
SECTION 00500

AGREEMENT

THIS AGREEMENT, made this ____ day of _____,
20____ by and between City of Manteca, hereinafter called the "City," and _____
_____ hereinafter
called the "Contractor."

W I T N E S S E T H:

Article 1. WORK

WHEREAS, the City has caused the contract documents to be prepared comprised of bidding and contract requirements and technical specifications and plans for the construction of the Influent Pump Station Rehabilitation Project as described therein, and

WHEREAS, the Contractor has offered to perform the proposed work in accordance with the terms of the contract documents for the sum of \$_____ subject to additions and deductions provided therein.

NOW, THEREFORE, in consideration of the mutual covenants and agreements of the parties herein contained and to be performed, the