed installation must conform to ASTM F 567.

3.1 GENERAL

Final grading and established elevations must be complete prior to commencing fence installation.

3.2 EXCAVATION

Excavations for post footings must be drilled holes in virgin or compacted soil, of minimum sizes as indicated.

Space footings for line posts 10 feet on center maximum and at closer intervals when indicated.

Bottoms of the holes must be approximately 3-inches below the bottoms of the posts. Set bottom of each post not less than 36-inches below finished grade when in firm, undisturbed soil. Set posts deeper, as required, in soft and problem soils and for heavy, lateral loads.

Soil from excavations must be spread uniformly adjacent to the fence line as directed.

3.3 SETTING POSTS

Remove loose and foreign materials from holes and the soil moistened prior to placing concrete.

Provide tops of footings that are trowel finished and sloped or domed to shed water away from posts. Set hold-open devices, sleeves, and other accessories in concrete.

Keep exposed concrete moist for at least 7 calendar days after placement or cured with a membrane curing material, as approved.

Posts set in concrete construction must be set vertically, with tops aligned and held in position until concrete has set.

3.3.1 Bracing

Brace gate, corner, end, and pull posts to nearest post with a horizontal brace used as a compression member, placed at least 12 inches below top of fence, and a diagonal truss rod and truss tightener used as a tension member two diagonal truss rods and truss tighteners used as tension members.

3.4 CONCRETE STRENGTH

Provide Concrete that has attained at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than 7 calendar days after placement, before rails, tension wire, or fabric are installed. Fabric and wires must not be stretched or gates hung until the concrete has attained its full design strength.

3.5 TOP RAILS

Provide top rails that run continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by the fencing manufacturer.

3.6 BRACE ASSEMBLY

Contractor must provide bracing assemblies at end and gate posts and at both sides of corner and pull posts, with the horizontal brace located at mid-height of the fabric.

Install brace assemblies so posts are plumb when the diagonal rod is under proper tension.

Provide two complete brace assemblies at corner and pull posts where required for stiffness and as indicated.

3.7 TENSION WIRE INSTALLATION

Install tension wire by weaving them through the fabric and tying them to each post with not less than 7-gage galvanized wire or by securing the wire to the fabric with 10-gage ties or clips spaced 24 inches on center.

3.8 FABRIC INSTALLATION

Provide Fabric in single lengths between stretch bars with bottom barbs placed approximately 1-1/2-inches above the ground line. Pull fabric taut and tied to posts, rails, and tension wire with wire ties and bands.

Install fabric on the security side of fence, unless otherwise directed.

Fabric must remain under tension after the pulling force is released.

3.9 GATE INSTALLATION

Install gates plumb, level, and secure, with full opening without interference. Install ground set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricated where necessary.

3.10 TIE WIRES

Provide tie wires that are U-shaped to the pipe diameters to which attached. Twist ends of tie wires not less than two full turns and bent so as not to present a hazard.

3.11 FASTENERS

Install nuts for tension bands and hardware on the side of the fence opposite the fabric side. Peen ends of bolts to prevent removal of nuts.

3.12 ZINC-COATING REPAIR

Clean and repair galvanized surfaces damaged by welding or abrasion, and cut ends of fabric, or other cut sections with specified galvanizing repair material applied in strict conformance with the manufacturer's printed instructions.

3.13 TOLERANCES

Provide posts that are straight and plumb within a vertical tolerance of 1/4 inch after the fabric has been stretched. Provide fencing and gates that are true to line with no more than 1/2 inch deviation from the established centerline between line posts. Repair defects as directed.

3.14 SITE PREPARATION

3.14.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing. Establish a graded, compacted fence line prior to fencing installation.

3.15 FENCE INSTALLATION

Install fence on prepared surfaces to line and grade indicated. Install fence in accordance with fence manufacturer's written installation instructions except as modified herein.

3.15.1 Post Spacing

Provide line posts spaced equidistantly apart, not exceeding 10 feet on center. Provide gate posts spaced as necessary for size of gate openings. Provide corner or pull posts, with bracing in both directions, for changes in direction of 15 degrees or more, or for abrupt changes in grade. Provide drawings showing location of gate, corner, end, and pull posts.

3.15.2 Top and Bottom Tension Wire

Install top and bottom tension wires before installing chain-link fabric, and pull wires taut. Place top and bottom tension wires within 8 inches of respective fabric line.

3.16 ACCESSORIES INSTALLATION

3.16.1 Post Caps

Install post caps as recommended by the manufacturer.

3.17 CLEANUP

Remove waste fencing materials and other debris from the work site.

-- End of Section --

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SECTION 03100

FORMWORK FOR CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 347R (2003) Guide to Formwork for Concrete

1.2 DESIGN REQUIREMENTS

The design, engineering, and construction of the formwork shall be the responsibility of the Contractor. The formwork shall be designed for anticipated live and dead loads and shall comply with the tolerances specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE paragraph TOLERANCES. The adequacy of formwork design and construction shall be monitored prior to and during concrete placement as part of the Contractor's Quality Control Plan.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings

Drawings and design computations for all formwork required shall be submitted at least 15 days either before fabrication on site or before delivery of prefabricated forms.

1.4 SHOP DRAWINGS

The shop drawings and data submitted shall include the type, size, quantity, and strength of all materials of which the forms are made, and the assumed design values and loading conditions.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Forms

Forms shall be fabricated with facing materials that will produce a finish meeting the specified irregularities in formed surface requirements as defined in ACI 347R.

2.1.2 Form Coating

Form coating shall be commercial formulation that will not bond with, stain, cause deterioration, or any other damage to concrete surfaces. The coating shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

2.2 ACCESSORIES

Ties and other similar form accessories to be partially or wholly embedded in the concrete shall be of a commercially manufactured type. Form ties shall be constructed so that the ends or end fasteners can be removed without spalling the concrete.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Form Construction

Forms shall be constructed true to the structural design and required alignment. The form surface and joints shall be mortar tight and supported to achieve safe performance during construction, concrete placement, and form removal. Failure of any supporting surface either due to surface texture, deflection or form collapse shall be the responsibility of the Contractor as will the replacement or correction of unsatisfactory surfaces. All surfaces of used forms shall be cleaned of mortar and any other foreign material before reuse.

3.1.2 Chamfering

All exposed joints, edges and external corners shall be chamfered by molding placed in the forms unless the drawings specifically state that chamfering is to be omitted or as otherwise specified.

3.1.3 Coating

Forms for exposed or painted surfaces shall be coated with form oil or a form-release agent before the form or reinforcement is placed in final position.

3.2 FORM REMOVAL

Forms shall not be removed without approval. It is the responsibility of the Contractor to consider all applicable factors and leave the forms in place until it is safe to remove them. All removal shall be accomplished in a manner which will prevent damage to the concrete and ensure the complete safety of the structure.

3.3 INSPECTION

Forms and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor in order to certify to the Owner that

they are ready to receive concrete. The results of each inspection shall be reported in writing.

-- End of Section --

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SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 318/318R (2005) Building Code Requirements for Structural Concrete and Commentary

ASTM INTERNATIONAL (ASTM)

ASTM A 615/A 615M (2006a) Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 1MSP (2001) Manual of Standard Practice

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Reinforcement

Detail drawings showing reinforcing steel placement, schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

SD-07 Certificates

Reinforcing Steel

Certified copies of mill reports attesting that the reinforcing steel furnished meets the requirements specified herein, prior to the installation of reinforcing steel.

1.3 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M grade 60.

2.2 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.3 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI 1MSP and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface.

PART 3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical or welded butt connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete.

-- End of Section --

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R (1990; R 2002) Standard Tolerances for Concrete Construction and Materials & Commentary

ASTM INTERNATIONAL (ASTM)

ASTM C 1064/C 1064M (2005) Temperature of Freshly Mixed Portland Cement Concrete

ASTM C 1107 (2005) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

ASTM C 143/C 143M (2005a) Slump of Hydraulic Cement Concrete

ASTM C 150 (2005) Portland Cement

ASTM C 171 (2003) Sheet Materials for Curing Concrete

ASTM C 260 (2001) Air-Entraining Admixtures for Concrete

ASTM C 33 (2003) Concrete Aggregates

ASTM C 39/C 39M (2004a) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 494/C 494M (2005a) Chemical Admixtures for Concrete

ASTM C 618 (2005) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete

ASTM C 94/C 94M (2004a) Ready-Mixed Concrete

ASTM E 96/E 96M (2005) Water Vapor Transmission of Materials

NATIONAL READY MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA TMMB 100 (2001) Truck Mixer, Agitator and Front Discharge Concrete Carrier Standards

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 400

(1963) Requirements for Water for Use in
Mixing or Curing Concrete

1.2 SUBMITTALS

Owner approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Mixture Proportions

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of each strength or class of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

Surface Retarder

Sample of surface retarder material with manufacturer's instructions for application in conjunction with air-water cutting.

SD-06 Test Reports

Testing and Inspection for Contractor Quality Control

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

1.3 GENERAL REQUIREMENTS

1.3.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

1.3.2 Strength Requirements and w/c Ratio

1.3.2.1 Compressive Strength Requirements

Minimum 28-day compressive strength (f'c) shall be 5000 psi:

Compressive strength shall be determined in accordance with ASTM C 39/C 39M.

1.3.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) shall be 0.45:

1.3.3 Air Entrainment

Except as otherwise specified, all concrete shall be air entrained to contain between 4 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 4.5 and 7.5 percent.

1.3.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be 4 inches maximum as determined in accordance with ASTM C 143/C 143M.

1.3.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 90 degrees F. When the ambient temperature during placing is 40 degrees F or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 55 and 75 degrees F.

1.3.6 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

1.4 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

1.4.1 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for concrete specified shall be the responsibility of the Contractor.

1.5 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be

arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement, or portland cement in combination with pozzolan and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

2.1.1 Portland Cement

ASTM C 150, Type I with a maximum 15 percent amount of tricalcium aluminate, or Type II.

2.1.2 Pozzolan (Fly Ash)

Pozzolan shall conform to ASTM C 618, Class C or F, including low alkali and moderate sulfate resistance requirements in Table 3 of ASTM C 618. If pozzolan is used, it shall never be less than 15 percent nor more than 25 percent by weight of the total cementitious material.

2.2 AGGREGATES

2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 3S, size designation 67.

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

2.3.2 Accelerating Admixture

ASTM C 494/C 494M, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494/C 494M, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

2.3.4 High-Range Water Reducer

ASTM C 494/C 494M, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107, and shall be a commercial formulation suitable for the proposed application.

2.7 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96/E 96M.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100 FORMWORK FOR CONCRETE. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200 CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated or

required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale.

3.2 CONCRETE PRODUCTION

3.2.1 General Requirements

Concrete shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94/C 94M, except as otherwise specified.

3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers conforming to NRMCA TMMB 100.

3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients. Conveying equipment shall be cleaned before each placement.

3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Fresh concrete shall not be deposited on concrete that has hardened.

3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations.

3.5.3 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	90 F
40-60	85 F
Less than 40	80 F

3.6 JOINTS

Joints shall be located and constructed as indicated or approved. Joints not indicated on the drawings shall be located and constructed to minimize the impact on the strength of the structure.

3.7 FINISHING FORMED SURFACES

Finishing of formed surfaces shall be as specified herein. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Repairs not meeting these requirements will be rejected and shall be replaced.

3.7.1 Class A Finish and Class B Finish

Class A finish is required where indicated on the drawings. Fins, ravelings, and loose material shall be removed, all surface defects over 1/2 inch in diameter or more than 1/2 inch deep, shall be repaired and holes left by removal of form ties shall be reamed and filled.

3.8 REPAIRS

3.8.1 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep or, for Class A and B finishes, more than 1/2 inch in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

3.8.1.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If

reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inches shall be outlined by saw cuts at least 1 inch deep. Defective areas less than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Owner's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

3.9 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, as specified herein.

3.9.1 General

Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

3.9.2 Broomed Finish

Walkways and driving surfaces shall receive a broomed finish. Finish shall be perpendicular to route of traffic.

3.10 CURING AND PROTECTION

3.10.1 General

Concrete shall be cured by an approved method for a minimum of 7 days.

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period.

3.11 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports.

3.11.1 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production.
- b. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143/C 143M for each separate concrete mixture produced during each 8-hour or less period of concrete production each day.
- c. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.
- d. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 500 cubic yards or portion thereof of that concrete mixture placed each day.

3.11.2 Inspection before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Owner that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.11.3 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Owner, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the

temperature requirements, immediate steps shall be taken to improve temperature controls.

3.11.4 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Owner has the right to examine all contractor quality control records.

-- End of Section --

DRAFT

SECTION 03453

PRECAST PRESTRESSED STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ACI INTERNATIONAL (ACI)

- ACI 304R (2000) Guide for Measuring, Mixing, Transporting, and Placing Concrete
- ACI 309R (2005) Guide for Consolidation of Concrete
- ACI 318/318R (2008; Errata 2008) Building Code Requirements for Structural Concrete and Commentary

ASTM INTERNATIONAL (ASTM)

- ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A 185/A 185M (2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- ASTM A 27/A 27M (2005) Standard Specification for Steel Castings, Carbon, for General Application
- ASTM A 416/A 416M (2006) Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
- ASTM A 421/A 421M (2005) Standard Specification for Uncoated Stress-Relieved Wire for Prestressed Concrete
- ASTM A 496/A 496M (2007) Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
- ASTM A 497/A 497M (2007) Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
- ASTM A 615/A 615M (2008) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM A 706/A 706M (2006a) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A 722/A 722M	(2007) Standard Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete
ASTM A 82/A 82M	(2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM C 1107/C 1107M	(2007a) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 33	(2007) Standard Specification for Concrete Aggregates
ASTM C 595	(2008) Standard Specification for Blended Hydraulic Cements
ASTM C 94/C 94M	(2007) Standard Specification for Ready-Mixed Concrete
PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)	
PCI MNL-116	(1999) Manual for Quality Control for Plants and Production of Structural Precast Concrete Products
PCI MNL-120	(2004) Design Handbook - Precast and Prestressed Concrete

1.2 SYSTEM DESCRIPTION

The work includes the provision of precast non-prestressed concrete herein referred to as precast members and precast, prestressed concrete herein referred to as prestressed members. Precast and Prestressed members shall be the product of a manufacturer specializing in the production of precast prestressed concrete members.

1.2.1 Design Requirements

Design precast prestressed members in accordance with ACI 318/318R and the PCI MNL-120. Design precast prestressed members (including connections) for the design load conditions and spans indicated, and handling and erection stresses, and for additional loads imposed by openings and supports of the work of other trades. Design precast prestressed members for handling without cracking in accordance with the PCI MNL-120. Concrete toppings shall not be used in establishing the design strength of the precast prestressed members.

1.2.1.1 Loads

Loadings for members and connections shall include all dead load, live load, applicable lateral loads such as wind and earthquake, applicable construction loads such as handling, erection loads, and other applicable loads.

1.2.1.2 Drawing and Design Calculation Information

Submit drawings and design calculations indicating complete information for the fabrication, handling, and erection of the precast prestressed member. Drawings shall not be reproductions of contract drawings. Design calculations, drawings of precast members, and drawings of precast prestressed concrete members (including connections) shall be made by a registered professional engineer experienced in the design of precast prestressed concrete members and registered in California, and submitted for approval prior to fabrication. The drawings shall indicate, as a minimum, the following information:

- a. Plans, elevations and other drawing views
- b. Elevations, sections and other details for each member showing the following:
 - (1) Connections between members and connections between members and other construction.
 - (2) Connections for work of other trades and cast-in items and their relation to other trades.
 - (3) Dimensioned size and shape for each member with quantities, position and other details of reinforcing steel, anchors, inserts and other embedded items.
 - (4) Lifting, erection and other handling devices and inserts.
 - (5) Surface finishes of each member.
 - (6) Estimated cambers
- c. Magnitude, schedule and sequence of tensioning and detensioning prestressing strands.
- d. Strength properties for concrete, steel and other materials.
- e. Methods for storage and transportation.
- f. Description of loose, cast-in and field hardware.
- g. All dead, live, handling, erection and other applicable loads used in the design.

1.3 SUBMITTALS

SD-02 Shop Drawings

Drawings of precast members

Drawings of precast prestressed concrete members

SD-03 Product Data

Anchorage and lifting inserts and devices

Bearing pads

SD-05 Design Data

Precast Prestressed concrete members design calculations

Concrete mix design

SD-06 Test Reports

Contractor-furnished mix design

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports shall include mill test and all other test for cement, silica fume, aggregates, and admixtures. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size. Test reports shall be submitted along with the concrete mix design. Obtain approval before concrete placement.

Cement

Pozzolan

Air-Entraining Admixture

Water-Reducing Admixture

Accelerating Admixture

Aggregates

Submit test results for aggregates in accordance with ASTM C 1260 for potential alkali-silica reactions.

SD-07 Certificates

Quality control procedures

Submit quality control procedures established in accordance with PCI MNL-116 by the precast manufacturer.

Construction records of the manufacturing, handling, and erection of the precast prestressed concrete members shall be submitted.

SD-11 Closeout Submittals

Concrete batch ticket information

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

1.4.1.1 Manufacturer Qualifications

PCI MNL-116. Plants shall be certified by the PCI Plant Certification Program . At the Owner's option, PCI Plant quality control program records shall be available for review.

1.4.1.2 Designer Qualifications

The designer shall be a registered professional engineer in California and experienced in the design of precast prestressed concrete.

1.4.1.3 Erector Qualifications

The erector shall be regularly engaged for at least three years in the erection of precast prestressed structural concrete similar to the requirements of this project. Submit documentation of experience to Owner.

1.4.1.4 Welding Qualifications

Provide AWS D1.1/D1.1M qualified welders who are currently certified at contract award date and have maintained their certificates over the past year. Provide documentation of certification to Owner.

1.4.2 Concrete Mix Design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, silica fume, ground slag, and admixtures, and applicable reference specification. Provide mix proportion data using at least three different water-cement ratios for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. No material shall be provided unless proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Owner. The submittal shall clearly indicate where each mix design will be used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregates changes.

1.4.3 Certificates: Record Requirement

ASTM C 94/C 94M. Submit mandatory batch ticket information for each load of ready-mixed concrete.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Transportation

1.5.1.1 Transporting Members

In transporting members by truck, railroad car, or barge, provision shall be made for supporting the members as described above, except battens can be continuous over more than one stack of units, with adequate bracing to ensure their maintaining the vertical position and damping of dangerous vibrations. Trucks with double bolsters are satisfactory provided the members are fully seated on the outer bolsters at not more than 3 feet or the depth of the member from the end and the inner bolster is not more than

8 feet from the end of the member or the designated pickup point. Adequate padding material shall be provided between tie chains or cables to preclude chipping of concrete.

1.5.1.2 Lateral Deflection or Vibration

Any noticeable indication of lateral deflection or vibration during transportation shall be corrected by rigid bracing between members or by means of lateral trussing.

1.5.2 Storage

1.5.2.1 Storage Areas

Storage areas for precast prestressed members shall be stabilized, and suitable foundations shall be provided, so differential settlement or twisting of members will not occur.

1.5.2.2 Stacked members

Stacked members shall be separated and supported by battens placed across the full width of each bearing point. Battens shall be arranged in vertical planes at a distance not greater than the depth of the member from designated pickup points. Battens shall not be continuous over more than one stack of precast units. Stacking of members shall be such that lifting devices will be accessible and undamaged. The upper members of a stacked tier shall not be used as storage areas for shorter members or equipment.

1.5.3 Handling of Members

The location of pickup points for handling of the members and details of the pickup devices shall be shown in shop drawings. Members shall be handled only by means of approved devices at designated locations. Members shall be maintained in an upright position at all times and picked up and supported as shown in approved shop drawings.

PART 2 PRODUCTS

2.1 CONCRETE PLANKS

Product shall be standard 10 inch prestressed concrete sheet piles as manufactured by JH Pomery or approved equal.

2.2 CONTRACTOR-FURNISHED MIX DESIGN

ACI 318/318R. The minimum compressive strength of concrete at 28 days shall be 5000 psi, unless otherwise indicated. Add air-entraining admixtures at the mixer to produce between 4 and 6 percent air by volume. Ensure a dense concrete free of shrinkage cracks, with a minimum degree of permeability. The maximum water cement ratio shall be 0.45.

2.3 MATERIALS

2.3.1 Cement

ASTM C 150, Type II with a maximum alkali content of 0.40 percent ASTM C 595 Type IP(MS) or IS(MS) blended cement.

2.3.2 Water

Water shall be fresh, clean, and potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete, ACI 318/318R.

2.3.3 Aggregates

2.3.3.1 Aggregates Selection

ASTM C 33, Aggregates shall not contain any substance which may be deleteriously reactive with the alkalis in the cement, nor in an amount sufficient to cause excessive expansion of concrete.

2.3.4 Grout

2.3.4.1 Nonshrink Grout

ASTM C 1107/C 1107M.

2.3.4.2 Cementitious Grout

Shall be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method. Provide air entrainment for grout exposed to the weather.

2.3.5 Reinforcement

2.3.5.1 Reinforcing Bars

ASTM A 615/A 615M, Grade 40 60; ASTM A 706/A 706M, Grade 60; or ASTM A 996/A 996M, Grade 50 60.

2.3.5.2 Wire

ASTM A 82/A 82M or ASTM A 496/A 496M.

2.3.5.3 Welded Wire Fabric

ASTM A 185/A 185M or ASTM A 497/A 497M.

2.3.6 Prestressing Strands

Uncoated, 7-wire strand stressed relieved, ASTM A 416/A 416M, Grade 250270, strand diameter as shown.

Single wire stressed relieved, ASTM A 421/A 421M for low relaxation wire.

High-strength steel bars shall conform to ASTM A 722/A 722M, Type I or II, meeting all supplementary requirements.

2.3.7 Metal Accessories

Provide ASTM A 123/A 123M or ASTM A 153/A 153M galvanized.

2.3.7.1 Inserts

ASTM A 47/A 47M, Grade 32510 or 35018, or ASTM A 27/A 27M Grade U-60-30.

2.3.7.2 Structural Steel

ASTM A 36/A 36M.

2.3.7.3 Bolts

ASTM A 307; ASTM A 325.

2.3.7.4 Nuts

ASTM A 563.

2.3.7.5 Washers

ASTM F 844 washers for ASTM A 307 bolts, and ASTM F 436 washers for ASTM A 325 bolts.

2.3.8 Bearing Pads

2.3.8.1 Elastomeric

AASHTO HB-17, for plain neoprene bearings.

2.4 PRODUCTION QUALITY CONTROL PROCEDURES

PCI MNL-116 unless specified otherwise.

2.4.1 Forms

Brace forms to prevent deformation. Forms shall produce a smooth, dense surface. Chamfer exposed edges of columns and beams 3/4 inch, unless otherwise indicated. Provide threaded or snap-off type form ties.

2.4.2 Reinforcement Placement

ACI 318/318R for placement and splicing. Reinforcement may be preassembled before placement in forms. Provide exposed connecting bars, or other approved connection methods, between precast prestressed and cast-in-place construction. Remove any excess mortar that adheres to the exposed connections. Provide curvature or drape of the prestressing strands using approved hold-down devices.

2.4.3 Inserts

When the ends of the prestressed member will be exposed, recess the prestressing stands using inserts. After detensioning, remove inserts and fill the recess with nonshrink grout.

2.4.4 Concrete

2.4.4.1 Concrete Mixing

ASTM C 94/C 94M. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.

2.4.4.2 Concrete Placing

ACI 304R, and ACI 309R, unless otherwise specified.

2.4.4.3 Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures to keep the temperature of the concrete between 50 and 190 degrees F. When accelerated curing is used, apply heat at controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts.

2.4.5 Prestressing

Do not transfer prestressing forces during detensioning until the concrete has reached a minimum compressive strength of 3500 psi, unless a higher strength is required by the Contractor furnished design.

2.4.6 Surface Repairs

Repairs located in a bearing area shall be approved by the Owner prior to repairs. Prestressed members which contain honeycombed sections deep enough to expose prestressing strands shall be rejected. Precast prestressed members containing hairline cracks which are visible and are less than 0.01 inches in width, may be accepted, except that cracks larger than 0.005 inches in width for surfaces exposed to the weather shall be repaired. Defects that involve more than 36 square inches of concrete shall be grounds for rejection. Any precast prestressed member that is structurally impaired or contains honeycombed section deep enough to expose stressing tendons or reinforcing shall be rejected. Defects shall be repaired or rejected as specified in paragraph "Defects."

2.4.6.1 Unformed Surfaces

Provide a floated finish except at non-skid deformations.

2.4.6.2 Formed Surfaces

PCI MNL-116 (Appendix A - Commentary), Chapter 3, for grades of surface finishes.

- a. Unexposed Surfaces: Provide a commercial standard grade surface finish.
- b. Exposed Surfaces: Provide a standard grade surface finish. The combined area of acceptable defective areas shall not exceed 0.2 percent of the exposed to view surface area, and the patches shall be indistinguishable from the surrounding surfaces when dry.

2.4.7 Acceptance/Rejection of Defects

2.4.7.1 Minor Defects

All honeycombed areas, chipped corners, air pockets over 1/4 inch in diameter, and other minor defects involve less than 36 square inches of concrete shall be repaired. Form offsets of fins over 1/8 inch shall be ground smooth. All unsound concrete shall be removed from defective areas

prior to repairing. All surfaces permanently exposed to view shall be repaired by a blend of portland cement and white cement properly proportioned so that the final color when cured will be the same as adjacent concrete.

2.4.7.2 Major Defects

Major defects are those which involve more than 36 square inches of concrete or expose stressing tendons or reinforcing steel. If one or more major defects appear in a member, it shall be rejected. Cracks of a width of more than 0.01 inch shall be cause for rejection of the member.

2.5 TESTS, INSPECTIONS, AND VERIFICATIONS

2.5.1 Factory Inspection

At the option of the Owner, precast prestressed units may be inspected prior to being transported to the job site. The Contractor shall give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Owner's right to enforce contractual provisions after units are transported or erected.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to erection, and again after installation, precast prestressed members shall be checked for damage, such as cracking, spalling, and honeycombing. As directed by the Owner, precast prestressed members that do not meet the surface finish requirements specified in Part 2 in paragraph entitled "Surface Finish" shall be repaired, or removed and replaced with new precast prestressed members.

3.2 ERECTION

Precast prestressed members shall be erected after the concrete has attained the specified compressive strength, unless otherwise approved by the precast prestressing manufacturer. In addition, prestressed members shall not be rigidly fixed in position until the prestressed member has "aged" 90 days after detensioning. Erect in accordance with the approved shop drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Provide a 1:500 tolerance, if no tolerance is specified. Brace precast prestressed members, unless design calculations submitted with the shop drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads. Place precast prestressed members level, plumb, square, and true within tolerances. Align member ends.

3.3 BEARING SURFACES

Shall be flat, free of irregularities, and properly sized. Size bearing surfaces to provide for the indicated clearances between the precast prestressed member and adjacent precast prestressed members or adjoining field placed surfaces. Correct bearing surface irregularities with nonshrink grout. Provide bearing pads where indicated or required. Do not use hardboard bearing pads in exterior locations. Place precast prestressed

members at right angles to the bearing surface, unless indicated otherwise, and draw-up tight without forcing or distortion, with sides plumb.

3.4 ANCHORAGE

Provide anchorage for fastening work in place. Conceal fasteners where practicable. Make threaded connections up tight and nick threads to prevent loosening.

3.5 WELDING

AWS D1.4/D1.4M for welding connections and reinforcing splices. Do not weld prestressing strands. Protect the concrete and other reinforcing from heat during welding. Weld continuously along the entire area of contact. Grind smooth visible welds in the finished installation.

3.6 OPENINGS

Holes or cuts requiring reinforcing prestressing steel to be cut, which are not indicated on the approved shop drawing, shall only be made with the approval of the Owner and the precast manufacturer. Drill holes less than 12 inches in diameter with a diamond tipped core drill.

3.7 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A 780 zinc rich paint for galvanized surfaces damaged by handling, transporting, cutting, welding, bolting, or acid washing. Do not heat surfaces to which repair paint has been applied.

3.8 GROUTING

Clean and fill indicated keyways between precast prestressed members, and other indicated areas, solidly with nonshrink grout or cementitious grout. Provide reinforcing where indicated. Remove excess grout before hardening.

3.9 SEALANTS

Provide as indicated on the drawings.

3.10 CONSTRUCTION RECORDS

Complete construction records shall be kept of the manufacturing, handling, and erection of the precast-prestressed concrete members. Records shall be kept for, but not limited to, the following items:

- a. Specifications of material used in the manufacture of the members.
- b. Time-temperature history of the concrete members from casting to the transfer of the prestress force.
- c. Records of the tendon stressing operation including initial prestress force, measured elongation, how it was measured, and how the tendons were stressed and destressed.

- d. Records of inspection of the members before and after the prestress force is transferred to the members.
- e. Records of the inspection of the members each time they are moved.
- f. Records of any defects in the member and any corrective measures taken.

-- End of Section --

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SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 317 (1992; Reprint 1999) ASD Manual of Steel Construction, Volume II, Connections

AISC 325 (2005) Manual of Steel Construction

AISC 326 (2002) Detailing for Steel Construction

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2006; Errata 2006) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 307 (2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 325 (2007a) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 563 (2007a) Standard Specification for Carbon and Alloy Steel Nuts

ASTM A 572/A 572M (2007) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM A 722 (2005) Uncoated High Strength Steel Bar for Prestressing Concrete

ASTM F 436 (2007a) Hardened Steel Washers

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1 (2000; E 2004) Shop, Field, and Maintenance Painting

SSPC PS 13.01 (1982; E 2004) Epoxy-Polyamide Painting System

SSPC Paint 25 (1997; E 2004) Paint Specification No. 25 Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel Type I and Type II

1.2 SYSTEM DESCRIPTION

Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with AISC 325.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication drawings including description of connections;

SD-03 Product Data

Shop primer

Welding electrodes and rods

SD-06 Test Reports

Bolts, nuts, and washers

Supply the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

SD-07 Certificates

Steel

Bolts, nuts, and washers

Welding procedures and qualifications

1.4 QUALITY ASSURANCE

1.4.1 Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326, AISC 325 and AISC 317. Fabrication drawings shall not be reproductions of contract drawings. Member substitutions of details shown on the contract drawings shall be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.4.2 Certifications

1.4.2.1 Welding Procedures and Welder Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 STEEL

2.1.1 Structural Steel

Structural steel shapes may be new or used meeting ASTM A 572/A 572M Grade 50 for rolled shapes.

2.2 BOLTS, NUTS, AND WASHERS

Provide the following unless indicated otherwise.

2.2.1 Structural Steel

2.2.1.1 Bolts

ASTM A 325, Type 1 for all gate and hull attachments bolts. ASTM A 307 for all other bolts. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.2.1.2 Nuts

ASTM A 563, Grade and Style for applicable ASTM bolt standard recommended.

2.2.1.3 Washers

ASTM F 436 washers for ASTM A 325 bolts.

2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.4 SHOP PRIMER

SSPC Paint 25, (alkyd primer) or SSPC PS 13.01 epoxy-polyamide, green primer (Form 150) type 1, except provide a Class B coating in accordance with AISC 325 and AISC 317 for slip critical joints. Primer shall conform to Federal, State, and local VOC regulations. If flash rusting occurs, re-clean the surface prior to application of primer.

2.5 FABRICATION

2.5.1 Markings

Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.

2.5.2 Shop Primer

Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Owner.

3.2 CONNECTIONS

Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member. Holes shall not be cut or enlarged by burning. Bolts, nuts, and washers shall be clean of dirt and rust and lubricated immediately prior to installation.

3.2.1 High-Strength Bolts

<MET> ASTM A 490M</MET>ASTM A 325 bolts shall be fully tensioned to 70 percent of their minimum tensile strength. Bolts shall be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, bolts shall then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Owners.

3.4 WELDING

Conform to AWS D1.1/D1.1M. Grind exposed welds smooth. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

The Contractor shall develop and submit the Welding Procedure Specifications (WPS) for all welding; including welding done using prequalified procedures. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified shall be submitted for approval.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove only from finished areas.

3.5 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

-- End of Section --

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SECTION 05500

METAL: MISCELLANEOUS AND FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2005) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2006; Errata 2006) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 36/A 36M (2008) Standard Specification for Carbon Structural Steel

ASTM A 780 (2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

ASTM A 992/A 992M (2006a) Standard Specification for Structural Steel Shapes

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Handrail, installation drawings

Waler, installation drawings

Angles and plates, installation drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

All structural steel members shall be new materials meeting ASTM A 36/A 36M or ASTM A 992/A 992M.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A 123/A 123M, ASTM A 153/A 153M, as applicable.

2.2.2 Galvanize

Handrail, anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A 780 or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Owner. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete

each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

3.2 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion shields, and powder-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

-- End of Section --

SECTION 09965

PAINTS AND COATINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100Doc (2005) Documentation of the Threshold Limit Values and Biological Exposure Indices

MASTER PAINTERS INSTITUTE (MPI)

MPI 101 (Jan 2004) Epoxy Anti-Corrosive Metal Primer

MPI 107 (Jan 2004) Rust Inhibitive Primer (Water-Based)

MPI 23 (Jan 2004) Surface Tolerant Metal Primer

MPI 79 (Jan 2004) Alkyd Anti-Corrosive Metal Primer

MPI 9 (Jan 2004) Exterior Alkyd, Gloss, MPI Gloss Level 6

MPI 94 (Jan 2004) Exterior Alkyd, Semi-Gloss, MPI Gloss Level 5

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SP-01 (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1 (2000; E 2004) Shop, Field, and Maintenance Painting

SSPC PA Guide 3 (1982; E 1995) A Guide to Safety in Paint Application

SSPC QP 1 (1998; E 2004) Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)

SSPC SP 1 (1982; E 2004) Solvent Cleaning

SSPC SP 10 (2007) Near-White Blast Cleaning

SSPC SP 12	(2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC SP 2	(1982; E 2004) Hand Tool Cleaning
SSPC SP 3	(2004; E 2004) Power Tool Cleaning
SSPC SP 6	(2000; E 2004) Commercial Blast Cleaning
SSPC SP 7	(2007) Brush-Off Blast Cleaning
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC VIS 3	(2004) Visual Standard for Power-and Hand-Tool Cleaned Steel
SSPC VIS 4	(1998; E 2000; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting
U.S. ARMY CORPS OF ENGINEERS (USACE)	
EM 385-1-1	(2003) Safety -- Safety and Health Requirements
U.S. GENERAL SERVICES ADMINISTRATION (GSA)	
FED-STD-313	(Rev D; Am 1) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Owner Activities
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
29 CFR 1910.1000	Air Contaminants

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

In keeping with the intent of Executive Order 13101, "Greening the Owner through Waste Prevention, Recycling, and Federal Acquisition", products

certified by SCS as meeting SCS SP-01 shall be given preferential consideration over registered products. Products that are registered shall be given preferential consideration over products not carrying any EPP designation.

SD-03 Product Data

Environmental Data

Coating

Manufacturer's Technical Data Sheets; (LEED)

Indicate VOC content.

Color

Submit manufacturer's samples of paint colors for Owner's selection.

SD-08 Manufacturer's Instructions

Application instructions

Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

1.3 APPLICATOR'S QUALIFICATIONS

1.3.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application.

1.3.2 SSPC QP 1 Certification

All contractors and subcontractors that perform surface preparation or coating application shall be certified by the Society for Protective Coatings (formerly Steel Structures Painting Council) (SSPC) to the requirements of SSPC QP 1 prior to contract award, and shall remain certified while accomplishing any surface preparation or coating application.

1.4 REGULATORY REQUIREMENTS

1.4.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Owner of any paint specified herein which fails to conform.

1.4.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.4.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.4.4 Asbestos Content

Materials shall not contain asbestos.

1.4.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

1.4.6 Silica

Abrasive blast media shall not contain free crystalline silica.

1.4.7 Human Carcinogens

Materials shall not contain ACGIH 0100Doc and ACGIH 0100Doc confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.5 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer.

1.6 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the contractor's safety program.

1.7.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.7.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100Doc, threshold limit values.

1.8 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation.

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Owner and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

1.9 LOCATION AND SURFACE TYPE TO BE PAINTED

1.9.1 Painting Included

The steel to be painted is generally limited to the exposed upper 3 feet of the gates as well as the sheet pile cap and other structural elements at or above the gate elevation. The walkway, stair decks and handrails shall be galvanized. Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.
- c. Existing coated surfaces that are damaged during performance of the work.

1.9.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Copper, stainless steel, aluminum, brass, galvanized steel and lead except existing coated surfaces.
- b. Hardware, fittings, and other factory finished items.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.3 PREPARATION OF METAL SURFACES

3.3.1 Existing and New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, SSPC SP 3, SSPC SP 6, or SSPC SP 10.
- b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 10/SSPC SP 12 WJ-2.

3.3.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 3.

For abrasive blast cleaned surfaces, the requirements are stated in SSPC SP 7, SSPC SP 6, and SSPC SP 10. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 1.

For waterjet cleaned surfaces, the requirements are stated in SSPC SP 12. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 4.

3.3.3 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces shall be solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.4 APPLICATION

3.4.1 Coating Application

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats.

- a. **Drying Time:** Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
- b. **Primers, and Intermediate Coats:** Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely and

there shall be a visually perceptible difference in shades of successive coats.

- c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.

3.4.2 Coating Systems

- a. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise. Coating thickness where specified, refers to the minimum dry film thickness.
- b. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- c. Existing Surfaces Damaged During Performance of the Work, Including New Patches in Existing Surfaces: Coat surfaces with the following:
 - (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- d. Existing Coated Surfaces to Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.5 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

- f. Exposed Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed ferrous metal with latex primer MPI 107.

3.6 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Owner. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.7 WASTE MANAGEMENT

Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacturer for recycling into new product. When such a service is not available, local recyclers shall be sought after to reclaim the materials. Set aside extra paint for future color matches or reuse by the Owner.

3.8 PAINT TABLES

All DFT's are minimum values. Acceptable products are listed in the MPI Green Approved Products List, available at <http://www.specifygreen.com/APL/ProductIdxByMPInum.asp>.

3.8.1 EXTERIOR PAINT TABLES

STEEL / FERROUS SURFACES

- A. New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3

1. Alkyd

New; MPI EXT 5.1Q-G6 (Gloss) / Existing; MPI REX 5.1D-G6		
Primer:	Intermediate:	Topcoat:
MPI 23	MPI 9	MPI 9
System DFT: 5.25 mils		

-- End of Section --

SECTION 13310

STEEL BARGE

PART 1 GENERAL

1.1 SCOPE OF WORK

This section covers the requirements for the design and fabrication of two steel barges intended for use as supports for the butterfly gates. The barges shall be furnished complete with cleats and bitts, ballasting and deballasting piping and controlled valving, stairs and ladders, ring buoys, fire extinguishers, railing, and other items as specified herein and shown on the drawings. Each barge is to be capable of ballasting down to sit on bottom and deballasting to again float. This specification assumes that the barges will be supplied as existing units modified to suit the use intended. However, sufficient detail is provided to allow construction of one or both of the barges.

1.2 RELATED SECTIONS

Section 05120 Structural Steel
Section 05500 Metal Miscellaneous and Fabrications

1.3 References

American Bureau of Shipping (ABS) Rules for Building and Classing Steel Vessels

American Welding Society (AWS) D1.1 Structural Welding Code - Steel

AISC Manual of Steel Construction LRFD, Thirteenth Edition, American Institute of Steel Construction.

SEI/ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers.

MIL-HDBK-1026/4A Mooring Design, Department of Defense Handbook, Jul 1999.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 36 Standard Specification for Structural Steel
A 53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A 131 Structural Steel for Ships
A 153 Standard Specification for Zinc (Hot-Dip Galvanized)

Coatings on Iron and Steel Hardware

- A 194 Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or both
- A 204 Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- A 307 Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- A-312 Specification for Austenitic Stainless Steel Pipe
- A 325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A 563 Specification for Carbon and Alloy Steel Nuts
- A 653 Specification for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- A 780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- A 959 Guide for Specifying Harmonized Standard Grade Compositions of Wrought Stainless Steels
- A 992 Specification for Structural Steel Shapes
- F 436 Specification for Hardened Steel Washers
- F 844 Specification for Washers, Steel, Plain (Flat), Unhardened for General Use

CODE OF FEDERAL REGULATIONS, Title 46 - Shipping, Chapter I - Coast Guard

- Part 170 Stability Requirements for All Inspected Vessels
- Part 174 Special Rules Pertaining to Specific Vessel Types

1.4 GOVERNING STANDARD

The barge need not possess American Bureau of Shipping (ABS) classification. However, a report of a comprehensive condition survey equivalent to that required for ABS Special Periodical Survey No. 3 inclusive of drydocking

requirements shall be submitted to the Owner.

1.5 BARGE DESIGN FEATURES

The following requirements shall be observed in the barge design:

a. Barge Design Life

The barge and all associated appurtenances are to be designed to provide the project service including annual removal and reinstallation for a minimum period of 5 years.

b. Barge Physical Characteristics

In addition to the information shown on the drawings:

The barge with gates, gate support structure, end walls, operator house and all appurtenances installed shall meet the stability requirements of 46 CFR 170 & 174.

The barge with gates, gate support structure, end walls, operator house and all appurtenances installed shall be able to remain afloat with one compartment free flooding with a minimum of 3" freeboard at any location along the edge of the deck.

c. Barge Ballast System:

The barge shall have a remote operated ballasting and deballasting system. The barge is to be lowered to sit on the bottom and raised back up to a floating condition by the operation of the ballasting and deballasting system. The ballasting/deballasting valves are to be air operated or may be operated by other remote means and are to be suitable for remaining submerged for multiple years in brackish water. Deballasting is to be accomplished by use of eductors or other submerged pumping devices. The compressed air for valve operation and the pressurized water for eductor operation may be provided by an external source.

d. Barge Manholes:

Each compartment shall be provided with a manhole with a watertight manhole cover. A vertical ladder shall be located directly below the manhole to allow access to the bottom of the compartment.

e. Barge Fenders and Mooring Hardware:

Barge shall be equipped with a fendering system, cleats, bitts and mooring line assemblies. The mooring accessories shall be of sufficient size and quantity to safely and rapidly effect mooring of the design vessel.

1.7 DESIGN REQUIREMENTS

Information presented in this specification is based upon the best estimate of those environmental and physical factors which reasonably can be expected to affect the design, performance, and durability of the barge. These criteria shall be considered as minimum requirements for the barge; however, mere conformance to the minimum sizes, strengths, and design parameters given herein will not automatically ensure approval. Contractors final calculations shall furnish proof that the barge; using the criteria specified herein as a minimum standard, is designed to withstand the loading without damage throughout the design life of the system.

a. Design Butterfly Gate Structures

The barge will be designed to accommodate a pair of butterfly gate structures as shown on the drawings. No portion of the barge may interfere with the opening or closing of the gates.

b. Vertical datum information is shown on the drawings.

c. Structural Loading

The barge shall be designed to accommodate all environmental and operational loading conditions described in this section.

(1) Dead Load, D:

- a. Weight of the steel barge.
- b. Weight of any permanent ballast.
- c. Weight of the structures supported on the deck.
- d. Weight of permanent equipment supported on the deck.
- e. External hydrostatic pressure and buoyancy in calm water conditions assuming barge is submerged to the bottom depth of 25 feet. Hydrostatic pressures shall be based on a water level to Mean Higher High Water (MHHW).
- f. Weight of any interim or temporary deck loadings during placement or operation.

(2) Gate Loads

The loads on the pivot post from the gates are shown on the plans.

- (3) Live Load, L: The barge and barge structures shall be designed to resist the live loads described below.
 - a. Motions and wave impacts resulting from an ocean tow, if the barge is to be outfitted with the butterfly gates at some place outside the San Francisco/San Pablo Bay area.
 - b. Internal pressures and water movement resulting from lowering the barge to the bottom and refloating the barge.
 - c. Impact with the bottom resulting from lowering the barge to the bottom.
 - d. Longitudinal bending resulting from transit in a seaway or from lowering/raising the barge to/from the bottom.
 - e. Mooring bitts shall be able to take a side load of 140 kips in any direction. If the bitts are to be used always in conjunction with a mooring chock, then the chock shall be able to take a line tension of 140 kips in any direction, and the bitt shall be able to take a load of 140 kips in line with the chock.
 - f. Towing: Forces exerted on the barge from towing, wave forces and motions during transit. The maximum towing load (obtained by limiting tow cable load) shall be specified and used for this load.
 - g. Temporary ballast.
 - h. Guardrails: 50 PLF horizontal load applied at the top of the rail, 200 lbs concentrated load applied at any point and in any direction.

- (4) Environmental Loads, E: Environmental loads shall be calculated as equivalent quasi-static loads representing the maximum dynamic effect for the following environmental phenomena:

The barge and mooring system are to be designed for the Bacon Island area of the Sacramento/San Joaquin Delta. Resultant loads vary depending upon whether the environment approaches end-on to or broadside to the barge. Environmental criteria for two directions are therefore specified below.

LOADING	Direction	
	End-on	Broadside
Wind Load (3-sec gust)	61 knots	61 knots

Current	2.5 knots	1 knot
Wave Ht (H_s)	2 Ft	2 Ft.
Wave Peak Period (T_p)	4.0 sec	4.0 sec
Boat Wake	2.0 Ft.	2.0 Ft.

Waves shall also be considered to cause non-uniform bottom support during on bottom operation.

- (5) Accidental Loads, A: Accidental loads occur as a result of an accident or exceptional conditions when floating. The barge is to be protected from impact by other vessels by adequate fendering.
- (6) Loads and Load Combinations:
- a. Required strength, U , shall be at least equal to the effects of the following factored loads:
- $$U = 1.2D + 1.6L + 1.3E$$
- $$U = 1.2D + 1.3A$$
- $$U = 0.9D + \max(1.6L, 1.3E)$$
- $$U = 0.9D + 1.3A$$
- b. The barge shall be designed to provide safety against failure for the following modes:
- Loss of overall equilibrium
 - Failure of critical sections
 - Leakage into compartments.

1.8 SUBMITTALS

Submit the following to the owner's Representative prior to fabrication of the barge and its appurtenances.

a. Shop Drawings:

Submit stamped, signed Design Drawings for the barge showing all materials, member shapes and sizes, dimensions, quantities, connecting details, and accessories. Shop Drawings shall be provided for all specially fabricated items, and catalog sheets for all standard manufactured items that are to be incorporated into the barge.

b. Design Calculations:

Submit Final Design Calculations for barge and all appurtenances

attesting that the barge conforms to all design requirements. Calculations shall be prepared under the supervision of, and sealed by a Professional Engineer holding a valid Certificate of Registration in a state of the United States of America. The calculations shall be complete, have a table of contents with page numbers, shall include design criteria, and shall be easily readable. Details of analysis work shall be provided, and summarized. Computer program results shall be described and where program results are included the data shall be clearly described.

C. Steel Barge Designer and Fabricator:

Submit name, address and qualifications of designer and fabricator.

D. Certification Test Reports:

Submit certification from ABSTECH attesting that the barge conforms with the contract requirements.

1.9 QUALITY ASSURANCE

a. Barge Manufacturer Qualifications:

Barge fabricator shall have a minimum of five years successful experience in the design and fabrication of similar steel barges. Fabricator shall submit a minimum of 3 similar project designs with its bid along with contact information for the operating authority or owner.

b. Barge Designer Qualifications:

If barge designer is not a direct employee of the fabricator, additional experience representation must also be provided. Examples of designs for similar facilities must be provided along with contact information for the facility operating authority or owner.

c. Inspections:

- (1) The fabricators facilities shall be available to the Owner and their Representative for inspection before and after award of contract.
- (2) Special Inspections and testing will be provided by the owner's Representative for steel and welds.
- (3) The schedule is to be updated weekly once the fabrication starts.

d. Sea Trials:

Barge fabricator shall develop and also perform appropriate sea trial criteria to prove the performance and stability of the manufactured barge prior to delivery to the site. Any such trials must take into account expected wave, vessel berthing and mooring, live loading, dead loading and any other criteria necessary to show that the finished barge facility will fully meet the intended use by the Owner. Any such off-site sea trials will be coordinated with the Owner to permit

witnessing by Owner's Representatives.

- e. The design and fabrication of all portions of the facility shall be shown to meet the specified design life and maintenance criteria.

1.10 DELIVERY

- a. Project Site:

The project sites are located on the north side of Bacon Island in Connection Slough and the west side of Bacon Island in Old River. The water access to the site is via San Francisco Bay, San Pablo Bay, Carquinez Straight, the Sacramento River and the San Joaquin River. Contractor is advised that the waterway will continue to be in use and all delivery and installation shall be coordinated with and not interfere with vessel traffic.

- b. Barge:

The contractor shall deliver the steel barge complete with cleats and bits, ballasting and deballasting piping and controlled valving, stairs and ladders, ring buoys, railing, and other items as specified herein and shown on the drawings for outfitting with the butterfly gates.

PART 2 PRODUCTS

2.1 BARGE STRUCTURE

Structural Steel for Ships ASTM A 131, all grades are acceptable.

2.2 MOORING ACCESSORIES

ASTM A36 or ASTM A 992, Galvanized; per ASTM A 123/A, A 153/A and A 653/A.

2.3 MANHOLE, MANHOLE COVERS AND FASTENERS

The manhole shall be watertight when the manhole cover is in-place. The manhole covers shall be the quick opening, flush type at least 24 inches diameter clear opening. Materials shall be ASTM A 240, Type 316L Stainless Steel, A 194 Connectors.

2.4 GUARDRAILS

Structural Steel, ASTM A 36, Galvanized; per ASTM A 123/A, A 153/A and A 653/A.

2.5 GALVANIZED BOLTS, NUTS AND WASHERS

Bolts

Bolts shall conform to the requirements of ASTM A 307. Nuts shall conform to the requirements of ASTM A 563 Grade A. Washers shall conform to the requirements of ASTM F 844.

Bolts, nuts and washers to be galvanized unless otherwise specified on drawings; ASTM 123/A and 153/A.

2.6 MOVABLE BROW RAMP

(NIC)

2.7 CHAIN

ABS or ORQ stud link anchor chain.

2.8 DISSIMILAR METALS

Contact between dissimilar metals should be avoided to eliminate the possibility of galvanic corrosion in a saltwater environment.

2.9 ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE (UHMW)

All UHMW for the bearings and rub strips shall be Ultra-Fend manufactured by Ultra Poly or approved equal. The UHMW shall be all virgin material and white in color.

2.10 NEOPRENE WASHERS AND GASKETS

Neoprene washers and gaskets shall be Durometer 40.

2.11 LADDERS AND STAIRS

Ladders and stairs shall be provided on the barge at locations shown. Ladders and stairs shall be fabricated from ASTM A 36 structural steel and shall be hot dipped galvanized in accordance with ASTM A 123/A. All connections shall be made by welding including connections at the top to the ramp structure and by bolting to the barge deck. Stairs and ladders shall be designed to fit the width shown on the drawings, but not less than 18 inches wide, except not less than 16 inches wide within the compartments of the barge. Risers, treads, and handrails shall be designed in accordance with applicable ABS and US Coast Guard requirements. Stair treads shall be painted with two contrasting colors in alternating stripes.

2.12 MOORING BITTS AND CLEATS

Mooring bitts and cleats shall be provided by the contractor as required for navigation and mooring. Bitts and cleats shall be positioned so as to not present an obstruction to the gate operations nor limit water depth at the barge location. Bitts shall be fabricated from ASTM A 53 Grade B, Double-Extra Strong Pipe, A36 bar and base plate. Apply zinc coating in accordance with ASTM A 123. Repair damage surfaces as required for "Metal Fabrications". Cleats shall be selected for size and attached at locations shown on the drawings in a manner that they can carry the given mooring line loads.

2.13 SHACKLES

Hot dipped galvanized shackles will be provided on as necessary.

2.14 CATHODIC PROTECTION

New zinc anodes shall be provided for the protection of the underwater hull area from corrosion. One type ZHS-23 zinc anode conforming to Military Specification MIL-A-18001 with galvanized steel straps shall be provided for each 100 square feet of wetted surface area. The anodes shall be installed in locations always submerged, and by bolting the ends of the steel straps to brackets welded to the steel hull.

2.15 BALLAST/DEBALLAST SYSTEM

The barge is to be outfitted with a remotely controlled ballast/deballast system that is capable of performing the procedures described in Section 13400 BARGE POSITIONING AND PLACEMENT. The system must also be able to deballast or raise the barge back to a floating condition.

The power for both the ballast/deballast system and the compressed air system, whether pressurized water or air, is to be provided by the construction barge.

The components within the barge are dependent upon the size of the barge and the number of compartments. If a tiltdown type ballasting procedure is selected by the contractor, then the components and quantities are estimated to be as follows:

L ::	Length of the barge
B ::	Breadth of the barge
N ::	Number of compartments
Qty.	Description
N	4" Air Operated Gate Valves (Air open / Spring close)
2 x N	6" Air Operated Gate Valves (Air open / Spring close)
1	6" Manual Gate Valve
N	6" x 4" x 6" Eductors (Suction / Supply / Discharge)
2 x N	9" Grills (Stainless steel, 50% Open area)
2 x N	8" x 6" SCH 80 Reducers
2 x N	6" Weldneck Flanges (150#)
75'	6" Flexible Hose
N x B/4	4" SCH 80 Pipe (Branch)
L + 45'	6" SCH 80 Pipe (Main Supply)
N x B/3	6" SCH 80 Pipe (Discharge)
3 x N x 75'	1/2" Air Hoses
3xNx(L/2+B/3+45')	0.500" x 16 Gauge Tubing (Air lines)

There shall also be a cabinet with at bank of 3 x N solenoid operated air valves and a control console with a switch and lights (open/closed) for each valve.

PART 3 - EXECUTION

3.1 FABRICATION

The barge body shall be of welded steel construction. The deck shall be free of obstruction that would interfere with its intended use.

a. Steel

See applicable ASTM specification noted in Section 2.01.

3.2 INSTALLATION

- a. Barge hull steel fabrication and installation shall conform to the requirements of ABS Rules for Building and Classing Steel Vessels
- b. Structural steel fabrication and installation shall conform to the requirements of AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.
- c. Welding shall conform to AWS D1.1 Structural Welding Code - Steel
- d. Fasteners protruding above the surface of the deck shall have a low, rounded profile.

3.3 DECK ACCESSORIES

All deck accessories shall be coordinated with utilities and installed in accordance with the drawings (or as directed by the owner) and the manufacturer's recommended method of installation.

3.4 TOLERANCES

- a. Barge Fabrication (allowable variation of construction dimension from nominal dimension shown on barge plans).
 - (1) Barge Width and Length ± 2 inches from nominal barge width.
 - (2) Barge Depth ± 1 inch from nominal barge width.
 - (3) Barge Deck flatness within 1 inch across width and within 1 inch over any 50 ft length.

3.5 POLLUTANTS

Contractor shall take extra care to remove any and all residual oils, lubricants and other contaminants from the barges prior to placement in the channels. Barge condition is to be inspected by the Owner prior to placement.

--End of Section --

SECTION 13320

OPERATOR'S HOUSE

PART 1 - GENERAL

1.1 SCOPE

- A. The work under this section of the Specifications consists of furnishing labor, materials, appliances, tools and equipment to furnish and install a prefabricated Operator's House at each of two barge locations as indicated on the drawings, and as specified herein.

1.2 REFERENCES

- A. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members
- B. American Welding Society (AWS)
- C. American Society for Testing and Materials (ASTM)
- D. American Institute of Steel Construction (AISC)

1.3 SUBMITTALS

A. Product data:

1. Literature indicating any and all options for selection and/or clarification by the Owner or Owner's Representative.
2. Product data and fixture cut sheets for all equipment to be used:
 - a. Indicate power requirements of all equipment.
 - b. Maintenance and Operations manuals for all equipment.

B. Samples:

1. Submit sample chains or product literature showing all options for color selection by the Owner. Colors to be selected at the time of submittal.

C. Shop drawings shall include:

1. Plans, Elevations, Sections and Details as required to completely describe sizes and locations of casework, doors, windows, switches and all other equipment whether standard or custom based on requirements of the construction documents.
2. Door and Window details.

3. Electrical plan showing location of switches, outlets, fixtures and panels, if any, for power and signal systems.
4. Mechanical plan showing operation of mechanical system and components.

1.4 WARRANTY

- A. The Contractor shall furnish a written warranty guaranteeing that:
 1. All material and work shall be of the quality, quantity and character specified and/or shown.
 2. Any defect due to the use of improper workmanship and material discovered and made known to him within two years of the final completion date of the project shall be repaired without additional expense.
 3. The written warranty covering the above provisions shall be supplied to the Owner before final payment will be made.
 4. The above provisions shall be considered as supplementary to other requirements of these specifications and in no way shall relieve the Contractor from any of the other requirements set forth herein.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. B.I.G. Enterprises, Inc., 9702 East Rush Street, South El Monte, CA 91733, 800-669-1449, or approved equal.

2.2 MATERIAL

- A. Structural Tubing: ASTM A500.
- B. Sheet Steel: ASTM A 446, Grade A structural quality, G90 galvanized coating at 1.25 ounces per square foot, minimum yield strength of 33,000 psi.
- C. Welding Material: AWS D1.1.
- D. Anchoring: Unit shall be anchored to concrete foundation in accordance with manufacturer's recommendations.

2.3 COMPONENTS

- A. OPERATOR'S HOUSE:
 1. Operator's House shall be model D58120B, as manufactured by B.I.G. ENTERPRISES INC. 626-448-1449. Pre-fabricated steel designed in strict accordance to the latest editions of I.B.C. all electrical to be to N.E.C. Refer to drawings for dimensions and additional specification requirements. Unit to

- be UL classified and bear a UL classified label affixed to the side of the building and have a data plate affixed to the load center.
2. FRAME: To be minimum A-500, 2" x 2" x .083 structural mechanical steel tubing, formed for accuracy.
 3. WALL SYSTEM AND ROOF PANELS: To be minimum of A-527, 16ga. cold rolled galvanized steel panels MIG welded between frame and mullions for self aligning unitized system. Roof to have 8" fascia with 24" overhang on the two 10' end walls and a 6" overhang at the two 24' side walls. Unit to have interior and exterior finished steel panels painted the same color with rigid urethane insulation sandwiched between panels; overall system to allow for a minimum "R" value of 10 in the walls. Roof to have minimum "R" value of 19. Roof shall be designed to accommodate a light standard and signs as shown on the drawings.
 4. FLOOR:
 - a) Unit to have 20 GA. Structural metal floor and shall be structurally attached to the gate structure as shown on the drawings. The floor shall have all required cut outs for piping and electrical.
 - b) Typical Floor Finishes: General: 12" Vinyl Composition Tile (VCT) with cove base.
 5. DOORS: Unit to have two heavy-duty steel swing out door constructed of 16ga. steel panels on steel tube frame with half height bulletproof (level 3) glazing. Doors to include heavy-duty hardware, mortise lockset and complete weather stripping. Door to be located at the center rear and center front of the booth.
 6. WINDOWS: Unit to have steel window frame system with flush mounted corners and concealed welded fastening. Unit to have all windows fixed, all glazing to be gray tinted bulletproof (level 3) glass.
 7. ELECTRIC SYSTEM:
 - a. The factory-assembled electrical system shall be furnished and installed in accordance with applicable UL standards and shall be UL labeled as an assembly In accordance with San Joaquin County requirements, entire booth shall be UL certified or certified by an acceptable inspection laboratory as meeting UL standards.
 - b. All wiring shall be stranded copper conductors with THWN/THHN or XHHW insulation. Wiring shall be routed concealed within the walls and ceiling of the structure, utilizing EMT or MC cable as permitted by the labeling requirements

- c. Wiring devices shall be specification-grade nylon, installed in recessed, galvanized steel outlet boxes.
 - d. Electrical loads shall be suitable for operation on a 208V three-phase or 120V single-phase system.
8. Units shall be furnished with side wall air conditioning unit of sufficient capacity to maintain a maximum of 75° Fahrenheit during a 110° Fahrenheit day and heating units capable of raising the interim temperature to 68° Fahrenheit on a 32° Fahrenheit outside temperature.
9. SHELVES: Unit to have two steel shelves 36" deep mounted at 30" above finished floor and covered with plastic laminate - color selected by architect/engineer.
10. WEATHER PROOFING: All seams and joints are to be pressure bonderized, all openings to be fully weather-stripped. Roof to have elastomeric membrane by Pendex (or equal). Floor underside to be bitumous coated.
11. FINISH: Unit to be electrostatically painted with RUST inhibitive coating system. Using a High build primer, and two-part catalyst polyurethane finish coat. Overall system to have minimum 5 mil rating, and to carry a minimum of 1,500 hr. salt spray test. Color to be selected by Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble, install and anchor prefabricated guard booth in strict accordance with manufacturer's latest specifications and recommendations.

3.2 CLEANING

- A. Clean all glass and wall surfaces completely, inside and out, removing all excess sealant labels, dirt, etc.

3.3 PROTECTION

- A. Contractor shall be responsible for the protection from harm of the guard booth during the construction process and until such time as the acceptance of the project.

-- End of Section --

SECTION 13340

HYDRAULIC GATE OPERATORS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2006; Errata 2006) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B16.11 (2005) Forged Fittings, Socket-Welding and Threaded

ASME B31.1 (2007) Power Piping

ASME B36.19M (2004) Stainless Steel Pipe

ASME B40.100 (2006) Pressure Gauges and Gauge Attachments

ASME BPVC SEC VIII D1 (2007) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

ASTM INTERNATIONAL (ASTM)

ASTM A 182/A 182M (2008) Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

ASTM A 193/A 193M (2007) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

ASTM A 194/A 194M (2007) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both

ASTM A 312/A 312M (2008) Standard Specification for Seamless, Welded, and Heavily Worked Austenitic Stainless Steel Pipes

ASTM A 325 (2007a) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 354	(2007a) Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
ASTM A 516/A 516M	(2006) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A 519	(2006) Standard Specification for Seamless Carbon and Alloy Steel Mechanical Tubing
ASTM A 564/A 564M	(2004) Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM A 576	(1990b; R 2006) Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
ASTM A 659/A 659M	(2006) Standard Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled
ASTM A 705/A 705M	(1995; R 2004) Standard Specification for Age-Hardening Stainless Steel Forgings
ASTM A 789/A 789M	(2007) Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service
ASTM D 3951	(1998; R 2004) Commercial Packaging
ASTM F 844	(2007a) Washers, Steel, Plain (Flat), Unhardened for General Use
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)	
IEEE C57.12.70	(2000) Standard Terminal Markings and Connections for Distribution and Power Transformers
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)	
ISO 1219-1	(2006) Fluid Power Systems and Components Graphic Symbols and Circuit Diagrams Part 1: Graphic Symbols for Conventional Use and Data-Processing Applications
ISO 1219-2	(1995) Fluid Power Systems and Components Graphic Symbols and Circuit Diagrams Part 2: Circuit Diagrams
ISO 16889	(1999) Hydraulic Fluid Power - Multi-Pass Method for Evaluating Filtration Performance of a Filter Element

ISO 4021 (1992) Hydraulic Fluid Power - Particulate Contamination Analysis - Extraction of Fluid Samples from Lines of an Operating System

ISO 5598 (1985) Fluid Power Systems and Components - Vocabulary

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C80.1 (2005) Standard for Electrical Rigid Steel Conduit (ERSC)

NEMA ICS 1 (2000; R 2005) Standard for Industrial Control and Systems General Requirements

NEMA ICS 2 (2000; Errata 2002; R 2005; Errata 2006) Standard for Industrial Control and Systems: Controllers, Contractors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment

NEMA ICS 6 (1993; R 2006) Standard for Industrial Controls and Systems Enclosures

NEMA MG 1 (2007) Standard for Motors and Generators

NEMA RN 1 (2005) Standard for Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

NATIONAL FLUID POWER ASSOCIATION (NFPA)

NFPA T2.24.1 R1 (2007) Hydraulic Fluid Power - Systems Standard for Stationary Industrial Machinery; Supplement to ISO 4413

NFPA T3.16.2 R1 (1997; R 2005) Hydraulic Fluid Power - Design for Nonintegral Industrial Reservoirs

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE ARP598 (2003; Rev C) Aerospace Microscopic Sizing and Counting of Particulate Contamination for Fluid Power Systems

SAE J1165 (1979; R 1986) Reporting Cleanliness Levels of Hydraulic Fluids

SAE J514 (2004) Hydraulic Tube Fittings

UNDERWRITERS LABORATORIES (UL)

UL 50 (2007) Standard for Enclosures for Electrical Equipment

UL 6 (2007) Standard for Electrical Rigid Metal Conduit-Steel

1.2 SYSTEM DESCRIPTION

The work covered by this section of the specifications consists of detailed requirements for the design, fabrication, shop assembly, testing, delivery, and installation of the hydraulic power systems for operation of the butterfly gates as specified and as shown.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

The contract drawings indicate the general arrangement of the hydraulic power system for operation of the butterfly gates, clearances necessitated by the structure or other equipment, maximum overall dimensions, and other pertinent features. Furnish the detailed design in conformity with NFPA T2.24.1 R1, and the following design criteria.

1.3.1 Design Parameters

The principal design parameters for the hydraulic power system are as follows:

The butterfly gate operating system for each gate must meet the following design criteria:

- a. Maximum operating pressure: 3,000 psi design working / 2,000 psi operating
- b. Rated opening torque: 1,000,000 ft. lb. at 25 degree open
- c. Rated closing torque: 1,000,000 ft. lb. at 25 degree open
- d. Maximum opening time: 4 minutes
- e. Maximum closing time: 4 minutes
- f. Butterfly gate rotation: 90 degrees
- g. Double gate clear opening: 75 feet at Old River Site and 60 feet at Connection Slough site.
- h. Operating Air Temperature range 20 degrees F to 110 degrees F
- i. Duty cycles: one open-close cycle per hour

1.3.2 Allowable Stresses

1.3.2.1 Structural Items

Structural items associated with the hydraulic power system, such as support beams, shall be designed to withstand the maximum force exerted by the hydraulic cylinder plus any dead loads with a factor of safety of 2 based on the yield strength of the materials involved.

1.3.2.2 Hydraulic Cylinders

Select the hydraulic cylinders to meet the design working pressure in the system. Select rod diameter and stop tube length to resist buckling under the operating compression load.

1.3.2.3 Stress Concentration Factors

Stress concentration factors shall be used where applicable. Reduction of allowable stresses to compensate for repeated cycles of loading is not required.

1.3.3 Connections

1.3.3.1 Pinned Connections

Design pinned hydraulic cylinder connections for field assembly as shown.

1.3.3.2 Shop Connections

Design shop connections for assembly by means of welding or by bolting.

1.3.3.3 Welded Connections

Design of welded connections shall be in accordance with the applicable provisions of AWS D1.1/D1.1M except that provisions for repeated stress will not be required. Hydraulic cylinders shall be welded in accordance with ASME BPVC SEC VIII D1, Section VIII. Piping shall be welded in accordance with ASME B31.1.

1.3.3.4 Structural Bolted Connections

Structural bolted connections carrying primary loads shall be made with ASTM A 325 bolts.

1.4 SUBMITTALS

SD-02 Shop Drawings

Schematic and Drawings

Schematic and drawings as specified.

SD-03 Product Data

Materials and Mechanical Equipment

Electrical Equipment

Manufacturer's catalog data and descriptive literature for all standard equipment and products to be incorporated in the work, including all materials and equipment specified in paragraphs MATERIALS AND MECHANICAL EQUIPMENT and ELECTRICAL EQUIPMENT. Include in this data specifications and assembly drawings showing sizes, ratings, parts and material lists, overall dimensions, and mounting dimensions.

System Description

Design and Performance Requirements

Design computations for all items which are to be designed by the Contractor.

Shop Assembly and Testing

Procedures for shop testing for all testing outlined in paragraph SHOP ASSEMBLY AND TESTING.

Cleaning and Flushing the System

Procedures for field cleaning and flushing as outlined in paragraph CLEANING AND FLUSHING THE SYSTEM and a detailed field cleaning procedure not less than 10 days before start of cleaning operations.

Field Testing

Procedures for field testing as specified in paragraph FIELD TESTING. Proposed testing program, at least 4 weeks prior to the first scheduled test, to ensure agreement as to personnel required and scope of the testing program.

SD-06 Test Reports

Shop Tests

Field Tests

Operational test reports for all required shop testing and testing of the equipment after installation.

Piston Rods (Standard Design)

Certified test report of the corrosion resistant test on rod material.

SD-10 Operation and Maintenance Data

Operation and Maintenance

Operation and maintenance requirement as specified.

1.5 SCHEMATIC AND DRAWINGS

1.5.1 Shop Drawings

Detailed shop drawings shall include fabrication, shop assembly, delivery, and field installation drawings. Any component part of fabricated items omitted shall be detailed on the shop drawings. If departures from the contract drawings are deemed necessary by the Contractor, submit details of such departures, including changes in related portions of the project and reasons thereof, with the shop drawings.

1.5.2 Fabrication Drawings

Provide fabrication drawings for all mechanical and structural parts or components, except those which are of standard manufacture. The drawings shall show complete details of materials, tolerances, machined surface finishes, connections, and proposed welding sequences which differentiate shop welds and field welds.

1.5.3 Shop Assembly Drawings

Provide shop assembly drawings with details for connecting the adjoining fabricated components in the shop to ensure satisfactory field installation.

1.5.4 Hydraulic Schematic

Hydraulic Schematic: Provide a complete hydraulic schematic in accordance with ISO 1219-1 and ISO 1219-2. All hydraulic components shall be shown on the schematic, and all setpoint and size parameters shall be indicated for each component.

1.5.5 Delivery Drawings

Provide delivery drawings with descriptions of methods of delivering components to the site, including details for supporting fabricated components during shipping to prevent distortion or other damage.

1.5.6 Field Installation Procedures

Provide field installation drawings with a detailed description of the field installation procedures. The description shall include the location and method of support of installation and handling equipment, the provisions to be taken to protect personnel and other work during installation, the method of maintaining components in correct alignment, and the methods for installing other appurtenant items.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Packaging

The hydraulic power systems shall not be prepared for shipment until they have been inspected and accepted for shipment at origin by the Contracting Officer, unless inspection has been waived in writing. Each hydraulic power system or subassembly shall be shipped completely assembled. The subassemblies shall be defined as the following:

- a. Hydraulic cylinders
- b. Hydraulic power units
- c. Piping assemblies
- d. Control consoles

Provide the subassemblies with adequate protective pads, supports, and blocking and securely restrained to prevent distortion or damage to the painted surfaces in transit. Any loss or damage during shipment, including damage to the painted surfaces, will be considered the responsibility of the Contractor. All accessories and spare parts shall be packed separately in containers plainly marked "ACCESSORIES ONLY," or "SPARE PARTS ONLY." A packing list, listing the contents of each container, shall be placed in a moisture-proof envelope and securely fastened to the outside of the container. Standard commercial packaging in accordance with ASTM D 3951 will be acceptable except where a different method or standard of packaging is specified.

1.6.2 Shipping, Preservation, and Storage

Packing, crating, cradles, etc., necessary to ensure safe shipment, are the responsibility of the Contractor. The hydraulic cylinders shall be filled with the specified hydraulic fluid and the piping connections sealed. The shipping provisions shall be such that the cylinders may be rotated in increments of 90 degrees during storage. Should the cylinders be stored by the Contractor during fabrication, shipping, or at the worksite in the horizontal position more than 30 days, they shall be rotated every 30 days as follows: first 90 degrees, then 180 degrees, then 90 degrees, and then 180 degrees. Provisions shall be made with external shipping devices to prevent damage to the cylinder and piston rod resulting from the rod flexing up and down in the cylinder during transport. Internal rod supports are not acceptable. Submit a proposal for controlling movement of the piston rod for approval. Adequately protect machined surfaces from corrosion and physical damage. Protect equipment delivered and placed in storage from the weather, humidity, temperature variation, dirt and dust, or other contaminants.

1.7 WARRANTY

All equipment shall be guaranteed for a period of 2 years from the date of acceptance. Replacement parts shall be guaranteed for 2 years from date of replacement. Provide Warranty against defective materials, design, and workmanship. In cases where the equipment manufacturer's advertised minimum guarantee is in excess of 2 years, it shall remain in force for its full period. Upon receipt of notice of failure of any of the parts during the warranty period, new replacement parts shall be furnished and installed promptly at no additional cost.

1.8 OPERATION AND MAINTENANCE

Furnish complete sets of instructions containing the manufacturer's operation and maintenance instructions for each piece of equipment in accordance with Section 01330 SUBMITTAL PROCEDURES. Each set shall be permanently bound and shall have a hard cover. Furnish one complete set prior to field testing and the remaining sets shall be furnished before the contract is completed. The following identification shall be inscribed on the covers: "OPERATING AND MAINTENANCE INSTRUCTIONS," title of the project, location of the project, the name of the Contractor, and the contract number. A flysheet shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2 by 11 inches, with large sheets of drawings folded in. The instructions shall include, but not be limited to, the following:

- a. A cross-section drawing of the hydraulic cylinder with parts list.
- b. A system layout drawing showing the piping, valves, and controls.
- c. A system hydraulic schematic.
- d. Electrical wiring and control diagrams.
- e. Operating and maintenance instructions.
- f. Manufacturer's bulletins, catalog cuts, and descriptive data.

Provide the Operation and Maintenance (O&M) Manual with all information which may be needed or useful for operation, maintenance, repair, dismantling or assembling, and for identification of parts for ordering replacements. The manual will be subject to approval. Furnish parts lists and recommended spare parts in the quantities recommended by the manufacturer.

PART 2 PRODUCTS

2.1 MATERIALS AND MECHANICAL EQUIPMENT

2.1.1 General

Provide materials and mechanical equipment that conform to the requirements indicated or specified, and if not specified, furnish materials and mechanical equipment of the best commercial grade quality suited to the intended use and as approved. The manufacturer's name, address, and catalog number shall be permanently displayed on a nameplate securely attached to each major item of equipment.

2.1.2 Standard Products

Where items are referred to hereinafter as "similar and equal to" a particular manufacturer's product, such references have been made merely as a convenient method of indicating the type of material or equipment required, with no intention of asserting superiority thereof. The standard product of any reputable manufacturer regularly engaged in the commercial production of the type and quality of material or equipment referred to will not be excluded on the basis of minor differences, provided essential requirements of the specifications relative to materials, capacity, and performance are met. In accordance with paragraph SUBMITTALS, furnish for approval, performance capacities and other pertinent information concerning the manufacturer's "equal to" standard products intended for incorporation in the work. "Equal to" standard products installed or used without such approval shall be at the risk of subsequent rejection.

2.1.3 Hydraulic Cylinders (Standard Design)

The hydraulic cylinder shall be one of the types listed in ISO 5598, and specified or indicated, of tie rod design, square head standard construction. The pressure rating of the cylinder shall not be less than the maximum system pressure indicated. The manufacturer shall produce evidence that each cylinder was hydrostatically tested to 200 percent of the severest service rating and that dynamic seals are suitable for both frequent and infrequent operation and are capable of not less than 500,000 cycles of operation in systems properly maintained. The bore, stroke, rod diameter, and mounting style of the cylinder shall be as indicated. The cylinder shall be provided with piping ports per SAE.

2.1.3.1 Cylinder Tubes

The cylinder tube shall be machined from ASTM A 519, Grade 1018, heavy wall seamless steel tubing and shall have the bore honed to a surface finish compatible with the seals being used so as to result in zero leakage past the seals.

2.1.3.2 Cylinder Heads and Caps

The cylinder head and cap shall be fabricated from ASTM A 576, Grade 1018, steel bar stock ASTM A 516/A 516M, Grade 60 plate and machine finished on all surfaces. The cylinder head shall be equipped with a rod seal and external dirt wiper and shall have a rod bushing piloted into the head to ensure concentricity. Rod bushings shall be removable without the use of special tools and without removing the tie rods or cylinder head. Attachment of the cylinder tube to the head and cap shall be by tie rods having minimum yield strength of 100,000 psi. Removable attachments shall have the cylinder tube end seals arranged to seal with pressure and shall be designed to prevent shearing and extrusion and to provide axial metal backup.

2.1.3.3 Pistons

The piston shall be precision fitted to the cylinder body bore. The piston shall be fine-grained cast iron and shall be designed and equipped with zero leakage cup-type seals. The design shall protect the piston rings from blow-out and oversqueezing. Cup-type seals shall be self regulating and shall automatically compensate for wear.

2.1.3.4 Piston Rods (Standard Design)

The piston rod shall be made of Type 630 (17-4PH) stainless steel. The rod shall be polished to a 10 microinch RMS surface finish or better, and hard chrome plated to 0.003 inch minimum thickness.

2.1.4 Gate Locking Device

The gate locking device shall be fabricated from stainless steel conforming to ASTM A 564/A 564M or ASTM A 705/A 705M, Type 630 or XM-12, Condition H-1150.

2.1.5 Hydraulic Power Unit

The hydraulic power unit shall be a self-contained, packaged unit designed by the Contractor to operate the hydraulic cylinders in accordance with the criteria stated in paragraph DESIGN PARAMETERS. The power unit shall be designed to meet the space limitations shown and shall be configured essentially as shown.

2.1.6 Oil Reservoirs

The oil reservoir shall be sized as shown by the Contractor to meet the space limitations shown. The reservoir shall be made of steel with welded joints and shall conform to the requirements of NFPA T3.16.2 R1 and as shown. The reservoir shall be equipped with a fluid level indicator and filler with built-in strainer. There shall be a baffle provided between the intake and return lines to facilitate the separation of air and foreign matter from the hydraulic fluid. Both the intake and return pipes shall be brought down to a distance of 1 1/2 pipe diameters above the tank bottom. Interior surfaces of the reservoir shall be cleaned down to bright metal and coated with an epoxy-based urethane finish or an approved alternate that is compatible with oil and water.

2.1.6.1 Magnetic Separators

The manufacturer's standard magnetic separator shall be provided in the reservoir. The magnetic separator shall consist of a high-strength permanent magnet arranged for rigid mounting with the poles of the magnet exposed to the fluid in the reservoir.

2.1.6.2 Air Breather

The reservoir shall be provided with an air breather which removes dirt and moisture from the incoming air. The incoming air shall first pass through a desiccant bed to remove the moisture, and then pass through a filter to eliminate the solid contaminants before entering the reservoir. Outgoing air shall pass directly to the atmosphere through a check valve. The breather shall also provide visual indication of the desiccant and filter condition.

2.1.7 Pumps

The pumps for the hydraulic system shall be an electric motor-driven, fixed displacement, gear type rated to deliver a nominal 15 gpm at 2,000 psi while operating with the specified oil in the specified temperature range. Maximum rotating speed shall be 1800 rpm. Exposed rotating parts shall be properly safety guarded. The pumps shall mount in or on the reservoir in a manner similar to that shown on the drawings so that the pump suction is flooded. The pumps shall operate on 208 volts, 60 Hz, three phase power. The pumps shall be rated for continuous operation at a discharge pressure equal to or greater than the operating design pressure. The rated discharge capacity of each pump shall not be less than indicated when the pump is operated at the design input speed and discharge pressure.

2.1.8 Filters

The filters shall be located in the return line to the reservoir and in the pump suction line and shall be of the spin-on type with a bypass and an indicator to show the condition of the filter element. The filter element shall have a rating of 10 microns absolute unless a smaller mesh is recommended by the pump manufacturer. The filter element shall have a minimum silt control rating of Beta sub two (2) = 2 and Beta sub ten (10) = 500 at 60 psi differential pressure per ISO 16889. The filter shall be rated for use with hydraulic oil and the pressure drop should not exceed 6 psi in the clean condition. Determine the pressure and flow rating of the filters to be compatible with his design of the power units.

2.1.9 Gauges

2.1.9.1 Pressure Gauges

Pressure gauges shall conform to ASME B40.100, have a black enameled metal case, a 4-1/2 inch dial, and a stainless steel Bourdon tube. The scale range of the gauge shall be approximately 150 percent of the maximum pressure of the line in which installed. Gauges shall be the safety type with solid fronts and blowout backs. Each gauge shall be provided with a pressure snubber. Gauge mounting shall be as indicated on the drawings.

2.1.9.2 Thermometer

A direct indicating thermometer shall be provided to indicate fluid temperature in the reservoir. Mercury shall not be used in thermometers. The thermometer shall be of the bimetallic type mounted directly on the reservoir. The thermometer shall have a minimum 3 inch dial with black markings on a white background. The scale range shall be 20 to 240 degrees F. The case and stem shall be corrosion resistant, and the wetted components shall be stainless steel. Thermometer wells of the separable socket type shall be provided for each thermometer with a direct type bulb.

2.1.10 Counterbalance Valve

An externally piloted counterbalance valve (brake valve) shall be installed in the hydraulic oil line on the return side of each gate operating valve as indicated to limit the rotation speed of the gate and prevent overrunning the cylinders. The valve shall be adjustable for operating over a pressure range of 200 to 500 psi. The valve shall be designed for a system operating pressure of 2,000 psi. The capacity rating for the valve shall not be less than 15 gpm. The valve shall function to retain pressure in the hoist cylinder in the amount of the valve's pressure adjustment.

2.1.10.1 Ball Valves

Ball valves shall be made of stainless steel and designed for use with hydraulic oil. Pipe connections shall be socket welded. The valves shall have replaceable seats and be repairable without disturbing the welded connections.

2.1.10.2 Needle Valves

Needle valves shall be made of stainless steel and designed for fine flow regulation. The stem sealing O-rings shall be Buna N.

2.1.10.3 Control Valves

a. Flow - Flow control valves shall be subplate mounted for socket-welded piping. The valves shall be pressure-compensating, free flowing in one direction, and adjustable. The valves shall be capable of being locked in position to prevent an unintentional adjustment. The flow rating shall be determined by the Contractor in accordance with the design criteria stated in paragraph DESIGN PARAMETERS.

b. Manual Four-Way Directional Control Valves - Manual four-way directional control valves shall be the rotary shear seal type, open or closed center and detent or spring centered as shown. The valve shall be three position, subplate mounted with socket-welded piping connections. The flow rating shall be determined by the Contractor in accordance with the design criteria stated in paragraph DESIGN PARAMETERS.

c. Pilot-Operated, Solenoid-Controlled Four-Way Directional Control valves shall be three position and closed centered as shown. The valve shall be pilot operated and have two solenoids. The valve shall be subplate mounted with socket-welded piping or tubing connections. The solenoids shall operate at 120 volts AC. The flow rating shall be determined by the Contractor in accordance with the design criteria stated in paragraph DESIGN PARAMETERS.

2.1.10.4 Pressure Relief Valves

Pressure relief valves shall be adjustable with a body designed for a set pressure of 2,000 psi. The flow capacity shall be determined by the Contractor in accordance with the design criteria stated in paragraph DESIGN PARAMETERS.

2.1.10.5 Unloading Valves

Unloading valves shall be adjustable and designed for 2,000 psi service. The pressure setting shall be as shown, and the flow capacity shall be determined by the Contractor so that the valve operates without cavitating.

2.1.10.6 Supply Spring Loaded Check Valves

Supply spring loaded check valves shall be of stainless steel construction and shall be the ball or poppet type with a body designed for high shock and 3,000 psi service.

2.1.10.7 Return Spring Loaded Check Valves

Return spring loaded check valves shall be of stainless steel construction and shall be the ball or poppet type with a body designed for 3,000 psi service. Cracking pressure shall be 3,000 psi.

2.1.10.8 Bleeder Valves

Bleeder valves shall be 1/4 inch, stainless steel construction, and wrench operated.

2.1.10.9 Pressure Snubbers

Pressure snubbers shall be provided for all pressure gauges and pressure switches to protect against shock and provide more stable instrument operation. Snubbers shall be of stainless steel construction.

2.1.10.10 Counterbalance Valve

An externally piloted counterbalance valve (brake valve) shall be installed in the hydraulic oil line on the return side of each gate operating valve as indicated to limit the rotation speed of the gate and prevent overrunning the cylinders. The valve shall be adjustable for operating over a pressure range of 200 to 500 psi. The valve shall be designed for a system operating pressure of 2,000 psi. The capacity rating for the valve shall not be less than 15 gpm. The valve shall function to retain pressure in the hoist cylinder in the amount of the valve's pressure adjustment.

2.1.11 Piping

Piping, tubing, and hose shall be designed for a working pressure of 3,000 psi. Pipe shall be used when a 1 inch or larger diameter is required. Tubing may be used when less than 1 inch diameter is required. External cylinder piping shall be as shown. Pipe shall be welded or threaded as required on the drawings.

2.1.11.1 Pipe

Pipe shall be seamless stainless steel conforming to ASME B36.19M and ASTM A 312/A 312M, Grade TP316. The piping weight class shall be Schedule 80.

2.1.11.2 Pipe Fittings

Pipe fittings shall be the socket welding type conforming to ASME B16.11 and made of stainless steel conforming to and ASTM A 182/A 182M, Grade F316. The pressure class shall be 3,000 pounds. Flanges shall conform to ASTM A 182/A 182M with the grade suitable for the pipe to which attached. Threaded fittings shall also conform to the above, but shall be used only where absolutely necessary for the application.

2.1.11.3 Unions

Unions shall be the O-ring type, made of stainless steel with socket-welding ends. The Contractor may at his option substitute four bolt split flanges with Buna N O-rings for the unions.

2.1.11.4 Hydraulic Tubing

Tubing shall be seamless stainless steel tubing conforming to ASTM A 789/A 789M. The wall thickness shall be selected to provide a safety factor of 6 based on the manufacturer's ratings for burst strength.

2.1.11.5 Tube Fittings

Tube fittings shall be made of stainless steel and be the flareless type with SAE straight threads and Buna N O-ring seals. The fittings shall conform with SAE J514.

2.1.11.6 Hose

Flexible hydraulic lines shall be wire-reinforced, high-pressure-type hose made of neoprene or Buna N. Flexible hose shall be rated by the manufacturer for a working pressure not lower than the system operating pressure indicated above with a factor of safety of 4. Fittings shall be specifically designed for use with the hose selected and shall be as recommended by the hose manufacturer. Fittings shall be made of stainless steel and shall be the reusable type.

2.1.12 Bolts, Nuts, and Washers

2.1.12.1 Carbon Steel Bolts and Nuts

Carbon steel bolts and nuts shall conform to ASTM A 354, Grade BC, with ASTM A 194/A 194M, Grade 2H nuts. Structural bolted connections carrying primary loads shall be made with ASTM A 325 bolts.

2.1.12.2 Stainless Steel Bolts and Nuts

Stainless steel bolts and nuts shall conform to ASTM A 193/A 193M, Grade B7 or B16, with ASTM A 194/A 194M, Grade 8 nuts.

2.1.12.3 Flat Washers

Flat washers shall conform to ASTM F 844.

2.1.13 Hydraulic Fluid

The hydraulic fluid to be used during shop testing, to fill the cylinders before shipment, flush the system after installation, and to fill the complete hydraulic system shall be U.S. Coast Guard approved biodegradable hydFresh hydraulic fluid shall be filtered through a 10 micron filter before it is added to the system. All oil shall be supplied by the Contractor and two 55 gallon containers shall be furnished for a reserve supply.

2.2 ELECTRICAL EQUIPMENT

The electrical equipment for the hydraulic power systems shall be as shown and as specified. Other electrical materials and equipment required for the installation of the hydraulic power systems shall be as specified in the electrical specifications. All electrical equipment furnished shall be standard catalog items under regular manufacture with preexisting catalog ratings equal to or better than the requirements of the contract drawings and specifications. The Contractor's request for approval of equipment other than as specified or as shown shall be accompanied by technical and descriptive data and specifications sufficient for the Owner to determine its adequacy. Unless otherwise specified or indicated, all electrical materials and equipment shall meet the standards, specifications, and tests referenced.

2.2.1 Conduit, Duct, and Accessories

Threads on the following equipment shall be American Standard. No metric threads will be accepted.

2.2.1.1 Plastic Coated Rigid Metal Conduit

The conduit shall be hot-dip galvanized including the threads. The galvanized conduit shall conform to NEMA C80.1 and UL 6. The plastic coating shall be factory applied by the same manufacturer who produces the hot-dip galvanized conduit. The plastic coating shall have a minimum thickness of 0.040 inch for the full length of the pipe except for the threads. The plastic coating shall have a tensile strength of 3500 psi. A coupling shall be furnished loose with each length of the conduit. The bond between metal and plastic shall be equal to or greater than the tensile strength of the plastic coating. The coated conduit shall conform to NEMA RN 1, Type A.

2.2.1.2 Conduit Fittings

Conduit fittings shall be galvanized, high test, gray iron castings. The fittings shall be plastic coated in the same manner as outlined above for the conduit. Gaskets shall be furnished for all covers.

2.2.1.3 Conduit and Cabinet Supports

Conduit and cabinets shall be supported as required by IEEE C57.12.70. The supports shall be galvanized and plastic coated in the same manner as outlined above for the conduit.

2.2.2 Cabinets and Boxes

Cabinets and boxes shall be watertight, stainless steel, NEMA 4X housings sized as required. The cabinet and box hubs shall be consistent with the NEMA 4X rating of the box. Cabinets and boxes shall be mounted such that the NEMA 4X rating is not compromised. Threads on the hubs shall match the threads on the conduit and shall be American Standard. Metric threads will not be accepted. The cabinets and boxes shall conform to UL 50.

2.2.3 Pump Motors

The pump motors shall conform to the applicable requirements of NEMA MG 1, except as hereinafter specified, and shall be designed to withstand full voltage starting. The motor shall be of totally enclosed frame construction and shall be fan cooled. The enclosure shall be designed for exposure to the weather. A stainless steel drain-breather similar and equal to Crouse-Hinds type "ECD Universal" shall be provided and located so that any water present can be drained from inside the motor. The motors shall have encapsulated windings. Manual or automatic control and protective or signal devices required for the operation, and any control wiring required for controls and devices but not shown on the electrical drawings, shall be provided.

2.2.3.1 Rating

The motors shall operate on 208 volts, 60 Hz, 3 phase power and shall be sized to operate the pumps specified in paragraph PUMPS. The motor shall be designed to operate continuously without exceeding the temperature rise permitted by the applicable NEMA standards for the class of insulation and frame construction used.

2.2.3.2 Winding Insulation

The winding insulation shall be either class F or H with special moisture, fungus, and oil-proof treatment. The winding insulation shall be of the type designed and constructed to withstand the severe moisture conditions and the wide range in ambient temperature to which the motors will be subjected.

2.2.3.3 Winding Heaters

A heater or heaters shall be installed in the motor frame or end bells or wrapped around the winding end turns. The heater shall be automatically turned on when the motor is not running. The heater shall be capable of withstanding the same temperature extremes as the motor. The heaters shall be such that when energized the temperature of the motor winding will be held approximately 10 degrees C above ambient. They shall be designed for 125 volts AC continuous operation. The heaters shall withstand 10 percent overvoltage continuously. Terminals of the heaters, including the leads, shall be watertight. The leads shall be terminated in the motor lead terminal box.

2.2.3.4 Terminal Leads

The motor leads shall extend outside the frame, shall have insulation equivalent to that of the motor winding, and shall be terminated in a two-piece, four-position, watertight, stainless steel, NEMA 4X, terminal box secured rigidly to the motor frame. The leads shall be positioned and sealed where they pass through the frame with a water-resistant seal of a

synthetic rubber material or else with a synthetic rubber gasket. Conduit entrances to the terminal box shall be threaded.

2.2.4 Control Components

2.2.4.1 Control Devices and Wiring

Manual or automatic control protective or signal devices required for the specified operation and all control wiring for these controls and devices shall be provided whether indicated or not. Electrical control devices shall have minimum current and voltage ratings in accordance with the requirements of NEMA ICS 2 contact rating designation A 300, as applicable, unless larger ratings are indicated or are required. Control devices shall be provided with the number and arrangement of contacts required to perform the specified control functions. Devices shall be provided with or installed in NEMA 4X enclosures.

2.2.4.2 Pressure Switches

Pressure switches shall have a minimum pressure rating of 3,000 psi with set point operating as shown. The switches shall be enclosed in watertight, stainless steel, NEMA 4X housings. The switches shall be provided with a normally open, normally closed contact having a minimum rating of 125 volts AC.

2.2.4.3 Electronic Limit Switches

The electronic limit switches shall have solid-state, thumbwheel, programmable limits with a count/revolution range of 0000 to 3599; four decades of limit programming; set point switch function selection; initial power supply that provides four AC power levels (plus 24 V) from standard 120 VAC sources; and outputs for read-outs on digital displays (one remote digital read-out in the control room). The operating temperature range of the electronic limit switches shall be 0 degrees F to plus 150 degrees F. The limit switches shall be located and mounted as shown.

2.2.4.4 Sensor (Electromagnetic Position Sensor or Proximity Sensor)

A proximity sensor shall be mounted on the support frame post near to each locking pin socket so that it can indicate when the locking pin is seated in the socket. A proximity sensor shall also be mounted on the gate near to each locking pin guide so that it can indicate when the locking pin has been fully retracted. For each butterfly gate there will be three sensors to indicate when the "gate closed" locking pins are engaged, three sensors to indicate when the "gate closed" locking pins are retracted, three sensors to indicate when the "gate open" locking pins are engaged, and three sensors to indicate when the "gate open" locking pins are retracted - a total of 12 sensors per gate. Condition indicating lights shall be provided for each sensor on the gate operator control console. The indicating lights shall be white in color and adequately labeled.

In addition, arrays of five proximity sensors each shall be mounted to indicate when the gate is aligned in its proper closed or open position, i.e. when the "gate closed" locking pins and "gate open" locking pins are in alignment with their respective sockets. The five sensors in each array shall be spaced one inch apart so that they indicate when the gate is +/- two inches from alignment, +/- one inch from alignment and aligned. For

each butterfly gate there will be an array of five sensors to indicate closed alignment and an array of five sensors to indicate fully open alignment - a total of 10 sensors per gate. Condition indicating lights shall be provided for each sensor on the gate operator control console. The indicating lights shall be color coded with the +/- two-inch misalignment lights red in color, the +/- one-inch misalignment lights yellow in color and the true alignment light green in color

The sensor shall be screw type, heavy duty, and enclosed in an IEC IP68 (submersible) protection rated enclosure and shall have an operating range of minus 20 degrees F to plus 185 degrees F.

2.2.4.5 Remote Read-Out Digital Display

Provide a remote digital display which is to be connected to the BCD output from the limit switch.

2.2.4.6 Manual Switches

Manually operated switches, including push-button switches, selector switches, and key-operated switches, shall be heavy-duty, oil-tight type conforming to the requirements of NEMA ICS 1. Switches shall be the maintained contact type with illuminated button].

2.2.4.7 Relays

Relays used in control circuits shall be industrial magnetic control relays conforming to NEMA ICS 2 contact rating designation A 300, except where other ratings are indicated. Relays shall be applied in control circuits in such a manner that proper control functions shall be obtained regardless of whether the contacts are overlapping or non-overlapping.

2.2.4.8 Indicating Lights

Indicating light assemblies shall be the switchboard type, insulated for 120 volt AC. service, with appropriate colored caps as indicated and integrally mounted resistors for 120 volt AC service. Color caps shall be made of a material which will not be softened by the heat from the lamp. Lamps shall be replaceable from the front of the panel, and any special tools required for lamp replacement shall be furnished by the Contractor. The indicating light assemblies shall be the same product line as compatible push buttons and switches.

2.2.5 Control Consoles and Valve and Gauge Panels

2.2.5.1 Control Console Construction

A gate operator control console shall be provided that has the hydraulic control valve levers and the status and position indicating lights arranged in a logical manner and adequately labeled so that it is intuitive how the indicating lights and valve levers interrelate. Example control panel layouts are shown on the drawings.

The control console shall include a basic frame with metal panels fully custom fabricated or it may consist of custom modules using standardized components where available to meet the dimensional and functional characteristics shown and specified. The console shall be constructed of

stainless steel meeting the requirements of NEMA ICS 6. Stainless steel sheet shall conform to ASTM A 659/A 659M. Removable panels shall be secured in place using captive, spring-loaded, self-locking spring nuts and hardened sheet metal screws. Screws and nuts shall be stainless steel. Access panels shall be secured with spring-loaded, quarter-turn fasteners with studs held captive in the removable panel. The console shall be equipped with adequate louvered panels to ventilate the interior and dissipate the heat generated within the console. Special equipment supports and guides shall be provided as required to support the equipment and other components within the console. The interior and exterior surfaces shall be finished with one coat of primer and two coats of the manufacturer's standard baked-on white enamel finish.

2.2.5.2 Valve and Gauge Panel Construction

Valve and gauge panels shall be constructed of stainless steel plate thick enough to provide rigid support for the valves and other components mounted thereon. All piping shall be terminated with bulkhead type connections in a position convenient for the connection of external lines. Primer and finish shall be the manufacturer's standard coating.

2.2.5.3 Nameplates and Instruction Plates

Nameplates shall be provided for each device on the control console, valve panels, and gauge panels. Nameplates shall clearly indicate the function of each device and, in the case of manually operated controls, shall indicate the condition established for each position of the control. Instruction plates shall clearly indicate the proper procedures and sequences of operations to activate the system, to operate the system, and to secure the system after completion of operation. Lettering on nameplates shall be machine engraved on plastic laminate with white characters on a black background. Instruction plates shall be mounted on a rigid backing and covered with clear, rigid plastic sheeting. Instruction plates shall be mounted in a location easily visible to an operator stationed at the console or panel.

2.2.5.4 Security Provisions

Control consoles shall be constructed and installed to prevent unauthorized or accidental operation of the system. The control console shall be provided with a hinged cover with a key-operated lock arranged to automatically lock the cover in the closed position.

2.2.5.5 Weather Protection

Control consoles and valve and gauge panels exposed to the weather or subjected to water or dirt in the atmosphere shall be NEMA Type 4 for exterior nonhazardous applications. Enclosures shall have hinged and latched covers. Hinges shall be the separable type to permit complete removal of the cover for maintenance. Hinges and latches shall be constructed of stainless steel.

2.3 FOUNDATIONS & TORQUE TRANSMISSION COMPONENTS

2.3.1 Materials

Material for foundations and torque transmission components is to be Higher Strength Steel with yield strength of 50,000 psi minimum per ASTM 242. Welding rods and wire are to be compatible with Higher Strength Steel and are to be of equal or better yield strength.

2.3.2 Welding and Stress Relieving

All welding is to conform to AWS D1.1 / D1.1M. Weldments that require a large amount of welding and/or welding of thick components must be stress relieved using appropriate heat treatment or cryogenic treatment before machining mating surfaces or drilling holes for assembly.

2.3.3 Hydraulic Cylinder Foundations

The foundations that attach the hydraulic cylinder cap end to the underside of the Butterfly Gate Support Frame shall be designed to take the full reaction load from the hydraulic cylinders and allow each cylinder to swing horizontally outward up to 10 deg. The foundation may be permanently welded to the support frame, or it may be bolted to the support frame. If the foundation is permanently welded to the support frame, then a portion of the support frame may be considered part of the foundation structure. The strength of the foundation should be verified by finite element analysis.

2.3.4 Torque Transmission Yokes

The yokes that transmit the linear forces from the hydraulic cylinders into torques applied to the Butterfly Gate Pivot Sleeves shall be designed to take the full force from the hydraulic cylinders and the full shear that transmits the torque to each pivot sleeve. The yoke is to be permanently welded to the pivot sleeve. In evaluating the strength of the yoke a portion of the pivot sleeve may be considered part of the yoke structure. The strength of the yoke should be verified by finite element analysis.

2.3.5 Bearings

Radial bearings of Ultra High Molecular Weight Polyethylene (UHMW) or High Density Polyethylene (HDPE) shall be provided at the top and bottom of each Pivot Sleeve. The radial bearings may be of the stave configuration or a solid ring. Unless otherwise trapped by boundary plates or the geometric configuration, the radial bearings shall be held in place by tack welded keeper bars, top and bottom. The nominal design load on the radial bearings shall not exceed 600 psi. Thrust bearings of a continuous flat ring or of a set of segmented pads shall be provided between the Barge Deck insert plate and the bottom of the pivot sleeve. The thrust bearings shall also be of UHMW or HDPE. If the thrust bearings are continuous flat rings then tack welded keeper tabs shall be provided to hold the bearings in place. If the thrust bearings are sets of segmented pads, then each pad shall be secured by bolts or clamps such that no portion of any bolt or clamp is closer than one-half inch to the mating, sliding surface. Mating steel surfaces shall be free of burrs, nicks and weld splatter and be smooth to the touch. The mating surfaces shall not be painted.

2.3.6 Emergency Open/Close Backup Equipment

Two 2 inch anchor shackles shall be mounted on each butterfly gate, as shown on the drawings. The mounting padeyes for the shackles shall be designed to

carry 100 kips force over a 180 degree arc within +/- 15 degrees of a horizontal plane.

Either in the Utility Yard or somewhere on the Gate Support Frame or on the Gangway there is to be a lockable metal box with a weatherproof lid that contains 500 feet of Samson AmSteel-Blue 1 3/4 inch diameter synthetic fiber rope and a spare 2 inch anchor shackle. The rope is to have an eye-splice at one end. The net length will be less than 500 feet due to the eye-splice.

2.4 SHOP ASSEMBLY AND TESTING

Each hydraulic power system shall be completely shop assembled and tested insofar as is possible using temporary piping and wiring to determine the correctness of fabrication and the matching of component parts to ensure acceptable operation after field erection. Shop tests shall be made in the presence of a representative of the Contracting Officer, unless otherwise authorized in writing. Upon satisfactory completion of the shop assembly and testing, preliminary acceptance will be made by the Contracting Officer.

2.4.1 Cleaning

Extreme care shall be taken during shop assembly to avoid inclusion of foreign materials into the equipment. The interior of the piping shall be cleaned with lint free cloths and flushed with oil at a minimum velocity of 15 fps which has passed through a 10 micron filter. The cleaning procedure shall clean the system of particles so that the contamination level is below 15/12 in accordance with SAE J1165. The manufacturer shall take three 500 milliliter samples at random locations according to ISO 4021. Particle counting on each sample shall be performed in accordance with SAE ARP598 by an approved independent test laboratory. Water content of each sample shall be below 200 ppm. If any sample does not comply with the permissible contamination limits, the system shall be re-cleaned and re-inspected. The piping and valves shall be sealed with enough oil in the system to protect the metal surfaces.

2.4.2 Hydraulic Power Units

Shop-fabricated power and control units and piping shall be hydrostatically tested at the maximum pressure allowed by the installed equipment. Valves and operators shall undergo a functional test and the pumps shall be tested to verify flow and pressure ratings. The power unit shall then be connected to the hydraulic cylinder and operationally tested at 3,000 psi. Any operational problems will be cause for rejection.

PART 3 EXECUTION

3.1 EXAMINAION

After visiting the site and becoming thoroughly familiar with all details of the work and working conditions, verify dimensions in the field, and then advise the Owner of any discrepancies prior to performing any work. The Contractor shall be specifically responsible for the coordination and proper relation of the contracted work to the structure and work of all trades.

3.2 INSTALLATION

3.2.1 General

Install the equipment specified and as shown on the drawings to complete the hydraulic power systems for operation of the butterfly gates. Installation of hydraulic components shall be in accordance with the manufacturer's written instructions and under the direction of the erection engineer or manufacturer's representative. Complete units or assemblies shall be installed without disassembly. Necessary supports for all appurtenances, pumps, motors, and other equipment or components shall be provided as shown. Floor-mounted equipment shall be anchored as shown. Installation shall be in accordance with Section 05500 METALWORK FABRICATION.

3.2.2 Cleaning and Flushing the System

Extreme care shall be taken during assembly to avoid the entrance of abrasives, dirt, metal chips, and other foreign materials into the hydraulic system through open ends of piping, tubing, and ports of the components. Submit a detailed cleaning and flushing the system procedure for approval in accordance with paragraph SUBMITTALS. The procedure shall include a detailed description of the equipment, materials, formulations of cleaning agents, solution temperatures, duration of each phase of the cleaning operation, method of removal of cleaning agents, and method of drying after cleaning. The procedure shall clean the system of particles so that the contamination level is below 15/12 in accordance with SAE J1165. Take three 500 milliliter samples at approved locations according to ISO 4021. Particle counting on each sample shall be performed in accordance with SAE ARP598 by an approved independent test laboratory. Water content of each sample shall be below 200 ppm. If any sample does not comply with the permissible contamination limits, the system shall be re-cleaned and re-inspected. When flushing is completed, the system shall be drained and then filled with the specified hydraulic fluid.

3.2.3 Filling and Bleeding the System

Oil used to fill the system shall be filtered through a 10 micron filter. The complete hydraulic power system shall be bled to remove all air from the system. Care shall be taken to exclude as much air as possible during initial filling. The hydraulic cylinders shall be filled in the horizontal position with the piping connections up to allow air to escape, and the piping shall be filled in a manner that excludes as much air as possible. The system, once filled, shall be bled of air, operated, and periodically bled during the first week of operation to remove any air that might have been entrained in the system.

3.3 PAINTING

All exposed exterior surfaces of assemblies and equipment except stainless steel, synthetic rubber, and plastic, shall be shop primed and coated as specified Section 09965 PAINTS AND COATINGS unless the equipment is given a standard factory finish as allowed by other paragraphs of this specification. Insofar as is practicable, the complete coating system shall be applied to individual components and items before assembly to ensure complete coverage and maximum protection against corrosion. Equipment such as the pumps which have a factory-finished coating do not need to be recoated. Chips, scratches, and other damage to shop-applied painted surfaces shall be repainted in the field.

3.4 ERECTION ENGINEER

Obtain the services of an experienced erection engineer who is regularly employed by the hydraulic cylinder/power unit manufacturer to supervise the installation, start-up, adjustment and operation, and testing of the equipment provided. The erection engineer shall furnish a signed statement stating that the final installation and start-up of the hydraulic power system has been inspected, witnessed, and complies fully with the manufacturer's warranty requirements. The erection engineer shall also instruct the Owner's operating staff members in the operation and maintenance features of the equipment.

3.5 FIELD TESTS AND INSPECTIONS

3.5.1 Field Testing

The Owner shall be given 2 weeks notice before any field testing is to be conducted. Any material, equipment, instruments, and personnel required for the tests shall be provided by the Contractor. Testing shall be conducted in the presence of the Owner's Representative, unless waived in writing and then a certified field test report shall be submitted in accordance with paragraph SUBMITTALS. Testing shall be done under the direction of the erection engineer or manufacturer's representative.

3.5.2 Proof Testing

The piping system shall be hydrostatically tested to not less than 125 percent of the design working pressure. Any equipment that might be damaged by this pressure shall be isolated or removed to prevent damage. The proof test pressure shall be maintained for 12 hours. All welded, flanged, flared, and threaded connections shall be carefully examined for leakage, and all lines shall be inspected for evidence of deflection caused by inadequate anchorage. No leakage or deflection will be allowed.

3.5.3 Final Acceptance Tests

In preparation for the final acceptance tests, and after completion of the installation and proof tests, operate the hydraulic power system to prove acceptability. Preliminary tests shall be conducted at minimum pressures and velocities until initial adjustments have been proven safe for normal operation. Details of all operations shall be constantly monitored for signs of impending trouble and corrections shall be made as necessary to prevent damage to the equipment. At such time as the Owner may direct, conduct the following complete acceptance tests on the hydraulic power system for approval. Any deficiency or maladjustment disclosed by the tests shall be corrected immediately and the test repeated until satisfactory results are obtained. No subsequent tests will be permitted until all preceding tests have been completed satisfactorily. Upon completion of the final acceptance tests, furnish a written statement that the hydraulic power system has been field tested and meets all operational requirements.

3.5.3.1 Initial Start-Up

The hydraulic reservoir shall be inspected to ensure that the fluid is at the proper level. The hydraulic pumps shall be test started using the controls at the control console. The pumps shall be inspected for proper operation and discharge pressure. The discharge pressure of each pump shall

be read and recorded. The pressure relief valves shall be adjusted to limit the system pressure to the specified value. The unloading valves shall be adjusted to unload the pumps to the reservoir if the control valves are not actuated. The hydraulic lines and components which are under pressure shall be inspected for evidence of leakage.

3.5.3.2 Combined System Tests

Tests and inspections of the hydraulic power system shall be performed concurrently with the testing specified under other sections of these specifications which test the mechanism operated by the hydraulic system. The hydraulic system shall be tested by operating the mechanism through a minimum of four complete cycles. During each test operation, the hydraulic lines and components shall be inspected for evidence of leakage. The pressure in the supply and return lines for each direction of operation shall be read and recorded. Response of components to operation of applicable controls shall be inspected to ensure that all connections have been made properly.

3.5.3.3 Test Reports

Prepare and complete test reports showing in detail the results of the field tests. The test reports shall include a detailed tabulation showing values of pressures, flow rates, and all adjustments recorded during the final tests, and adjustment and calibration of the entire system. During each test run, the following data and observations shall be recorded:

- a. Control operation
- b. Voltages
- c. Currents
- d. Pressures
- e. Speeds and times
- f. Relief valve settings
- g. Alignment and operating clearances
- h. Excessive vibration, by component
- i. Temperature of motors and hydraulic fluid
- j. Pertinent observations regarding such events as unusual sounds, malfunctions or difficulties encountered, and adjustments required.

-- End of Section --

SECTION 13400

BARGE POSITIONING AND PLACEMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

46 CFR Part 170 Stability Requirements for All Inspected Vessels

Subpart E Weather Criteria
Subpart I Free Surface

46 CFR Part 174 Special Rules Pertaining to Specific Vessel Types

Subpart B Special Rules Pertaining to Deck Cargo Barges

1.2 OPERATING CONDITIONS AND PERFORMANCE REQUIREMENTS

The following outlines the conditions predicted to be encountered at the two sites and sets the criteria for accuracy of positioning and for performance of the placement

1.2.1 Environmental Conditions

1.2.1.1 Wind

Winds in the area of the gates can vary to 80 miles per hour in the extreme. Contractor shall schedule the barge placement to coincide with suitable wind conditions and shall account for any and all wind speeds and directions when placing the barges in order to assure accurate placement.

1.2.1.2 Current

Contractor shall investigate and become familiar with the currents in the area of the two gates. These currents are affected by both tidal flow and river flow. Contractor shall schedule the barge placement so as to avoid extreme currents and shall provide suitable controls so barge placement is not adversely affected by currents.

1.2.1.3 Tides

Tide levels referenced to the North American Vertical Datum 1988 (NAVD) are as follows:

Mean Higher High Water (MHHW)	+6.11 ft
Mean High Water (MHW)	+5.68 ft
Mean Tide Level (MTL)	+4.29 ft
Mean Low Water (MLW)	+2.95 ft

Mean Lower Low Water (MLLW) +2.41 ft

1.2.1.4 Water Depths

A smooth prepared bed of gravel as shown on the drawings is to be prepared for placement of the barge, see Section 02300 EARTHWORK, TOE BERM AND GRANULAR MATERIALS. The water depths outside of the excavation area vary. The contractor and vessel operators should review the bathymetry at the site prior to commencing positioning and placement operations.

1.2.2 Mooring of Butterfly Gate Barges

Mooring arrangements shall be provided that can hold the Gate Barge and prevent it from running aground in any wind or current conditions.

1.2.3 Mooring of Support Vessels

Mooring arrangements shall be provided as necessary to control all support vessels in a safe manner against any wind or current conditions.

1.2.4 Locational Tolerances

The Gate Barge at each site shall be positioned and placed to within 3 inches either direction of the working points as shown on Drawings C1 and C31.

1.2.5 Barge Stability Requirements

At all times except during the actual placement operation, the Butterfly Gate Barges shall have sufficient stability to meet the requirements of 46 CFR Part 170 and 46 CFR Part 174. During the placement operation, the barges shall at all times have a positive GM (metacenter height above the center of gravity) of 3 inches and a range of roll stability of at least 6 deg. The free surface of all partially flooded compartments must be included in these calculations. If the flooding of a compartment is by a controlled valve, then only the compartments own free surface need be included. If the flooding opening is uncontrolled, then the compartment's free surface relative to centerline must be used. If these limits cannot be met during the placement operation, then the barge must be lift installed or lowered using guide piles or other system that will prevent the barge from capsizing.

1.2.6 Soft Landing Requirement

The placement operation shall be conducted in a manner that no part of the barge bottom contacts the prepared gravel bed at a velocity greater than 1 ft/sec. The ability to meet this requirement is to be confirmed by calculations or model testing.

1.2.7 Procedure Timing

The timing of the positioning and placement operations should be expeditious to minimize the exposure to possible adverse environmental conditions, but the procedure shall have safe stop or hang points incorporated such that the operations may be put on hold up to 24 hours in order to wait on wind, tide or current or to allow time to confirm position measurements or to allow for equipment checks and possible repair.

1.2.8 Disruption of Vessel Traffic

The positioning and placement operations shall be planned and executed so as to minimize disruption of vessel traffic in the area. If a channel is to be blocked off completely for more than 3 hrs, then notice and must be submitted to U.S. Coast Guard, Sector San Francisco, Vessel Traffic Service at least 72 hours prior to the channel blockage and a proper "Notice to Mariners be published.

1.3 SUBMITTALS

The contractor is to submit the following documents for owner's review at least six weeks prior to barge positioning and placement:

- a. Barge and construction vessel flotilla layout and mooring arrangements.
- b. Calculations, simulations or model tests showing that the operation can be performed safely.
- c. Operations manual describing each task to be performed.
- d. Schedule showing sequencing and duration of each task.
- e. Contingency plans for likely events that might interrupt or delay a task.

1.4 TRAINING

The contractor shall train the crew in all aspects of the positioning and placement operations prior to commencing any task, to the extent that all crew members know the tasks to be performed, the sequencing of each task and any contingency plans. The positioning and placement operations shall be directed by personnel that have had previous experience in performing these tasks. If there are critical aspects of the operation that require manual skills and quick reaction, then the crew who will perform such tasks shall be trained by simulating the event.

PART 2 PRODUCTS

2.1 GENERAL

The contractor shall tow each Butterfly Gate barge to its respective site, on Old River and Connection Slough. The contractor shall perform all activities to position each barge precisely over its prepared gravel bed, ballast or lower each barge down to sit on the gravel bed without damage to the barge and with minimal disturbance of the prepared gravel bed, fully flood each barge and lock each barge in place with rock fill along its sides.

2.2 SURVEYING

The contractor shall survey the site to locate and mark the work points and any reference points needed to confirm the location where the barge is to be placed.

2.3 POSITIONING

The contractor shall position the barge over the survey confirmed location within the tolerance limits specified herein.

2.3.1 Confirming Water Depth

The contractor shall confirm the elevation of the prepared gravel bed by direct measurement.

2.4 BALLASTING OR LOWERING

The contractor shall ballast or lower the barge down onto the prepared bed in a controlled and safe manner that will avoid damage to the barge and minimize any disturbance to the prepared gravel bed.

2.4.1 Control System

The contractor shall provide the control system that sequences and executes the ballasting and/or lowering operations. The controls may be manually operated, unless the required reaction times are quicker than can be manually performed, and in such case, the controls shall be computerized using tested and debugged hardware and software.

2.4.2 Ballasting Option

If the barge is to be ballasted down to the prepared gravel bed, then the contractor shall provide the valves, pumps, control lines, power sources, assist vessels and trained personnel to perform the procedure. If guide spuds or piles are required for the procedure, then the contractor shall provide, install and later remove such spuds or piles.

2.4.3 Lowering Option

If the barge is to be lowered by crane or other mechanical means, then the contractor shall provide the crane or mechanism(s) of sufficient certified capacity to perform the procedure. The contractor shall provide the fully trained personnel necessary to perform the procedure. Crane operators shall have the appropriate licenses and experience to operate the crane at the full load rating of the crane.

2.4.4 Simulation or Model Testing

Any critical portion of the ballasting and/or lowering procedure that the contractor's crew has not performed before shall be simulated or model tested in the presence of the crew, to the extent that the crew is familiar with the operation of the controls and they know the expected response and outcome of that portion of the procedure. Any contingency plans shall also be simulated or model tested in the presence of the crew, to the extent that the crew knows how to react to problems that may arise.

2.5 FULL FLOODING

The contractor shall check the position and level of the barge and assure that all compartments of the barge are fully flooded.

2.5.1 Location Check

Prior to final filling of the barge compartments, the contractor shall resurvey the position of the barge relative to the work points or reference markers to assure that the barge has not drifted from the intended location.

2.5.2 Filling All Compartments

Any compartments that were not completely filled during the ballasting and/or lowering procedure shall be filled and topped off by the contractor. The contractor shall supply any hoses, pumps and valving required to fill the compartments.

2.5.3 Venting Air Pockets

Once the barge is sitting on bottom the barge cannot be sallied to burp the tanks, so the contractor shall provide a means, perhaps by diver manipulated hose lines, to vent all air pockets within the barge.

2.6 SECURING AND LOCKING WITH FILL

The contractor shall reconfirm the barge location, including settling, and lock the barge in position with rock fill along the sides.

2.6.1 Final Location Check

Once again, the contractor shall resurvey the position of the barge relative to the work points or reference markers to assure that the barge has not shifted from the intended location. The contractor will also check the depth to each corner of the deck of the barge to determine any settling, rotation or twisting of the barge that may have occurred due to placement and filling of the barge. Any difference greater than 3 inches between any of the four measurements shall require approval of the Owner. The level 2nd position of the barge must be such to permit the proper operation of the gates.

2.6.2 Location Monitoring

While the locking fill is being installed the contractor shall continuously or repeatedly check the location and level of the barge to assure that the barge does not shift off of the intended location.

2.6.3 Mooring Option

To guarantee that the barge does not shift from its intended location the contractor may provide a temporary mooring system of sufficient strength and stiffness to resist forces from wind and current.

2.6.4 Spud Pile Option

At the contractor's option the contractor may provide spud piles to maintain the position of the barge. The contractor shall be responsible for providing, installing and removing any such spud piles.

2.6.5 Locking with Fill

The locking fill shall be placed evenly on each side of the barge, such that the differential pressure from the rock level on one side over that from the other side does not induce the barge to shift from the intended position or level.

2.6.6 Removal of Lines, Hoses, Pipes and Spuds

After placement and locking in place with fill, the contractor shall clear the barge of any lines, hoses, pipes, spuds or other items that were used in the positioning and placement of the barge and that are not a permanent part of the barge.

2.7 DOCUMENTATION

The contractor shall furnish the owner with photographs of all aspects of the placement and positioning of the barge with enough photographs to show sequencing, process and progress throughout the operation. The contractor shall provide the owner with copies of all field notes and measurements made or taken during the operation. Any problems that arose and/or contingency plans that were implemented shall be fully documented as to what happened, the suspected cause and the effectiveness of the corrective actions taken.

2.8 STORAGE OF EQUIPMENT

The contractor shall deliver all specifically designed and fabricated items that were used in the positioning and placement of the barge and that will be required to safely remove the barge to the owner at a place designated by the owner for storage until such time that the barge will be removed. The contractor shall prepare the items for storage in a manner that will prevent corrosion or deterioration.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 13600

BARRIER REMOVAL AND STORAGE REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

The work under this section of the Specifications consists of furnishing labor, materials, appliances, tools and equipment necessary for the interim removal and storage of the barrier materials and also the final removal and disposal of the barriers after the expected period of operation.

1.2 REFERENCES

- a. All Regulatory Agency Permits and their conditions.
- b. U.S. Coast Guard Notice-to-Mariners

1.3 SUBMITTALS

General:

- a. Detailed removal plan showing all planned procedures, equipment, schedule and other methods and processes for both the interim and final removal of the barriers.

1.4 DESCRIPTION

- a. Interim removal and storage of the barriers is specified on the drawings. Contractor shall take care during temporary removal, storage and reinstallation of the facilities so as to not damage the barge or structural components. It is anticipated that the barges will be refloated and the removed structural and other materials will be placed on the barges or safely transported from the site. It is the responsibility of the contractor to transport the barges and all materials to an Owner approved location within his control and store the barges and materials until the time of reinstallation. If he so chooses, materials may be transported and stored at the storage location indicated on the drawings located west of the Old River Site. During temporary removal, contractor shall make appropriate marking, inventory and tabulations as necessary to assure that all materials will be accounted for and that reassembly of the facilities will be complete. Should any materials be damaged or become missing during temporary removal or storage, the contractor will replace such materials at no cost to the Owner. Damaged painted surfaces, galvanizing, etc. will be repaired in accordance with accepted practice. Upon completion of the temporary removal, the site will be inspected by the Owner and appropriate regulatory agency representatives to assure that all required materials have been removed and properly stored. The site shall be left in a safe, neat condition for the interim removal period.

Care shall be taken during disassembly and removal of the hydraulic system to avoid spills or other contamination of the site or waterways.

- b. Final removal of the barriers is specified on the drawings. All materials specified for removal will become the property of the contractor and shall be legally disposed of off the site. Upon completion of the final barrier removal, the Owner and appropriate regulatory agency representatives will inspect the sites to assure that the areas have been returned to the conditions required by the project permits and that no refuse or other materials remain.

1.5 SCHEDULE

It is anticipated that the one time temporary removal will take place in July during the first year of operation and reinstalled in November of that year. It is expected that the temporary removal will be started on a day designated by the regulatory agencies and will be accomplished within a 3 week period.

The date that the facilities must be reinstalled and operational is expected to be at the end of November and will be designated by the regulatory agencies. The contractor shall schedule his work so as to complete the reinstallation on or before that date. It is expected that the reinstallation work will take place within 1 month of said date.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2007; Errata 2007) National Electrical Safety Code

IEEE C57.12.28 (2005) Standard for Pad-Mounted Equipment - Enclosure Integrity

IEEE C57.12.29 (2005) Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments

IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2003) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007) National Electrical Code - 2008 Edition

1.2 RELATED REQUIREMENTS

This section applies to certain portions of the following specification sections:

Section 16264 GENERATOR SET

Section 16520 EXTERIOR LIGHTING

Section 16550 Special Purpose Lighting and Miscellaneous Equipment

1.3 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.

- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 120/280 V, three phase, four wire, 60Hz.

1.5 ADDITIONAL SUBMITTALS INFORMATION

Submittals required in other sections that refer to this section must conform to the following additional requirements as applicable.

1.5.1 Shop Drawings (SD-02)

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.5.2 Product Data (SD-03)

Submittal shall include performance and characteristic curves.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Owner. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment

are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

1.6.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.8 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- c. Safety precautions.
- d. The procedure in the event of equipment failure.
- e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.9 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.10 FIELD FABRICATED NAMEPLATES

Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

1.11 WARNING SIGNS

Provide warning signs for the enclosures of electrical equipment including substations, pad-mounted transformers, pad-mounted switches, generators, and switchgear having a nominal rating exceeding 600 volts.

- a. When the enclosure integrity of such equipment is specified to be in accordance with IEEE C57.12.28 or IEEE C57.12.29, such as for pad-mounted transformers and pad-mounted SF6 switches, provide self-adhesive warning signs on the outside of the high voltage compartment door(s). Sign shall be a decal and shall have nominal dimensions of 7 by 10 inches with the legend "DANGER HIGH VOLTAGE" printed in two lines of nominal 2 inch high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background. Decal shall be Panduit No. PPS0710D72 or approved equal.
- b. When such equipment is guarded by a fence, mount signs on the fence. Provide metal signs having nominal dimensions of 14 by 10 inches with the legend "DANGER HIGH VOLTAGE KEEP OUT" printed in three lines of nominal 3 inch high white letters on a red and black field.

1.12 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.13 INSTRUCTION TO OWNER PERSONNEL

Furnish the services of competent instructors to give full instruction to designated Contractor personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given to all operating personnel and any and all replacement operating personnel during the term of the contract.

PART 2 PRODUCTS

2.1 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements specified in the technical sections.

PART 3 EXECUTION

3.1 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09965 PAINTING AND COATINGS

3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

-- End of Section --

DRAFT

SECTION 16264

GENERATOR SET

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C39.1 (1981; R 1992) Requirements for Electrical Analog Indicating Instruments

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC CS8 (2000) Extruded Dielectric Shielded Power Cables Rated 5 through 46 kV

ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)

EGSA 101P (1995) Engine Driven Generator Sets

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2007; Errata 2007) National Electrical Safety Code

IEEE Std 1 (2000) General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation

IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

IEEE Std 120 (1989; R 1997) Master Test Guide for Electrical Measurements in Power Circuits

IEEE Std 404 (2006) Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V Through 500 000 V

IEEE Std 48 (1996; R 2003) Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV

IEEE Std 519 (1992; Errata 2004) Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1) Normal Measurements

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1	(2002) Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures
NEMA C12.11	(2007) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV BIL (0.6 kV NSV through 69 kV NSV)
NEMA ICS 2	(2000; Errata 2002; R 2005; Errata 2006) Standard for Industrial Control and Systems: Controllers, Contractors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment
NEMA ICS 6	(1993; R 2006) Standard for Industrial Controls and Systems Enclosures
NEMA MG 1	(2007) Standard for Motors and Generators
NEMA PB 1	(2006; Errata 2008) Standard for Panelboards
NEMA WC 74	(2006) Standard for 5-46 kV Shielded Power Cable for use in the Transmission and Distribution of Electric Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2007; Errata 2008) Flammable and Combustible Liquids Code
NFPA 37	(2006) Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	(2007) National Electrical Code - 2008 Edition

UNDERWRITERS LABORATORIES (UL)

UL 1236	(2006) Standard for Safety Battery Chargers for Charging Engine-Starter Batteries
UL 489	(2002; Rev thru Jun 2006) Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 891	(2005) Dead-Front Switchboards

1.2 SUBMITTALS

Submit the following in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detailed Drawings

Acceptance

Drawings which accurately depict the as-built configuration of the installation, upon acceptance of the diesel-generator set installation. Layout drawings shall be revised to reflect the as-built conditions and submitted with the as-built drawings.

SD-03 Product Data

Performance Tests

Calculations of the engine and generator output power capability, including efficiency and parasitic load data.

Sound Limitations

Sound power level data for the packaged unit operating at 100% load in a free field environment. The data should demonstrate compliance with the sound limitation requirements of this specification.

Generator

Each generator KW rating and short circuit capacity (both symmetric and asymmetric).

Integral Main Fuel Storage Tank

Day Tank

Calculations for the capacity of each day tank, including allowances for recirculated fuel, usable tank capacity, and duration of fuel supply.

Power Factor

Generator capability curve showing generator kVA output (kW vs. kvar) for both leading and lagging power factors ranging from 0 to 1.0.

Heat Exchanger

Manufacturers data to quantify heat rejected to the space with the engine generator set at rated capacity.

Time-Delay on Alarms

The magnitude of monitored values which define alarm or action setpoints, and the tolerance (plus and/or minus) at which the device activates the alarm or action.

Cooling System

The maximum and minimum allowable inlet temperatures of the cooling air.

The maximum allowable temperature rise in the cooling air across the engine.

The minimum allowable inlet fuel temperature.

Manufacturer's Catalog

Manufacturer's standard catalog data describing and depicting each engine-generator set and all ancillary equipment in sufficient detail to demonstrate specification compliance.

Vibration Isolation

Vibration isolation system performance data for the range of frequencies generated by the engine-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Description of seismic qualification of the engine-generator mounting, base, and vibration isolation.

Instructions

Instructions including: the manufacturer's pre-start checklist and precautions; startup procedures for test mode, manual-start mode, and automatic-start mode, (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation, load-shedding, and automatic transfer switches). Instructions shall be weatherproof, laminated in plastic, framed, and posted where directed. Posted data shall include wiring and control diagrams showing the key mechanical and electrical control elements, and a diagrammatic layout of the system.

Experience

Statement showing that each component manufacturer has a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel-engine generator sets for commercial and industrial use. The engine-generator set manufacturer/assembler has a minimum of 3 years experience in the manufacture, assembly and sale of stationary diesel engine-generator sets for commercial and industrial use.

Field Engineer

A letter listing the qualifications, schools, formal training, and experience of the field engineer.

Site Welding

A letter listing the welder qualifying procedures for each welder, complete with supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their qualifications symbols.

General Installation

A complete copy of the manufacturer's installation procedures. A detailed description of the manufacturer's recommended break-in procedure.

Site Visit

A site visit letter stating the date the site was visited and listing discrepancies found.

SD-06 Test Reports

Onsite Inspection and Tests

A letter giving notice of the proposed dates of all onsite inspections and tests at least 14 days prior to beginning tests.

A detailed description of the Contractor's proposed procedures for onsite tests including the test including the test plan and a listing of equipment necessary to perform the tests. Submission shall be at least 14 days prior to beginning tests.

Six copies of the onsite test data described below in 8-1/2 by 11 inch 3-ring binders with a separate section for each test. Sections shall be separated by dividers with tabs. Data plots shall be full size 8-1/2 by 11 inches minimum), showing all grid lines, with full resolution.

- (1) A description of the procedures for onsite tests.
- (2) A list of equipment used, with calibration certifications.
- (3) A copy of measurements taken, with required plots and graphs.
- (4) The date of testing.
- (5) The parameters verified.
- (6) The condition specified for the parameter.
- (7) The test results, signed and dated.
- (8) A description of all adjustments made.

SD-07 Certificates

Vibration Isolation

Torsional analysis including prototype testing or calculations which certify and demonstrate that no damaging or dangerous torsional vibrations will occur when the prime mover is connected to the generator, at synchronous speeds, plus/minus 10%.

Prototype Tests

Manufacturer's standard certification that prototype tests were performed for the generator model proposed.

Reliability and Durability

Documentation which cites engines and generators in similar service to demonstrate compliance with the requirements of this specification. Certification does not exclude annual technological improvements made by a manufacturer in the basic standard model set on which experience was obtained, provided parts interchangeability has not been substantially affected and the current standard model meets all the performance requirements of this specification. For each different set, 2 like sets shall have performed satisfactorily in a stationary power application, independent and separate from the physical location of the manufacturer's and assembler's facilities, for a minimum of 2 consecutive years without any failure to start, including periodic exercise. The certification shall state that for the set proposed to meet this specification, there were no failures resulting in downtime for repairs in excess of 72 hours or any failure due to overheating during 2 consecutive years of service. Like sets are of the same model, speed, bore, stroke, number and configuration of cylinders, and output power rating. Like generators are of the same model, speed, pitch, cooling, exciter, voltage regulator and output power rating. A list shall be provided with the name of the installations, completion dates, and name and telephone number of a point of contact.

Emissions

A certification from the engine manufacturer stating that the engine exhaust emissions meet federal, state, and local regulations and restrictions specified. At a minimum, this certification shall include emission factors for criteria pollutants including nitrogen oxides, carbon monoxide, particulate matter, sulfur dioxide, non-methane hydrocarbon, and for hazardous air pollutants (HAPs).

Sound limitations

A certification from the manufacturer stating that the sound emissions meet the specification.

Current Balance

Manufacturer's certification that the flywheel has been statically and dynamically balanced and is capable of being rotated at 125% of rated speed without vibration or damage.

Materials and Equipment

A letter stating that where materials or equipment are specified to comply with requirements of UL, or other standards, written proof of such compliance has been obtained. The label or listing of the specified agency, or a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested

and conform to the requirements and testing methods of the specified agency are acceptable as proof.

Factory Inspection and Tests

A certification that each engine generator set passed the factory tests and inspections and a list of the test and inspections.

Inspections

A letter certifying that all facilities are complete and functional, that each system is fully functional, and that each item of equipment is complete, free from damage, adjusted, and ready for beneficial use.

Cooling System

Certification that the engine-generator set and cooling system function properly in the ambient temperatures specified.

1.3 SYSTEM DESCRIPTION

Each engine-generator set shall be provided and installed complete and totally functional, with all necessary ancillary equipment to include air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. Each engine generator set shall satisfy the requirements specified in the Engine Generator Parameter Schedule.

1.3.1 ENGINE GENERATOR PARAMETER SCHEDULE

Service Load	100 kW
Power Factor	0.8 lagging
Motor Starting kVA (maximum)	150 kVA
Maximum Speed	1800 rpm
Engine-Generator Application	primary stand-alone
Engine Cooling Type (50/50)	water/ethylene glycol
Heat Exchanger Type	fin-tube
Governor Type	Isochronous
Frequency Bandwidth steady state	$\pm 0.4\%$
Governor Type	Droop
Frequency Regulation (droop) (No load to full load)	3% (max.)

Frequency Bandwidth (steady state)	<u>±</u> 0.4%
Voltage Regulation (No load to full load)	<u>±</u> 1% (max.)
Voltage Bandwidth (steady state)	<u>±</u> 1%
Frequency	60 Hz
Voltage	208 volts
Phases	3 Phase, Wye
Minimum Generator Reactance	_____ percent Subtransient
Nonlinear Loads	_____ kVA
Max Step Load Increase	100% of Service Load at 0.8 PF
Max Step Load Decrease (without shutdown)	100 % of Service Load at _____ PF
Max Time to Start and be Ready to Assume Load	10 seconds
Max Summer Indoor Temp (Prior to Genset Operation)	_____ degrees
Min Winter Indoor Temp (Prior to Genset Operation)	_____ degrees
Max Allowable Heat Transferred To Engine Generator Space at Rated Output Capacity	_____ MBTUH/hr.
Max Summer Outdoor Temp (Ambient)	_____ degrees
Min Winter Outdoor Temp (Ambient)	_____ degrees
Installation Elevation	_____ above sea level

1.3.2 Output Capacity

Each generator set shall provide power equal to the sum of service load plus the machine's efficiency loss and associated ancillary equipment loads. Rated output capacity shall also consider engine and/or generator oversizing required to meet requirements in paragraph Engine-Generator Parameter Schedule.

1.3.3 Power Rating

Standby ratings shall be in accordance with EGSA 101P.

1.4 GENERAL REQUIREMENTS

1.4.1 Engine-Generator Set

Each set shall consist of one engine, one generator, and one exciter, mounted, assembled, and aligned on one base; and all other necessary ancillary equipment which may be mounted separately. Engine generators shall be NEC Primary rated. Sets shall be assembled and attached to the base prior to shipping. Set components shall be environmentally suitable for the locations shown and shall be the manufacturer's standard product offered in catalogs for commercial or industrial use. A generator strip heater shall be provided for moisture control when the generator is not operating.

1.4.2 Nameplates

Each major component of this specification shall have the manufacturer's name, type or style, model or serial number, and rating number on a plate secured to the equipment. As a minimum, nameplates shall be provided for: Engines; Relays; Generators; Day tanks; Transformers (CT & PT); Regulators; Pumps and pump motors; Governors; Generator Breaker; Economizers; Heat exchangers (other than base-mounted).

Engines	Relays
Generators	Day tanks
Transformers (CT & PT)	Regulators
Pumps and pump motors	Governors
Generator Breaker	Economizers
Heat exchangers (other than base-mounted)	

Where the following equipment is provided as a standard component by the diesel-engine generator set manufacturer, the nameplate information may be provided in the maintenance manual in lieu of nameplates.

Battery charger	Heaters
Exhaust mufflers	Exciters
Switchgear	Silencers
Battery	

1.4.3 Personnel Safety Device

Exposed moving parts, parts that produce high operating temperatures, parts which may be electrically energized, and parts that may be a hazard to operating personnel during normal operation shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed so that proper operation of the equipment is not impaired.

1.4.4 Site Visit

Before performing work, the premises shall be visited and details of the work verified. The Owner shall be advised in writing of any discrepancies before performing any work.

1.4.5 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, the design, fabrication and installation shall conform to the code.

1.4.6 Engine Generator Set Enclosure

The engine generator set enclosure shall be corrosion resistant and fully weather resistant. The enclosure shall contain all set components and provide ventilation to permit operation at rated load under secured conditions. Doors shall be provided for access to all controls and equipment requiring periodic maintenance or adjustment. Removable panels shall be provided for access to components requiring periodic replacement. The enclosure shall be capable of being removed without disassembly of the engine-generator set or removal of components other than exhaust system. The enclosure shall reduce the noise of the generator set to within the limits specified in the paragraph SOUND LIMITATIONS.

1.4.7 Vibration Isolation

The maximum engine-generator set vibration in the horizontal, vertical and axial directions shall be limited to 6 mils (peak-peak RMS), with an overall velocity limit of 0.95 inches/seconds RMS, for all speeds through 110% of rated speed. A vibration-isolation system shall be installed between the floor and the base. The engine-generator set shall be provided with vibration-isolation in accordance with the manufacturer's standard recommendation. Where the vibration-isolation system does not secure the base to the structure floor or unit foundation, seismic restraints shall be provided in accordance with the seismic parameters specified.

1.4.8 Experience

Each component manufacturer shall have a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel engine-generator sets for commercial and industrial use. The engine-generator set manufacture/assembler shall have a minimum of 3 years experience in the manufacture, assembly and sale of stationary diesel engine-generator sets for commercial and industrial use.

1.4.9 Field Engineer

The engine-generator set manufacturer or assembler shall furnish a qualified field engineer to supervise the complete installation of the engine-generator set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment. The field engineer shall have attended the engine-generator manufacturer's training courses on installation and operation and maintenance for engine generator sets.

1.4.10 Seismic Requirements

Seismic requirements shall be in accordance with UFC 3-310-04 SEISMIC DESIGN FOR BUILDINGS and Sections 13 48 00 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT, 13 48 00.00 10 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT and 26 05 48.00 10 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT

1.4.11 Detailed Drawings

The Contractor shall submit detailed drawings showing the following:

- a. Base-mounted equipment, complete with base and attachments including anchor bolt template and recommended clearances for maintenance and operation.
- b. Starting system.
- c. Fuel system.
- d. Cooling system.
- e. Exhaust system.
- f. Electric wiring of relays, breakers, programmable controllers, and switches including single line and wiring diagrams.
- g. Lubrication system, including piping, pumps, strainers, filters, heat exchangers for lube oil and turbocharger cooling, electric heater, controls and wiring.
- h. Location, type, and description of vibration isolation devices.
- i. The safety system, including wiring schematics.
- j. One-line schematic and wiring diagrams of the generator, exciter, regulator, governor, and all instrumentation.
- k. Panel layouts.
- l. Mounting and support for each panel and major piece of electrical equipment.
- m. Engine-generator set rigging points and lifting instructions.

1.5 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment in accordance with the manufacturers recommended storage procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

1.6 OPERATION AND MAINTENANCE MANUALS

The operation and maintenance manuals shall be submitted and approved prior to commencing onsite tests.

1.6.1 Operation Manual

Three copies of the manufacturer's standard operation manual operation manual in 8-1/2 by 11 inch three-ring binders shall be provided. Sections shall be separated by heavy plastic dividers with tabs which identify the material in the section. Drawings shall be folded blue lines, with the title block visible, and placed in 8-1/2 by 11 inch plastic pockets with reinforced holes. The manual shall include:

- a. Step-by-step procedures for system startup, operation, and shutdown;
- b. Drawings, diagrams, and single-line schematics to illustrate and define the electrical, mechanical, and hydraulic systems with their controls, alarms, and safety systems;
- c. Procedures for interface and interaction with related systems to include automatic transfer switches fire alarm/suppression systems load shedding systems uninterruptible power supplies.

1.6.2 Maintenance Manual

Three copies of the manufacturer's standard maintenance manual maintenance manual containing the information described below in 8-1/2 x 11 inch three-ring binders shall be provided. Each section shall be separated by a heavy plastic divider with tabs. Drawings shall be folded, with the title block visible, and placed in plastic pockets with reinforced holes. The manual shall include:

- a. Procedures for each routine maintenance item.
- b. The manufacturer's recommended maintenance schedule.
- c. A component list which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components listed in paragraph GENERAL REQUIREMENTS.
- d. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.

1.7 SPECIAL TOOLS AND FILTERS

Two sets of special tools and two sets of filters required for maintenance shall be provided. Special tools are those that only the manufacturer provides, for special purposes, or to reach otherwise inaccessible parts. One handset shall be provided for each electronic governor when required to indicate and/or change governor response settings. Two complete sets of filters shall be supplied in a suitable storage box. These filters shall be in addition to filters replaced after testing.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified.

2.1.1 Circuit Breakers, Low Voltage

NEMA AB 1 and UL 489.

2.1.2 Filter Elements (Fuel-oil, Lubricating-oil, and Combustion-air)

Manufacturer's standard.

2.1.3 Instrument Transformers

NEMA C12.11.

2.1.4 Electrical Enclosures

2.1.4.1 General

NEMA ICS 6.

2.1.4.2 Panelboards

NEMA PB 1.

2.1.5 Electric Motors

Electric motors shall conform to the requirements of NEMA MG 1. Motors shall have sealed ball bearings, a maximum speed of 1800 rpm and integral automatic or manual reset thermal overload protectors. Motors used indoors shall have drip proof frames; those used outside shall be totally enclosed. AC motors larger than 1/2 Hp shall be of the squirrel cage induction type for standard voltage of 208 volts, 60 Hz three phase power. AC motors 1/2 Hp or smaller, shall be for standard voltage 120 volts, 60 Hz, single phase power.

2.1.6 Motor Controllers

Motor controllers and starters shall conform to the requirements of NFPA 70 and NEMA ICS 2.

2.2 ENGINE

Each engine shall operate on No. 2-D diesel conforming to ASTM D 975, shall be designed for stationary applications and shall be complete with ancillaries. The engine shall be a standard production model described in the manufacturer's catalog. The engine shall be naturally aspirated, scavenged, supercharged or turbocharged. The engine shall be two- or four-stroke-cycle and compression-ignition type. The engine shall be vertical inline, V-, or opposed-piston type, with a solid cast block or individually cast cylinders. The engine shall have a minimum of two cylinders. Opposed-piston type engines shall have no less than four cylinders. Each block shall have a coolant drain port. Each engine shall be equipped with an overspeed sensor.

2.3 FUEL SYSTEM

The fuel system for each engine generator set shall conform to the requirements of NFPA 30 and NFPA 37 and contain the following elements.

2.3.1 Pumps

2.3.1.1 Main Pump

Each engine shall be provided with an engine driven pump. The pump shall supply fuel at a minimum rate sufficient to provide the amount of fuel required to meet the performance indicated within the parameter schedule. The fuel flow rate shall be based on meeting the load requirements and all necessary recirculation.

2.3.1.2 Auxiliary Fuel Pump

Auxiliary fuel pumps shall be provided to maintain the required engine fuel pressure, either required by the installation or indicated on the drawings. The auxiliary pump shall be driven by a dc electric motor powered by the starting/station batteries. The auxiliary pump shall be automatically actuated by a pressure detecting device.

2.3.2 Filter

A minimum of one full flow fuel filter shall be provided for each engine. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

2.3.3 Relief/Bypass Valve

A relief/bypass valve shall be provided to regulate pressure in the fuel supply line, return excess fuel to a return line, and prevent the build-up of excessive pressure in the fuel system.

2.3.4 Integral Main Fuel Storage Tank

Each engine shall be provided with an integral main fuel tank. Each tank shall be factory installed and provided as an integral part of the diesel generator manufacturer's product. Each tank shall be provided with connections for fuel supply line, fuel return line, local fuel fill port, gauge, vent line, and float switch assembly. A fuel return line cooler shall be provided as recommended by the manufacturer and assembler. The temperature of the fuel returning to the tank shall be below the flash point of the fuel. Each engine-generator set provided with weatherproof enclosures shall have its tank mounted within the enclosure. The fuel fill line shall be accessible without opening the enclosure.

2.3.4.1 Capacity

The tank shall have capacity to supply fuel to the engine for an uninterrupted 7-day period at 100% rated load without being refilled.

2.3.4.2 Local Fuel Fill

Each local fuel fill port on the day tank shall be provided with a screw-on cap.

2.3.4.3 Fuel Level Controls

Each tank shall have a float-switch assembly to perform the following functions:

- (1) Activate the "Low Fuel Level" alarm at 70% of the rated tank capacity.
- (2) Activate the "Overfill Fuel Level" alarm at 95% of the rated tank capacity.

2.3.4.4 Arrangement

Integral tanks may allow gravity flow into the engine. Gravity flow tanks and any tank that allows a fuel level above the fuel injectors shall be provided with an internal or external factory installed valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating. Integral day tanks shall be provided with any necessary pumps to supply fuel to the engine as recommended by the generator set manufacturer. The fuel supply line from the tank to the manufacturer's standard engine connection shall be welded pipe.

2.4 LUBRICATION

Each engine shall have a separate lube-oil system conforming to NFPA 30 and NFPA 37. Each system shall be pressurized by engine-driven oil pumps. Each system shall be furnished with a relief valve for oil pressure regulation (for closed systems) and a dip-stick for oil level indications. The crankcase shall be vented in accordance with the manufacturer's recommendation except that it shall not be vented to the engine exhaust system. Crankcase breathers, if provided on engines installed in buildings or enclosures, shall be piped to vent to the outside. The system shall be readily accessible for service such as draining, refilling, etc. Each system shall permit addition of oil and have oil-level indication with the set operating. The system shall utilize an oil cooler as recommended by the engine manufacturer.

2.4.1 Filter

One full-flow filter shall be provided for each pump. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

2.4.2 Lube-Oil Sensors

Each engine shall be equipped with lube-oil pressure sensors. Pressure sensors shall be located downstream of the filters and provide signals for required indication and alarms.

2.5 COOLING SYSTEM

Each engine cooling system shall operate automatically while the engine is running. Each cooling system shall be sized for the maximum summer outdoor indoor design temperature and site elevation. Water-cooled system coolant shall use a combination of water and ethylene-glycol (50/50) sufficient for freeze protection at the minimum winter outdoor temperature specified. The maximum temperature rise of the coolant across the engine shall be no more than that recommended and submitted in accordance with paragraph SUBMITTALS.

2.5.1 Coolant Pumps

Coolant pumps shall be the centrifugal type. Each engine shall have an engine-driven primary pump. Secondary pumps shall be electric motor driven and have automatic controllers.

2.5.2 Heat Exchanger

Each heat exchanger shall be of a size and capacity to limit the maximum allowable temperature rise in the coolant across the engine to that recommended and submitted in accordance with paragraph SUBMITTALS for the maximum summer outdoor design temperature and site elevation. Each heat exchanger shall be corrosion resistant, suitable for service in ambient conditions of application.

2.5.2.1 Fin-Tube-Type Heat Exchanger (Radiator)

Heat exchanger may be factory coated with corrosive resistant film providing that corrosion measures are taken to restore the heat rejection capability of the radiator to the initial design requirement via oversizing, or other compensating methods. Internal surfaces shall be compatible with liquid fluid coolant used. Materials and coolant are subject to approval by the Owner. Heat exchangers shall be pressure type incorporating a pressure valve, vacuum valve and a cap. Caps shall be designed for pressure relief prior to removal. Each heat exchanger and the entire cooling system shall be capable of withstanding a minimum pressure of 7 psi. Each heat exchanger shall be protected with a strong grille or screen guard. Each heat exchanger shall have at least two tapped holes. One tapped hole in the heat exchanger shall be equipped with a drain cock, the rest shall be plugged.

2.6 SOUND LIMITATIONS

The noise generated by the installed diesel generator set operating at 100 percent load shall not exceed a sound pressure level of 65 Decibels in a 63 Hz frequency band at a distance of 75 feet from the end of the exhaust and air intake piping directly along the path of intake and discharge for horizontal piping; or at a radius of 75 feet from the engine at 45 degrees apart in all directions.

2.7 AIR INTAKE EQUIPMENT

Filters and silencers shall be provided in locations that are convenient for servicing. The silencer shall be of the high-frequency filter type, located in the air intake system as recommended by the engine manufacturer. Silencer shall be capable of reducing the noise level at the air intake to a point below the maximum acceptable levels specified in paragraph SOUND LIMITATIONS. A combined filter-silencer unit meeting requirements for the

separate filter and silencer items may be provided. Expansion elements in air-intake lines shall be copper-rubber.

2.8 EXHAUST SYSTEM

The system shall be separate and complete for each engine. Piping shall be supported so as to minimize vibration. Where a V-type engine is provided, a V-type connector with necessary flexible sections and hardware shall connect the engine exhaust outlets.

2.8.1 Flexible Sections and Expansion Joints

A flexible section at each engine and an expansion joint at each muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

2.8.2 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for outside inside vertical horizontal mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature 400 degrees F resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations in paragraph SOUND LIMITATIONS. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

2.8.3 Exhaust Piping

Horizontal sections of exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be long-radius. Exhaust piping, mufflers and silencers installed inside any building shall be insulated in accordance with paragraph THERMAL INSULATION and covered to protect personnel. Vertical exhaust piping shall be provided with a hinged, gravity operated, self-closing rain cover.

2.9 EMISSIONS

The finished installation shall comply with Federal, state, and local regulations and restrictions regarding the limits of emissions, as listed herein.

2.10 STARTING SYSTEM

The starting system for engine generator sets used in non-emergency applications shall be as follows.

2.10.1 Controls

An engine control switch shall be provided with functions including: run/start (manual), off/reset, and automatic mode. Start-stop logic shall be provided for adjustable cycle cranking and cool down operation. The logic shall be arranged for manual starting. Electrical starting systems shall be provided with an adjustable cranking limit device to limit cranking periods from 1 second up to the maximum duration.

2.10.2 Capacity

The starting system shall be of sufficient capacity, at the maximum outdoor summer temperature specified to crank the engine without damage or overheating. The system shall be capable of providing a minimum of three cranking periods with 15-second intervals between cranks. Each cranking period shall have a maximum duration of 15 seconds.

2.10.3 Functional Requirements

Starting system shall be manufacturers recommended dc system utilizing a negative circuit ground. Starting motors shall be in accordance with SAE ARP892.

2.10.4 Battery

A starting battery system shall be provided and shall include the battery, battery rack, intercell connectors, and spacers. The battery shall be in accordance with SAE J537. Critical system components (rack, protection, etc.) shall be sized to withstand the seismic acceleration forces specified. The battery shall be lead-acid type, with sufficient capacity, at the minimum outdoor winter temperature specified to provide the specified cranking periods. Valve-regulated lead-acid batteries are not acceptable.

2.10.5 Battery Charger

A current-limiting battery charger, conforming to UL 1236, shall be provided and shall automatically recharge the batteries. The charger shall be capable of an equalize charging rate for recharging fully depleted batteries within 24 hours and a float charge rate for maintaining the batteries in prime starting condition. An ammeter shall be provided to indicate charging rate. A timer shall be provided for the equalized charging rate setting. A battery is considered to be fully depleted when the output voltage falls to a value which will not operate the engine generator set and its components.

2.10.6 Starting Aids

The manufacturer shall provide one or more of the following methods to assist engine starting.

2.10.6.1 Glow Plugs

Glow plugs shall be designed to provide sufficient heat for combustion of fuel within the cylinders to guarantee starting at an ambient temperature of -25 degrees F.

2.10.6.2 Jacket-Coolant Heaters

A thermostatically controlled electric heater shall be mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 3 degrees of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized. The control temperature shall be the temperature recommended by the engine manufacturer to meet the starting time specified.

2.11 GOVERNOR

Each engine shall be provided with a governor which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100% of rated output capacity. The governor shall be configured for safe manual adjustment of the speed/frequency during operation of the engine generator set, without special tools, from 90 to 110 % of the rated speed/frequency, over a steady state load range of zero to 100% of rated capacity. Isochronous governors shall maintain the midpoint of the frequency bandwidth at the same value for steady-state loads over the range of zero to 100% of rated output capacity.

2.12 GENERATOR

Each generator shall be of the synchronous type, one or two bearing, conforming to NEMA MG 1, equipped with winding terminal housings in accordance with NEMA MG 1, equipped with an amortisseur winding, and directly connected to the engine. Insulation shall be Class H Class F. Generator design shall protect against mechanical, electrical and thermal damage due to vibration, 25 percent overspeeds, or voltages and temperatures at a rated output capacity of 100 percent. Generator ancillary equipment shall meet the short circuit requirements of NEMA MG 1. Frames shall be the drip-proof type.

2.12.1 Current Balance

At 100 percent rated load, and load impedance equal for each of the three phases, the permissible current difference between any two phases shall not exceed 2 percent of the largest current on either of the two phases.

2.12.2 Voltage Balance

At any balanced load between 75 and 100 percent of rated load, the difference in line-to-neutral voltage among the three phases shall not exceed 1 percent of the average line-to-neutral voltage. For a single-phase load condition, consisting of 25 percent load at unity power factor placed between any phase and neutral with no load on the other two phases, the maximum simultaneous difference in line-to-neutral voltage between the phases shall not exceed 3 percent of rated line to neutral voltage. The single-phase load requirement shall be valid utilizing normal exciter and regulator control. The interpretation of the 25 percent load for single phase load conditions means 25 percent of rated current at rated phase voltage and unity power factor.

2.12.3 Waveform

The deviation factor of the line-to-line voltage at zero load and at balanced full rated load at 0.8 power factor shall not exceed 10%. The RMS

of all harmonics shall be less than 5.0% and that of any one harmonic less than 3.0% at full rated load. Each engine-generator shall be designed and configured to meet the total harmonic distortion limits of IEEE Std 519.

2.13 EXCITER

The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300% for peak inverse voltage and forward current ratings for all operating conditions, including 110% generator output at 104 degrees F ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified.

2.14 VOLTAGE REGULATOR

Each generator shall be provided with a solid-state voltage regulator, separate from the exciter. The regulator shall maintain the voltage within a bandwidth of the rated voltage, over a steady-state load range of zero to 100% of rated output capacity. Regulator shall be configured for safe manual adjustment of the engine generator voltage output without special tools, during operation from 90 to 110% of the rated voltage over the steady state load range of zero to 100% of rated output capacity. Regulation drift shall not exceed plus or minus 0.5% for an ambient temperature change of 36 degrees F. The voltage regulator shall have a maximum droop of 1% of rated voltage over a load range from 0 to 100% of rated output capacity and automatically maintain the generator output voltage within the specified operational bandwidth.

2.15 GENERATOR PROTECTION

Short circuit and overload protection for the generator shall be provided. The generator circuit breaker (IEEE Device 52) ratings shall be consistent with the generator rated voltage and frequency, with continuous, short circuit and interrupting current ratings to match the generator capacity. The manufacturer shall determine the short circuit current interrupting rating of the breaker. The breaker shall be engine generator base mounted by the engine-generator set manufacturer. Molded case breakers shall be provided with shunt trip. Surge protection shall be provided for each phase of the generator, to be mounted at the generator terminals.

2.15.1 Panelboards

Panelboards shall be metal-enclosed, general purpose, 3-phase, 4-wire, 600 volt rated, with neutral bus and continuous ground bus, conforming to NEMA PB 1 and UL 891. Neutral bus and ground bus capacity shall be full capacity. Enclosure designs, construction, materials and coatings shall be suitable for the application and environment. Bus continuous current rating shall be at least equal to the generator rating and correspond to UL listed current ratings specified for panelboards and switchboards. Current withstand rating (short circuit rating) shall match the generator capacity. Buses shall be copper.

2.15.2 Devices

Switches, circuit breakers, switchgear, fuses, relays, and other protective devices shall be as specified in Section 16400 LOW VOLTAGE ELECTRICAL.

2.16 SAFETY SYSTEM

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions. The safety system shall be provided with a self-test method to verify its operability. Alarm signals shall have manual acknowledgement and reset devices. The alarm signal systems shall reactivate for new signals after acknowledgment is given to any signal. The systems shall be configured so that loss of any monitoring device shall be dealt with as an alarm on that system element.

2.16.1 Audible Signal

The audible alarm signal shall sound at a frequency of 70 Hz at a volume of 75 dB at 10 feet. The sound shall be continuously activated upon alarm and silenced upon acknowledgment. Signal devices shall be located as shown.

2.16.2 Visual Signal Signal

The visual alarm signal shall be a panel light. The light shall be normally off, activated to be blinking upon alarm. The light shall change to continuously light upon acknowledgement. If automatic shutdown occurs, the display shall maintain activated status to indicate the cause of failure and shall not be reset until cause of alarm has been cleared and/or restored to normal condition. Shutdown alarms shall be red; all other alarms shall be amber.

2.16.3 Alarms and Action Logic

2.16.3.1 Shutdown

Simultaneous activation of the audible signal, activation of the visual signal, stopping the engine, and opening the generator main circuit breakers shall be accomplished.

2.16.3.2 Problem

Activation of the visual signal shall be accomplished.

2.16.4 Local Alarm Panel

A local alarm panel shall be provided with the following shutdown and alarm functions as indicated in accordance with NFPA 99 110 level 1 2 mounted either on or adjacent to the engine generator set.

Device/ Condition/ Function	What/Where/Size	NFPA 99	NFPA 110 Level 1	NFPA 110 Level 2
Shutdowns W/Alarms				
High engine temperature	Automatic/ jacket water/ cylinder	SD/CP VA	SD/CP VA	SD/CP VA SD VA

Low lube-oil pressure	Automatic/pressure/level	SD/CP VA	SD/CP VA	SD/CP VA	SD VA
Overspeed shutdown \$ alarm	(110% (+ 2%) of rated speed	SD/CP VA	SD/CP VA	SD/CP VA	SD VA
Overcrank failure to start	Automatic/Failure to start	SD/CP VA	SD/CP VA	SD/CP VA	
Air shutdown damper (200-600kW)	When used		SD/CP VA	SD/CP VA	
Day tank overflow limit indication & transfer pump shutdown (95% volume)	Automatic/Day Tank/Level				SD/OPA (Pump)
Red emergency stop switch	Manual Switch		SD/CP VA	SD/CP VA	SD VA
Failure to crank					
Day tank Integral Main Fuel Tank low fuel limit Device/Condition/indication (70% volume remaining)					
Alarms					
Low lube-oil pressure	Pressure/level	CP VA	CP VA	CP VAO	CP VA
Low fuel level	Main tank, 3 hours remaining	VA/AA	CP VA	CP VAO	
High fuel level	Integral Main Fuel Storage Tank 95% Volume				CP VA
Low coolant	Jacket water	CP/VA	CP VA	CP VA	
Pre-high	Jacket water/	CP VA	CP VA	CP VAO	CP VA

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temperature	cylinder		
Pre-low lube-oil pressure		CP VA	CP VA
High battery voltage		CP VA	CP VAO
Low battery voltage		CP VA	CP VAO
Battery charger AC failure	AC supply not available	CP VA	CP VAO
Control switch not in AUTO		CP VA	CP VAO
Low starting air pressure		CP VA	CP VAO
Low starting hydraulic pressure		CP VA	CP VAO

SD - Shut Down

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

O - Optional

2.16.5 Time-Delay on Alarms

For startup of the engine-generator set, time-delay devices shall be installed bypassing the low lubricating oil pressure alarm during cranking, and the coolant-fluid outlet temperature alarm. The lube-oil time-delay device shall return its alarm to normal status after the engine starts. The coolant time-delay device shall return its alarm to normal status 5 minutes after the engine starts.

2.17 ENGINE GENERATOR SET CONTROLS AND INSTRUMENTATION

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions.

2.17.1 Controls

A local control panel shall be provided with controls as indicated in accordance with NFPA 110 level 1 2 and as follows mounted either on or adjacent to the engine generator set as indicated. A remote control panel shall be provided with devices as indicated fully redundant to the local control panel.

Device/Condition/ Function	Corps Requirement	NFPA 110 Level 1	NFPA 110 Level 2	MFG Offering
Controls				
Switch: run/start - off/set - auto	CP			CP/STD
Emergency stop switch & alarm	CP			CP/STD
Lamp test/indicator test	CP	CP VA	CP VA	CP/STD
Common alarm contacts/ fault relay		X	X	CP/O
Panel lighting	CP			CP/STD
Audible alarm & silencing/reset switch	CP			
Voltage adjust for voltage Regulator	CP			CP/STD
Pyrometer display w/selector switch	CP			
Remote emergency stop switch		CP VA	CP VA	
Remote fuel shutoff switch				
Remote lube-oil shutoff switch				

2.17.2 Engine Generator Set Metering and Status Indication

A local panel shall be provided with devices as indicated in accordance with NFPA 110 level 1 2 and as follows mounted either on or adjacent to the engine generator set as indicated. A remote control panel shall be provided with devices as indicated fully redundant to the local control panel.

Device/Condition/ Function	Corps Requirement	NFPA 110 Level 1	NFPA 110 Level 2	MFG Offering
Genset Status & Metering				
Genset supplying load		CP VA	CP VAO	CP VAO
System ready				CP/STD
Engine oil pressure	CP			CP/STD
Engine coolant temperature	CP			CP/STD
Engine RPM (Tachometer)	CP			CP/STD
Engine run hours	CP			CP/STD
Pyrometer display w/selector switch	CP			
AC volts (generator), 3-phase	CP			CP/STD
AC amps (generator),	CP			CP/STD

3-phase

Generator frequency	CP	CP/STD
Phase selector switches (amps & volts)	CP	CP/STD
Watts/kW		CP/VA-O
Voltage Regulator Adjustment	CP	

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

O - Optional

STD - Manufacturers Standard Offering

2.18 PANELS

Each panel shall be of the type necessary to provide specified functions. Panels shall be mounted as shown. Instruments shall be mounted flush or semiflush. Convenient access to the back of instruments shall be provided to facilitate maintenance. Instruments shall be calibrated using recognized industry calibration standards. Each panel shall be provided with a panel identification plate which clearly identifies the panel function as indicated. Each instrument and device on the panel shall be provided with a plate which clearly identifies the device and its function as indicated. Panels except the remote alarm panel can be combined into a single panel.

2.18.1 Enclosures

Enclosures shall be designed for the application and environment, conforming to NEMA ICS 6, and provided with locking mechanisms which are keyed alike.

2.18.2 Analog

Analog electrical indicating instruments shall be in accordance with ANSI C39.1 with semiflush mounting. Switchgear, and control-room panel-mounted instruments shall have 250 degree scales with an accuracy of not less than 1 percent. Unit-mounted instruments shall be the manufacturer's standard with an accuracy of not less than 2 percent. The instrument's operating temperature range shall be minus 4 to plus 130 degrees F. Distorted generator output voltage waveform of a crest factor less than 5 shall not affect metering accuracy for phase voltages, hertz and amps.

2.18.3 Electronic

Electronic indicating instruments shall be true RMS indicating, 100 percent solid state, microprocessor controlled to provide all specified functions. Control, logic, and function devices shall be compatible as a system, sealed, dust and water tight, and shall utilize modular components with metal housings and digital instrumentation. An interface module shall be provided to decode serial link data from the electronic panel and translate alarm, fault and status conditions to set of relay contacts. Instrument accuracy shall be not less than 2 percent for unit mounted devices and 1 percent for control room, panel mounted devices, throughout a temperature

range of minus 4 to plus 130 degrees F. Data display shall utilize LED or back lit LCD. Additionally, the display shall provide indication of cycle programming and diagnostic codes for troubleshooting. Numeral height shall be 1/2 inch.

2.18.4 Parameter Display

Indication or readouts of the lubricating-oil pressure, ac voltmeter, ac ammeter, frequency meter, and coolant temperature.

2.19 SURGE PROTECTION

Electrical and electronic components shall be protected from, or designed to withstand the effects of surges from switching and lightning.

2.20 MANUAL ENGINE-GENERATOR SET SYSTEM OPERATION

Complete facilities shall be provided for manual starting and testing of each set without load, loading and unloading of each set.

2.21 BASE

The base shall be constructed of steel. The base shall be designed to rigidly support the engine-generator set, ensure permanent alignment of all rotating parts, be arranged to provide easy access to allow changing of lube-oil, and ensure that alignment will be maintained during shipping and normal operation. The base shall permit skidding in any direction during installation and shall be provided with suitable holes for foundation bolts. The base shall also withstand and mitigate the effects of synchronous vibration of the engine and generator, and shall be provided with suitable holes for anchor bolts diameter holes for anchor bolt and jacking screws for leveling.

2.22 PAINTING AND FINISHING

The engine-generator set shall be cleaned, primed and painted in accordance with the manufacturer's standard color and practice.

2.23 FACTORY INSPECTION AND TESTS

Factory inspection and tests shall be performed on each engine-generator set proposed to meet this specification section. Inspections shall be completed and necessary repairs made prior to testing. Inspectors shall look for leaks, looseness, defects in components, and proper assembly. Factory tests shall be NEMA MG 1 routine tests and the manufacturer's routine tests.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and IEEE C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

3.2 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16400 LOW VOLTAGE ELECTRICAL. For vibration isolation, flexible fittings shall be provided for all conduit, cable trays, and raceways attached to engine-generator sets; metallic conductor cables installed on the engine generator set and from the engine generator set to equipment not mounted on the engine generator set shall be flexible stranded conductor; and terminations of conductors on the engine generator set shall be crimp-type terminals or lugs. The Contractor shall submit proof of prototype tests as specified in the Submittals paragraph.

3.3 FIELD PAINTING

Field painting shall be as specified in Section 09965 PAINTING AND COATINGS.

3.4 ONSITE INSPECTION AND TESTS

3.4.1 Test Conditions

3.4.1.1 Data

Measurements shall be made and recorded of parameters necessary to verify that each set meets specified parameters. If the results of any test step are not satisfactory, adjustments or replacements shall be made and the step repeated until satisfactory results are obtained. Unless otherwise indicated, data shall be taken during engine-generator set operation and recorded in 15 minute intervals and shall include: readings of engine-generator set meters and gauges for electrical and power parameters; oil pressure; ambient temperature; and engine temperatures available from meters and gauges supplied as permanent equipment on the engine-generator set. In the following tests where measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Electrical measurements shall be performed in accordance with IEEE Std 120. Definitions and terms are in accordance with IEEE Std 100. Temperature limits in the rating of electrical equipment and for the evaluation of electrical insulation shall be in accordance with IEEE Std 1.

3.4.1.2 Power Factor

Engine-generator set operating tests shall be made utilizing a load with a 0.8 power factor.

3.4.1.3 Contractor Supplied Items

The Contractor shall provide all equipment and supplies required for inspections and tests including fuel, test instruments, and loadbanks at the specified power factors.

3.4.1.4 Instruments

Readings of panel gauges, meters, displays, and instruments, provided under this specification shall be verified during test runs by test instruments of precision and accuracy greater than the tested items. Test instrument accuracy shall be at least as follows: current, 1.5%; voltage, 1.5%; real power, 1.5%; reactive power, 1.5%; power factor, 3%; frequency, 0.5%. Test instruments shall be calibrated by a recognized standards laboratory within 30 90 days prior to testing.

3.4.1.5 Sequence

The sequence of testing shall be as specified in the approved testing plan unless variance is authorized by the Owner. Field testing shall be performed in the presence of the Owner. Tests may be scheduled and sequenced in order to optimize run-time periods; however the following general order of testing shall be followed: Construction Tests; Inspections; Safety run Tests; and Performance Tests and Final Inspection.

3.4.2 Construction Tests

Individual component and equipment functional tests for fuel piping, coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the engine-generator set manufacturer shall be performed prior to connection to the engine-generator set.

3.4.2.1 Piping Test

- a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the outflowing fluid has no obvious sediment or emulsion.
- b. Fuel piping which is external to the engine-generator set shall be tested in accordance with NFPA 30. All remaining piping which is external to the engine generator set shall be pressure tested with air pressure at 150% of the maximum anticipated working pressure, but in no case less than 150 psig, for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

3.4.2.2 Electrical Equipment Tests

- a. Low-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the distribution bus. Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

(1) R in megohms = (rated voltage in kV + 1) x 304,800/(length of cable in meters).

(2) $(R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet}))$

(3) Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

- b. Ground-Resistance Tests. The resistance of each grounding electrode shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

(1) Single rod electrode - 25 ohms.

- c. Circuit breakers and switchgear shall be examined and tested in accordance with manufacturer's published instructions for functional testing.

3.4.3 Inspections

The following inspections shall be performed jointly by the Owner and the Contractor, after complete installation of each engine-generator set and its associated equipment, and prior to startup of the engine-generator set. Checks applicable to the installation shall be performed. The results of those which are physical inspections (I) shall be documented by the Contractor and submitted in accordance with paragraph SUBMITTALS. The Contractor shall present manufacturer's data for the inspections designated (D) at the time of inspection. Inspections shall verify that equipment type, features, accessibility, installation and condition are in accordance with the contract specification. Manufacturer's statements shall certify provision of features which cannot be verified visually.

- (1) Drive belts. (I)
- (2) Governor type and features. (I)
- (3) Engine timing mark. (I)
- (4) Starting motor. (I)
- (5) Starting aids. (I)
- (6) Coolant type and concentration. (D)
- (7) Radiator drains. (I)
- (8) Block coolant drains. (I)
- (9) Coolant fill level. (I)
- (10) Coolant line connections. (I)
- (11) Coolant hoses. (I)
- (12) Combustion air filter. (I)
- (13) Intake air silencer. (I)
- (14) Lube oil type. (D)
- (15) Lube oil drain. (I)
- (16) Lube-oil filter. (I)
- (17) Lube-oil-fill level. (I)
- (18) Lube-oil line connections. (I)
- (19) Lube-oil lines. (I)

- (20) Fuel type. (D)
- (21) Fuel-level. (I)
- (22) Fuel-line connections. (I)
- (23) Fuel lines. (I)
- (24) Fuel filter. (I)
- (25) Access for maintenance. (I)
- (26) Voltage regulator. (I)
- (27) Battery-charger connections. (I)
- (28) Wiring & terminations. (I)
- (29) Instrumentation. (I)
- (30) Hazards to personnel. (I)
- (31) Base. (I)
- (32) Nameplates. (I)
- (33) Paint. (I)
- (34) Exhaust system. (I)
- (35) Access provided to controls. (I)
- (36) Enclosure. (I)
- (37) Engine & generator mounting bolts (proper application). (I)

3.4.4 Safety Run Tests

- a. Perform and record engine manufacturer's recommended prestarting checks and inspections.
- b. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- c. Activate the manual emergency stop switch and verify that the engine stops.
- d. Remove the high and pre-high lubricating oil temperature sensing elements from the engine and temporarily install temperature gauge in their normal locations on the engine (required for safety, not for recorded data). Where necessary, provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- e. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize. Monitor the temporarily installed temperature gauges. If temperature reading exceeds the value for an alarm condition, activate the manual emergency stop switch.
- f. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- g. Remove the high and pre-high coolant temperature sensing elements from the engine and temporarily seal their normal location on the engine and temporarily install temperature gauges in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.

- h. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize.
- i. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- j. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- k. Operate the engine generator-set for at least 30 minutes at 100 percent of service load.
- l. Verify proper operation of the governor and voltage regulator.
- m. Verify proper operation and setpoints of gauges and instruments.
- n. Verify proper operation of ancillary equipment.
- o. Manually adjust the governor to increase engine speed past the overspeed limit. Record the RPM at which the engine shuts down.
- p. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of rated load.
- q. Manually fill the day tank to a level above the overfill limit. Record the level at which the overfill alarm sounds. Verify shutdown of the fuel transfer pump. Drain the day tank down below the overfill limit.
- r. Shut down the engine. Remove the time-delay low lube oil pressure alarm bypass and try to start the engine. Record the results.
- s. Attach a manifold to the engine oil system (at the oil sensor pressure port) that contains a shutoff valve in series with a connection for the engine's oil pressure sensor followed by an oil pressure gauge ending with a bleed valve. The engine's oil pressure sensor shall be moved from the engine to the manifold and its normal location on the engine temporarily sealed. The manifold shutoff valve shall be open and bleed valve closed.
- t. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of service load.
- u. Close the manifold shutoff valve. Slowly allow the pressure in the manifold to bleed off through the bleed valve while watching the pressure gauge. Record the pressure at which the engine shuts

down. Catch oil spillage from the bleed valve in a container. Add the oil from the container back to the engine, remove the manifold, and reinstall the engine's oil pressure sensor on the engine.

- v. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 100% of service load. Record the maximum sound level in each frequency band at a distance of 75 feet from the end of the exhaust and air intake piping directly along the path of intake and discharge horizontal piping; or at a radius of 75 35 feet from the engine at 45 degrees apart in all directions for vertical piping. The measurements should comply with the paragraph SOUND LIMITATIONS. If a sound limiting enclosure is provided, the enclosure, the muffler, and intake silencer shall be modified or replaced as required to meet the sound requirements contained within this specification.
- w. Manually drain off fuel slowly from the day tank to empty it to below the low fuel level limit and record the level at which the audible alarm sounds. Add fuel back to the day tank to fill it above low level alarm limits.

3.4.5 Performance Tests

3.4.5.1 Continuous Engine Load Run Test

The engine-generator set and ancillary systems shall be tested at service load to: demonstrate reliability and durability; verify that heat of extended operation does not adversely affect or cause failure in any part of the system; and check all parts of the system. If the engine load run test is interrupted for any reason, the entire test shall be repeated. The engine load run test shall be accomplished principally during daylight hours, with an average ambient temperature of 75 degrees F. After each change in load in the following test, measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the allowable range. Measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Data taken at 15 minutes intervals shall include the following:

- a. Electrical: Output amperes, voltage, real and reactive power, power factor, frequency.
- b. Pressure: Lube-oil.
- c. Temperature: Coolant, Lube-oil, Ambient.

(1) Perform and record engine manufacturer's recommended prestarting checks and inspections. Include as a minimum checking of coolant fluid, fuel, and lube-oil levels.

- (2) Start the engine; make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- (3) Operate the engine generator-set for at least 2 hours at 75 percent of service load.
- (4) Increase load to 100% of service load and operate the engine generator-set for at least 2 hours.
- (5) Remove load from the engine-generator set.

3.4.5.2 Load Acceptance Test

Engine manufacturer's recommended prestarting checks and inspections shall be performed and recorded. The engine shall be started, and engine manufacturer's after-starting checks and inspections made and recorded during a reasonable warm-up period. For the following steps, the output line-line and line-neutral voltages and frequency shall be recorded after performing each step instruction (after stabilization of voltage and frequency). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings.

- a. Apply load in steps no larger than the Maximum Step Load Increase to load the engine-generator set to 100 of Service Load.
- b. Verify that the engine-generator set responds to the load addition and that the output voltage returns to and stabilizes within the rated bandwidths.

3.4.6 Automatic Operation Tests for Stand-Alone Operation

The automatic loading system shall be tested to demonstrate loading and unloading of each engine-generator set. The loads for this test shall utilize the actual loads to be served, and the loading sequence shall be the indicated sequence. Perform this test for a minimum of two successive, successful tests. Data taken shall include the following:

- a. Ambient temperature (at 15 minute intervals).
 - b. Generator output current (before and after load changes).
 - c. Generator output voltage (before and after load changes).
 - d. Generator output frequency (before and after load changes).
- (1) Initiate loss of the primary power source and verify automatic sequence of operation.
 - (2) Restore the primary power source and verify sequence of operation.
 - (3) Verify resetting of controls to normal.

3.5 FINAL INSPECTION AND TESTING

- a. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- b. Increase the load in steps no greater than the maximum step load increase to 100% of service load, and operate the engine-generator set for at least 30 minutes. Measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the same range as previous measurements and is within the required range.
- c. Remove load and shut down the engine-generator set after the recommended cool down period. Perform the pre-test inspections and take necessary corrective actions.
- d. Remove the lube oil filter and have the oil and filter examined by the engine manufacturer for excessive metal, abrasive foreign particles, etc. Any corrective action shall be verified for effectiveness by running the engine for 4 hours at service load, then re-examining the oil and filter.
- e. Remove the fuel filter and examine the filter for trash, abrasive foreign particles, etc.
- f. Visually inspect and check engine and generator mounting bolts for tightness and visible damage.
- g. Replace air, oil, and fuel filters with new filters.

3.6 MANUFACTURER'S FIELD SERVICE

3.6.1 Onsite Training

The Contractor shall conduct training course for operating staff. The training period shall consist of a total 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations such as oil change, oil filter change, and air filter change.

3.6.2 Manufacturer's Representative

The engine generator-set manufacturer shall furnish a qualified representative to supervise the installation of the engine generator-set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment.

3.7 INSTRUCTIONS

Two sets of instructions shall be typed in 8 1/2 x 11 inches format, laminated in weatherproof plastic, and placed in three-ring vinyl binders. The binders shall be placed as directed by the Owner. The instructions

shall be in place prior to acceptance of the engine generator set installation. First set of instructions shall include a one-line diagram, wiring and control diagrams and a complete layout of the system. Second set of instructions shall include the condensed operating instructions describing manufacturer's pre-start checklist and precautions; startup procedures for test-mode, manual-start mode, and automatic-start mode (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation, load-shedding, and automatic transfer switches).

3.8 ACCEPTANCE

Final acceptance of the engine-generator set will not be given until the Contractor has successfully completed all tests and after all defects in installation material or operation have been corrected.

-- End of Section --

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SECTION 16400

LOW-VOLTAGE ELECTRICAL SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish and install a complete low-voltage electrical system for these facilities.

1.02 RELATED DOCUMENTS

- a. Plans, General Conditions and Division 1 shall apply to work under this section.
- b. Section 16050, "Basic Electrical Materials and Methods", and Section 16520, "Exterior Lighting", shall apply to work under this Section.

1.03 MATERIAL SUBMITTALS

The Contractor shall submit catalog cuts for:

- a. Conduit and Fittings
- b. Wiring Devices
- c. Enclosed Circuit Breakers and Safety Switches
- d. Panelboards, Transformers and Load Centers
- e. Transfer Switches
- f. Receptacles
- g. Low-Voltage Wire and Cable, Connectors and Terminators.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

The manufacturers listed are approved for the following products.

- a. Rigid Galv. Steel Conduit Triangle, Republic, Wheatland
- b. Rigid Galv. Steel Condulets Crouse-Hinds, Appleton, T&B
- c. PVC-Coated RGS Conduit & Fittings OCAL (no known equivalent)
- d. Enclosed Circuit Breakers Crouse-Hinds, Cutler-Hammer,
 General Electric, Square D
- e. Misc. Panelboards & Transformers Cutler-Hammer, General
 Electric, Square D

- f. Transfer Switches Cutler-Hammer, General Electric, Square D
- g. Low-Voltage Wire and Cable Cablec, Pirelli, Southwire

2.02 ENCLOSURES

- a. Miscellaneous enclosures and auxiliary gutters used above ground shall be NEMA 3R raintight corrosion resistant steel enclosures. Auxiliary gutters shall be totally enclosed and gasketed, 14 gauge minimum steel body and door.
- b. Outdoor electronic equipment enclosures shall be NEMA 4 steel enclosures with hinged and clamped gasketed doors and corrosion-resistant epoxy powder paint finish.
- c. Sealing hubs shall be installed on conduits entering gasketed sheet metal enclosures.

2.03 ABOVE-GROUND CONDUIT

- a. Conduit shall be applied as follows for the given locations:
 - (1) Above ground, outdoors and exposed: RGS conduit
 - (2) Conduit stub-ups, unless otherwise noted: PVC-coated RGS
 - (3) Above ground, concealed, indoors: EMT
- b. Wireway shall be supplied as follows for the given applications:
 - (1) Outdoor: NEMA 3R steel with hinged clamped cover
 - (2) Indoor: NEMA 12 steel with hinged clamped cover
- c. Liquidtight flexible metal conduit or flexible metal conduit (see above for application requirements) shall be installed at: motor junction box connections, recessed light fixtures, instruments, as shown on the Plans, whenever flexibility is desired and wherever vibration may be present.
- d. Conduit minimum trade size shall be $\frac{3}{4}$ ", unless otherwise noted. Flexible conduit connections may be reduced to $\frac{1}{2}$ " trade size when the destination equipment is supplied with $\frac{1}{2}$ " hubs and the NEC conduit fill requirements are maintained.
- e. Where conduit sizes are not shown on the Plans, Contractor shall size conduits to meet NEC fill requirements.
- f. Conduit bodies for use with EMT shall be Crouse-Hinds Mark 9 series or equal and shall have sheet aluminum covers with neoprene gaskets. EMT fittings shall be compression-type and approved for the type of installation.
- g. Conduit bodies for use with RGS conduit shall be Crouse-Hinds Form 8 series or equal and shall have cast iron covers with neoprene gaskets and corrosion-resistant screws.

- h. Bushings, hubs and other similar fittings shall be hot-dip galvanized for outdoor, wet, or damp applications. Indoor fittings may be zinc electroplate or similar.
- i. RGS conduit fittings shall be steel or malleable iron. Zinc die-cast fittings are unacceptable.

2.04 PULL, OUTLET AND JUNCTION BOXES

- a. Outdoor pull boxes larger than 6" x 6" shall be NEMA 4X 304 stainless-steel enclosures with stainless-steel piano hinged, clamped and gasketed door and rear mounting panel. Enclosure shall include a padlockable hasp.
- b. Outdoor pull, outlet and junction boxes 6" x 6" and smaller shall be malleable cast iron with threaded hubs and aluminum finish.
- c. Indoor outlet and junction boxes shall be galvanized sheet steel with knockouts, mounting hardware, brackets, extension rings, and covers as required. Minimum box size shall be 4" x 4" square.

2.05 WIREWAY

- a. Wireway for interior use shall be NEMA 12 feed-through type with hinged, gasketed and clamped covers. Exterior wireway shall be of NEMA 4 construction.
- b. Wireway shall be 14 gauge sheet steel with ANSI 61 gray polyester powder finish inside and out.
- c. Provide hangers, elbows, tees, box connectors, telecopying fittings and other accessories required for a complete wireway system.
- d. Wireway sizes shall be provided as shown on the Plans.

2.06 HARDWARE

In exterior locations subject to weather, hardware shall be hot-dipped galvanized steel or stainless-steel, unless otherwise noted.

2.07 PAINTING AND FINISH

All electrical equipment enclosures (other than stainless-steel) shall be painted or galvanized.

2.08 PANELBOARDS

- a. Provide dead-front lighting and appliance panelboards suitable for use as service equipment. Provide all grounding and bonding required by NEC Article 250.
- b. Panelboard shall have copper bus bars, full-sized neutral bar and bare uninsulated grounding bar suitable for bonding to enclosure.

- c. Provide suitable lugs on neutral and ground busses for each outgoing feeder circuit. Lugs shall be of the anti-burn solderless pressure-type connectors approved for copper conductors.
- d. Breakers shall be bolt-on, heavy-duty, quick-make, quick-break breakers with pole arrangements and interrupting capacities as shown on the Plans.
- e. Provide galvanized sheet steel, NEMA 3R, code-gage thickness enclosure with multiple knockouts and wiring gutters. Enclosures shall be of the same manufacture as, and shall mate properly with, panelboard interiors.
- f. Provide panelboard fronts with adjustable indicating trim clamps, concealed piano-type door hinges, and doors with flush locks and keys. All panelboard enclosures shall be keyed alike.
- g. Equip with interior circuit-directory frame and 8.5" x 11" panel directory with clear plastic covering.
- h. Provide baked gray enamel finish over a rust inhibitor coating.

2.09 MANUAL TRANSFER SWITCHES (MTS'S)

- a. Construction: Transfer switch shall be of the non-automatic, manually-operated, mechanically-interlocked type.
- b. Ratings: Provide number of poles and current and voltage ratings as indicated on the Plans. Current ratings shall apply for 100 percent resistive through 100 percent inductive loads.
- c. Transfer switch fault closing and withstand ratings shall be a minimum of 42 kA rms symmetrical, based on testing in accordance with UL 1008, conducted at full rated system voltage and 20 percent power factor. Test each product for withstand duration time for rated short circuit current correlated with the actual type of circuit protective device indicated for the transfer switch
- d. Neutral Terminal: Provide fully-rated neutral bus for common neutral connections.
- e. Enclosures: Outdoor NEMA 4x Stainless Steel.
- f. Factory Wiring: Train and bundle factory wiring and identify consistently with shop drawings, either by color code or by numbered or lettered wire and cable tape markers at all terminations. Provide designated terminal blocks for field wiring, and arrange power terminal and field wiring space to be suitable for top, side, or bottom entrance of feeder conductors as indicated. Provide pressure type terminals suitable for copper or aluminum conductors of sizes indicated.
- g. Switch action for double throw type switches shall be mechanically held in both directions and shall be incapable of pauses or intermediate position stops during normal functioning except as indicated.

- h. Main contacts shall be silver-alloy for switching load current with separate arcing contacts.
- i. Molded-case switches (molded-case breaker without overcurrent protection trip) shall be used for switching.

2.10 ENCLOSED BREAKERS AND SAFETY SWITCHES

- a. Enclosed breakers used as disconnects shall utilize heavy-duty quick-make, quick-break, molded-case, thermal-magnetic circuit breakers, with handles that clearly indicate position.
- b. Safety switches shall be heavy-duty, 600 Vac (for 480V systems) or 250 Vac (for systems 240V and below), quick-make, quick-break mechanisms.
- c. Breakers and switches shall have a flange-mounted disconnect handle capable of being padlocked in either the ON or OFF position. The door shall be interlocked to prevent opening while switch or breaker is closed. A tool-operable interlock-defeat mechanism shall be provided to allow qualified personnel access to the interior of the enclosure while energized for maintenance and testing purposes.
- d. Enclosures for indoor use shall be NEMA 1 steel with ANSI 61 light gray finish. Enclosures for outdoor use shall be NEMA 4X stainless-steel.
- e. Switches for use as motor disconnects shall be horsepower-rated at or above the rating of the motors to be switched.
- f. Switches shall be fused or non-fused as shown on the Plans.
- g. Fuses shall be rated 200,000 AIC and shall be Type RK5 with time delay for motor circuits and Type RK1 or as recommended by equipment manufacturer for other applications.

2.11 600 VOLT WIRE AND CABLE

- a. All feeders and wiring in circuits operated at 480 V and below shall be type XHHW-2 with stranded copper conductors and 600V insulation rated for operation at a conductor temperature of 90 degree C in wet and dry locations.
- b. Multiconductor power and control cable shall be 600V Type TC tray cable with stranded copper conductors, Type XHHW-2 insulation and PVC jacket.
- c. Network communication cable for lighting control shall comply with the requirements of Section 16520, "Area Lighting".
- d. DC power wiring shall be type XHHW with stranded copper conductors and 600V insulation rated for operation at a conductor temperature of 90 degrees C dry, 75 degrees C wet.

2.12 WIRING DEVICES

- a. Wiring devices include switches, receptacles and accessory faceplates.
- b. Wiring devices shall comply with the following standards:
 - (1) NFPA 70 (NEC)
 - (2) NEMA WD 1
 - (3) UL Standards 20 and 498
- c. Wiring devices shall be specification-grade, back- and side-wired, with ivory-colored nylon housings.
- d. Wall plates in finished spaces shall be brushed stainless-steel. Wall plates in unfinished spaces shall be galvanized steel covers, unless otherwise noted. Outdoor covers shall be malleable iron.
- e. Switches shall be toggle-type, snap-action (quiet), single-pole, 2-way and 3-way as noted, 120V, 20A unless noted or required otherwise.
- f. Receptacles shall be duplex, straight-blade, 2-pole, 3-wire, grounding-type, 125V, 15A, NEMA 5-15R unless noted or required otherwise.
- g. Ground Fault Circuit Interrupter (GFCI) receptacles shall be duplex, straight-blade, 2-pole, 3-wire, grounding-type, 125V, 20A, NEMA 5-20R.
- h. Faceplates for telecommunication outlets shall be provided and installed by others.

PART 3 - EXECUTION

3.01 COORDINATION OF WORK

- a. The Contractor shall coordinate the electrical work with the work of other trades.
- b. Working Space: Working space in front of all panels shall be maintained.
- c. Materials: Prior to placing orders for materials, the Contractor shall confirm and verify equipment electrical ratings, equipment catalog numbers and equipment dimensions as to applicability and correctness for installation.
- d. Exact location of equipment: The Contractor shall allow for a reasonable relocation of equipment by the Engineer prior to installation. A reasonable relocation shall be defined as plus or minus six feet.

3.02 INSTALLATION

- a. General

- (1) Mount all equipment to structural members and anchor securely. Design and provide support structures fabricated from steel channel or other structural steel members as required.
- (2) Mount circuit-breaker and fused-switch equipment so that operating handles are no more than 6'-6" above grade or floor level.
- (3) All electrical connections shall be tightened to the proper torque values using a calibrated torque wrench/driver.

b. Panelboards

- (1) Panelboard circuit breakers shall be installed and arranged according to the circuit numbering shown on the Plans.
- (2) Panelboard schedules shall be filled out using a laser printer according to the as-built condition of the panel.

c. Enclosed Breakers and Safety Switches

- (1) Breakers and switches used as safety disconnects shall be mounted within sight of the equipment to be switched, preferably adjacent to the equipment.

d. Wiring Devices

- (1) Mount devices at the following elevations unless otherwise noted (to centerline of device; coordinate locations with other trades and Engineer prior to installation):
 - a. Receptacles in unfinished spaces, above floor or grade 48"
 - b. Switches, above floor or grade 48"
- (2) Install wiring devices only after device boxes have been cleaned and wiring installed.

3.03 ABOVE-GROUND CONDUIT

- a. Conduits and raceways shall be installed in a neat and orderly manner. Raceways shall be aligned and plumbed vertically and horizontally. Fasteners shall be factory designed, and supports installed at spacing's prescribed by electrical codes.
- b. Conduits shall be cut square and reamed. Rigid conduit joints shall be made up with 5 threads fully engaged and painted with a rust-resistant paint.
- c. Branch circuits and feeders are shown schematically on the Plans. Conduits shall be provided with junction boxes, condulets, expansion fittings, elbows and supports as required by codes. Routing of conduit shall be field engineered unless otherwise noted on the Plans.

- d. A pull rope shall be installed in all empty conduits. Pull rope shall be 160 lb. test yellow polypropylene cord.

3.04 WIRE AND CABLE

- a. Prior to installing cables in 1-1/2" conduit or larger, a steel mandrel shall be pulled through all conduits. Mandrel shall be 1/2" smaller in diameter than the conduit.
- b. Wire and cable bushings shall be installed on all conduits entering junction boxes pull boxes or equipment.
- c. When mechanized equipment is used for pulling cables. The cables shall be lubricated with a lubricating compound recommended by the cable manufacturer. Pulling sleeves shall have a minimum radius of 15 times the diameter of the cable.
- d. The cables shall be lubricated with a lubricating compound recommended by the cable manufacturer. Pulling sleeves shall have a minimum radius of 15 times the diameter of the cable.
- e. Where multiple circuits run above grade through the same junction box or outlet box, each wire shall be marked with a wrap-around cable marker indicating the circuit number and panel.
- f. At wiring devices, 6" tails shall be connected to the devices.
- g. Color code all wires and cables. A different color shall be used for each phase of each voltage system. No. 12 and No. 10 wires shall be provided with insulation color-coding, and No. 8 wire and larger may be coded by color markers. Coordinate coding scheme with Engineer.
- h. Gauge of wire flagged on homeruns shall be extended to all outlet boxes unless otherwise designated.

3.05 SPLICES

- a. Splices in underground distribution systems shall be made only in accessible locations such as manholes and handholes, with a compression connector on the conductor and by insulating and waterproofing by one of the following methods suitable for continuous submersion in water and complying with ANSI C119.1:
 - (1) Provide cast-type splice insulation by means of mold casting process employing a thermosetting epoxy resin insulating material applied by a gravity poured method or by a pressure injected method. Provide component materials of the resin insulation in a packaged form ready for convenient mixing without removing from the package. Do not allow the cables to be moved until after the splicing material has completely set.
 - (2) Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be spliced. When the mold is in place around the joined conductors, prepare the

resin mix and pour into the mold. Do not allow cables to be moved until after the splicing materials have completely set.

- (3) Provide heavy wall heat shrinkable splice insulation by means of a thermoplastic adhesive sealant material which should be applied by a clean burning propane gas torch. Cables may be moved when joint is cool to the touch.
- (4) Provide a cold-shrink rubber splice which consists of EPDM rubber tube which has been factory stretched onto a spiraled core which is removed during splice installation. The installation shall not require heat or flame, or any additional materials such as coverings or adhesive. It shall be designed for use with inline compression type connectors in indoor, outdoor direct-burial or submerged locations.

b. Above grade splices shall be installed as follows:

- (1) Branch circuits AWG #12 to #16, compression type connectors, taped in accordance with Paragraph 3 below.
- (2) Feeder AWG #4 and larger splices and taps shall be installed with appropriate Burndy compression sleeves, pressure connectors, or equal.
- (3) Two layers of Scotchfill electrical putty tape and four layers of Scotch #33 tape shall be applied as a minimum. The thickness of insulation over the splice shall be at least the same as that of the wire insulation.

3.06 BRANCH CIRCUITS

Branch circuits shall be installed in the following manner:

- a. The Contractor in the field may determine the exact installation of branch circuit conduits and home runs to panels.
- b. Minimum conduit size shall be 3/4" and minimum wire size shall be #12 AWG.

3.07 FASTENING AND MOUNTING

Electrical equipment shall be securely fastened in place and be capable of withstanding forces created by wind, earthquakes, or vibrations. Fastening and mounting details shall be developed as necessary by Contractor to ensure a secure attachment.

3.08 ADJUSTING AND CLEANING

- a. Clean dirt and construction debris from equipment and components and clean surfaces to remove dust, fingerprints, smudges and paint splatter. Touch up scratches or defects in the finish with manufacturer-supplied paint. Damage to galvanized finishes or edges of pre-galvanized sheet steel shall be repaired and coated with a zinc-rich cold-galvanizing compound.

- b. Operate breakers and switches through several open-close cycles to ensure that the mechanisms move freely and do not bind.

3.09 TESTING

- a. Testing and inspection of electrical systems and components shall comply with manufacturers' recommendations, NFPA 70B, NETA ATS and applicable ANSI/IEEE standards.
- b. Perform visual inspection of equipment and components for physical damage, proper ratings and proper connections.
- c. Perform insulation resistance testing on underground wiring, feeders entering or leaving switchboards, and transformers using a 1000 Vdc megohmmeter applied for a one-minute interval. Record values of insulation resistance measured.
- d. Perform insulation resistance testing on switchboard, panelboard and MCC busses. Record values of insulation resistance measured.
- e. Equipment busses shall have a minimum insulation resistance of 1 megohm and wiring shall have a minimum insulation resistance of 2 megohms. Equipment and wiring failing to meet these values shall be considered defective.
- f. Perform breaker trip unit setting and testing according to settings furnished by Engineer, for any breakers with adjustable long-time, short-time or ground fault setting capabilities. Testing shall be performed using primary current injection.
- g. Test receptacles for proper polarity and test GFCI receptacles for proper operation under simulated ground-fault conditions using GFCI tester designed for the purpose.
- h. 600 Volt Cable Tests
 - 1. Perform tests after wiring is completed, connected and ready for operation, but prior to placing system in service and before any branch circuit breaker is closed.
 - a. Visual and Mechanical Inspection.
 - (1) Inspect cables for physical damage and proper connection in accordance with contract plans and specifications.
 - (2) Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench. In the absence of manufacturer's data use NETA recommended values.
 - (3) Check cable color coding for compliance with contract specifications.

- b. Electrical Tests

- (4) Perform insulation-resistance test on each conductor with respect to ground and adjacent conductor; applied potential shall be 1000 volts DC for 1 minute; minimum insulation-resistance values shall not be less than 2 megohms.
- (5) Perform continuity test to insure proper cable connection.

- END OF SECTION -

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SECTION 16520

EXTERIOR LIGHTING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO LTS-4 (2006) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C136.21 (2004) Roadway Lighting Equipment - Vertical Tenons Used with Post-Top-Mounted Luminaires

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2007; Errata 2007) National Electrical Safety Code

IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2003) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA ANSLG C78.42 (2007) Standard for High-Pressure Sodium Lamps

NEMA C136.10 (2006) American National Standard for Roadway Lighting Equipment-Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing

NEMA C136.3 (2005) Roadway and Area Lighting Equipment Luminaire Attachments

NEMA C78.1381	(1998) Electric Lamps - 250-Watt, 70 Watt, M85 Metal-Halide Lamps
NEMA C78.43	(2007) Standard for Electric Lamps - Single-Ended Metal-Halide Lamps
NEMA C82.4	(2002) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)
NEMA ICS 2	(2000; Errata 2002; R 2005; Errata 2006) Standard for Industrial Control and Systems: Controllers, Contractors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment
NEMA ICS 6	(1993; R 2006) Standard for Industrial Controls and Systems Enclosures
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 70	(2007) National Electrical Code - 2008 Edition
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)	
Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System
UNDERWRITERS LABORATORIES (UL)	
UL 1029	(1994; Rev thru Dec 2007) Standard for Safety High-Intensity-Discharge Lamp Ballasts
UL 1598	(2004; Rev thru May 2006) Luminaires
UL 773	(1995; Rev thru Mar 2002) Standard for Plug-In Locking Type Photocontrols for Use with Area Lighting
UL 773A	(2006) Nonindustrial Photoelectric Switches for Lighting Control

1.2 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.
- b. Average life is the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.
- c. Groundline section is that portion between one foot above and 2 feet below the groundline.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Luminaire drawings

Poles

SD-03 Product Data

Local/Regional Materials

Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

Environmental Data

Energy Efficiency

Luminaires

Lamps

Ballasts

Lighting contactor

Time switch

Photocell switch

Steel poles

Brackets

Auxiliary instant-on quartz system

SD-04 Samples

Luminaires

Submit one sample of each luminaire type, complete with lamp and ballast. Submit one sample for each item other than luminaires. Sample will be returned to the Contractor for installation in the project work.

SD-05 Design Data

Design Data for luminaires

SD-06 Test Reports

Galvanized steel pole quality

Tests for fiberglass poles

Operating test

Submit operating test results as stated in paragraph entitled "Field Quality Control."

SD-08 Manufacturer's Instructions

Submit instructions prior to installation.

SD-10 Operation and Maintenance Data

Operational Service

Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

1.4 QUALITY ASSURANCE

1.4.1 Drawing Requirements

1.4.1.1 Luminaire Drawings

Include dimensions, effective projected area (EPA), accessories, and installation and construction details. Photometric data, including zonal lumen data, average and minimum ratio, aiming diagram, and computerized candlepower distribution data shall accompany shop drawings.

1.4.1.2 Poles

Include dimensions, wind load determined in accordance with AASHTO LTS-4, pole deflection, pole class, and other applicable information.

1.4.2 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Owner. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.3 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances

and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.3.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.3.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Steel Poles

Do not store poles on ground. Support poles so they are at least one foot above ground level and growing vegetation. Do not remove factory-applied pole wrappings until just before installing pole.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

1.6.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources.

1.6.2 Environmental Data

Submit Table 1 of ASTM E 2129 for the following products: Photocell control.

1.6.3 Energy Efficiency

Comply with National Energy Policy Act and Energy Star requirements for lighting products. Submit documentation for Energy Star qualifications for equipment provided under this section. Submit data indicating lumens per watt efficiency and color rendition index of light source.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.8 POWER SOURCE

Either PG&E service or diesel engine generator.

1.9 OPERATIONAL SERVICE

Coordinate with manufacturer for maintenance agreement take-back program. Collect information from the manufacturer about maintenance agreement green lease options, and submit to Owner. Services shall reclaim materials for recycling and/or reuse. Services shall not landfill or burn reclaimed materials. Indicate procedures for compliance with regulations governing disposal of mercury. When such a service is not available, local recyclers shall be sought after to reclaim the materials.

PART 2 PRODUCTS

2.1 LUMINAIRES

UL 1598. Provide luminaires as indicated. Provide luminaires complete with lamps of number, type, and wattage indicated. Details, shapes, and dimensions are indicative of the general type desired, but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar designs, light distribution and brightness characteristics, and of equal finish and quality will be acceptable as approved.

2.1.1 Lamps

2.1.1.1 High-Pressure Sodium (HPS) Lamps

NEMA ANSLG C78.42. Wattage as indicated. HPS lamps shall have average rated life of 16,000 hours (minimum) for 35 watt lamps and 24,000 hours (minimum) for all higher wattage lamps. 150 watt lamps, if required, shall be 55 volt lamps. Lamps shall have Luminaire Efficiency Ratings (LER) as follows:

- a. Upward efficiency of 0%
 1. 150-399 watts: minimum 58 LER for closed fixture; minimum 68 for open fixture
 2. 400-999 watts: minimum 63 LER for closed fixture; minimum 84 for open fixture
- b. Upward efficiency of 1%-10%
 1. 150-399 watts: minimum 64 LER for closed fixture; minimum 63 for open fixture
 2. 400-999 watts: minimum 82 LER for closed fixture; minimum 89 for open fixture
 3. 1000+ watts: minimum 109 LER for open fixture
- c. Upward efficiency of 11% to 20%
 1. 150-399 watts: minimum 78 LER for open fixture
 2. 400-999 watts: minimum 94 for open fixture
- d. Upward efficiency greater than 20%

1. 150-399 watts: minimum 75 LER for closed fixture; minimum 77 for open fixture

2.1.1.2 Metal-Halide Lamps

Provide luminaires with tempered glass lens.

- a. Double-ended, 70 watt, conforming to NEMA C78.1381
- b. Single-ended, wattage as indicated, conforming to NEMA C78.43

Lamps shall have Luminaire Efficiency Ratings (LER) as follows:

- a. Upward efficiency of 0%

1. --End of Section --

- 150-399 watts: minimum 41 LER for closed fixture
2. 400-999 watts: minimum 53 LER for closed fixture; minimum 59 for open fixture
3. 1000+ watts: minimum 77 LER for closed fixture
- b. Upward efficiency of 1%-10%
 1. 150-399 watts: minimum 56 LER for closed fixture
 2. 400-999 watts: minimum 62 LER for closed fixture; minimum 64 for open fixture
 3. 1000+ watts: minimum 88 LER for open fixture
- c. Upward efficiency greater than 20%
 1. 150-399 watts: minimum 62 LER for closed fixture; minimum 77 for open fixture
 2. 400-999 watts: minimum 65 LER for closed fixture

2.1.2 Ballasts for High-Intensity-Discharge (HID) Luminaires

UL 1029 and NEMA C82.4, and shall be constant wattage autotransformer (CWA) or regulator, high power-factor type (minimum 90%). Provide single-lamp ballasts which shall have a minimum starting temperature of minus 30 degrees C. Ballasts shall be:

- a. Designed to operate on voltage system to which they are connected.
- b. Constructed so that open circuit operation will not reduce the average life.

HID ballasts shall have a solid-state igniter/starter with an average life in the pulsing mode of 10,000 hours at the intended ambient temperature. Igniter case temperature shall not exceed 90 degrees C.

2.2 LIGHTING CONTACTOR

NEMA ICS 2, electrically mechanically held contactor. Contacts shall be rated 208 volts, _____ amperes, and 2 poles. Coils shall be rated 208 volts. Rate contactor as indicated. Provide in NEMA 3R enclosure conforming to NEMA ICS 6. Contactor shall have silver alloy double-break contacts and shall require no arcing contacts. Provide contactor with hand-off-automatic selector switch.

2.3 PHOTOCCELL SWITCH

UL 773 or UL 773A, hermetically sealed cadmium-sulfide or silicon diode type cell rated 208 volts ac, 60 Hz with single-throw contacts for mechanically held contactors rated 1000 watts designed to fail to the ON position. Switch shall turn on at or below 3 footcandles and off at 4 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources. Provide a directional lens in front of the cell to prevent fixed light sources from creating a turnoff condition. Provide switch:

- a. In a high-impact-resistant, noncorroding and nonconductive molded plastic housing with a fixture mounted, locking-type receptacle conforming to NEMA C136.10 and rated 1800 VA, minimum.
- b. In a cast weatherproof aluminum housing with adjustable window slide, rated 1800 VA, minimum.
- c. In a U.V. stabilized polycarbonate housing with swivel arm and adjustable window slide, rated 1800 VA, minimum.
- d. Integral to the luminaire, rated 1000 VA, minimum.

2.4 POLES

Provide poles designed for wind loading of 100 miles per hour determined in accordance with AASHTO LTS-4 while supporting luminaires and all other appurtenances indicated. The effective projected areas of luminaires and appurtenances used in calculations shall be specific for the actual products provided on each pole. Poles shall be anchor-base type designed for use with underground supply conductors. Poles, other than wood poles, shall have oval-shaped handhole having a minimum clear opening of 2.5 by 5 inches. Handhole cover shall be secured by galvanized steel captive screws. Metal poles shall have an internal grounding connection accessible from the handhole near the bottom of each pole. Scratched, stained, chipped, or dented poles shall not be installed.

2.4.1 Steel Poles

AASHTO LTS-4. Provide steel poles having minimum 11-gage steel with minimum yield/strength of 48,000 psi and hot-dipped galvanized in accordance with ASTM A 123/A 123M iron-oxide primed factory finish. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire. Pole shall be anchor bolt mounted type. Poles shall have tapered tubular members, either round in cross section or polygonal. Pole shafts shall be one piece. Poles shall be welded construction with no bolts, rivets, or other means of fastening except as specifically approved. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, and

length. Base covers for steel poles shall be structural quality hot-rolled carbon steel plate having a minimum yield of 36,000 psi.

2.5 BRACKETS AND SUPPORTS

NEMA C136.3, NEMA C136.13, and ANSI C136.21, as applicable. Pole brackets shall be not less than 1 1/4 inch galvanized steel pipe secured to pole. Slip-fitter or pipe-threaded brackets may be used, but brackets shall be coordinated to luminaires provided, and brackets for use with one type of luminaire shall be identical. Brackets for pole-mounted street lights shall correctly position luminaire no lower than mounting height indicated. Mount brackets not less than 24 feet above street. Special mountings or brackets shall be as indicated and shall be of metal which will not promote galvanic reaction with luminaire head.

2.6 POLE FOUNDATIONS

Anchor bolts shall be steel rod having a minimum yield strength of 50,000 psi; the top 12 inches of the rod shall be galvanized in accordance with ASTM A 153/A 153M. Concrete shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

2.7 EQUIPMENT IDENTIFICATION

2.7.1 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.7.2 Labels

Provide labeled luminaires in accordance with UL 1598 requirements. Luminaires shall be clearly marked for operation of specific lamps and ballasts according to proper lamp type. The following lamp characteristics shall be noted in the format "Use Only":

- a. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
- b. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
- c. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
- d. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- e. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

Markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.8 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to IEEE C2, NFPA 70, NEMA, NEC, and NECA's and to the requirements specified herein.

3.1.1 Steel Poles

Provide pole foundations with galvanized steel anchor bolts, threaded at the top end and bent 90 degrees at the bottom end. Provide ornamental covers to match pole and galvanized nuts and washers for anchor bolts. Concrete for anchor bases, polyvinyl chloride (PVC) conduit ells, and ground rods shall be as specified in Section 03300 Cast-In-Place Structural Concrete. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath and the end of conduit ell. Adjust poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location. After installation, paint exposed surfaces of steel poles with two finish coats of exterior oil paint of a color as indicated.

3.1.2 Pole Setting

Depth shall be as indicated. Dig holes large enough to permit the proper use of tampers to the full depth of the hole. Place backfill in the hole in 6 inch maximum layers and thoroughly tamp. Place surplus earth around the pole in a conical shape and pack tightly to drain water away.

3.1.3 Photocell Switch Aiming

Mount switch on top of booth when switch is provided in cast weatherproof aluminum housing with swivel arm. Set adjustable window slide for 3 footcandles photocell turn-on.

3.1.4 GROUNDING

Ground noncurrent-carrying parts of equipment including metal poles, luminaires, mounting arms, brackets, and metallic enclosures. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.1.5 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09965 PAINTING AND COATINGS.

3.2 FIELD QUALITY CONTROL

Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that the equipment operates in accordance with the requirements of this section.

-- End of Section --

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SECTION 16550

SPECIAL PURPOSE LIGHTING AND MISCELLANEOUS EQUIPMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only:

CODE OF FEDERAL REGULATIONS (CFR)

33 CFR Part 66 Private Aids to Navigation

1.2 SYSTEM DESCRIPTION

At each site the navigational aids consist of two components: a line of flashing lights and a number of day visible and lighted signs as shown on the Drawings. There are also to be 2 Electronic LED signs mounted on each Operator's House including a control computer and each Operator's House is to be equipped with one spot light positioned so as to be able to shine on the water on both sides of the gate structures and a hailer horn also mounted on the roof of the building.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

The navigation aids and miscellaneous equipment are to survive the following environmental conditions and have the stated characteristics

1.3.1 Environmental Conditions

1.3.1.1 Wind

Average wind speeds are on the order of 5 to 8 mph and predominately come from the Northwest and West. Winds of up to 80 mph can occur.

1.3.1.2 Exposure

The navigational aids will be mounted outdoors at approximately 4 feet above the high water level. The water at times is brackish. During the summer months there are long periods of sun and 100 plus degrees F temperatures. During the winter there are long periods of overcast and continual rain. The winter temperatures may get down to 20 degrees F.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330 Submittal Procedures:

- a. Arrangement drawings showing the locations of all navigational aids. The drawings shall include a complete list of equipment.
- b. Manufacturer's descriptive and technical literature, operating manuals, catalog cuts, performance charts and curves, and installation instructions.

- c. Shop drawings that show types of frames, mounting brackets, stanchions and other supports utilized. Foundation drawings shall include bolting patterns and bolt tightening procedures.

1.5 WARRANTY

The contractor shall transfer all manufacturers' warranties to owner taking care that the serial numbers on the warranties match the serial numbers on the equipment.

PART 2 PRODUCTS

The navigational aids and miscellaneous equipment supplied shall be as described above and called out below.

2.1 FLASHING LIGHT

The flashing light from all light type navigation aids shall be white, ultra-bright, long life LED's. The lights that flash once every two seconds shall be on for 0.5 second and off for 1.5 seconds. The lights that flash once every six seconds shall be on for 0.5 second and off for 5.5 seconds. All lights of the same flash code shall flash at the same time. The lights shall meet the requirements of U.S. Coast Guard contained in 33 CFR Part 66. Visible range 1 rule.

2.2 POWER SOURCE

The flashing lights shall be battery powered with solar panels to recharge the batteries. The batteries shall have an average life of five years.

2.3 CONTROLS

All of the flashing lights shall have sophisticated electronics, software and microprocessor controls that allow the unit to produce extremely accurate flash character that automatically turns on at dusk and off at dawn while maintaining consistent output performance over all battery voltage levels.

2.4 EXAMPLE

The lights shall be Carmanah Model M702-5 GPS with flash codes 055 and 072, or equal.

2.5 MOUNTING

The contractor shall supply and fabricate all mountings required to position and support the lights and day visible panels as shown on Drawing C66. The flashing light supports shall include a provision for securing the light to the foundation to prevent theft. A bird deterrent will be attached atop each light.

2.6 DAY VISIBLE SIGN PANELS

The day visible panels shall be of the size and shape and color shown on Drawing C66. Panel face shall be of 3M reflectorized sheeting.

2.7 ELECTRONIC LED SIGN

The electronic LED signs shall have one line of text with a minimum of 12-12 inch characters and shall be securely mounted to the roof of the Operator's House as shown on the drawings. Each pair of LED signs will be furnished with a suitable computer capable of accepting provided programming software. The signs shall be properly wired to a permanent power source and to the computer as needed for control purposes. The signs shall be Grandwell PDR0112-12 or approved equal.

2.8 SPOT LIGHT

The spot light shall be remote controlled and mounted on the water-side edge of the Operator's House roof with the remote control accessible from inside the house. The light shall have a minimum of 500,000 cd. and shall be design with a stainless steel case and hardware and tinned marine wire. The light shall be Optronics Model RC-550 or approved equal.

2.9 HAILER HORN

The hailer horns shall be mounted on the roof of the Operator's house and served with a remote hand held microphone located in the House. The hailers shall be Speco Model #SPC-15P/4 Hailer Horn or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

The contractor shall install the lights, miscellaneous equipment and panels as specified and as shown on the drawings. Installation shall be in accordance with the manufacturer's instructions. Complete units or assemblies shall be installed without disassembly.

3.2 PAINTING

All supports and accessory components fabricated by the contractor or not finish coated by the manufacturer, except stainless steel, synthetic rubber and plastic, shall be shop primed and coated as specified in Section 09965 Painting. Chips, scratches, weld burns and other damage to shop-applied painted surfaces shall be repainted in the field.

-- End of Section --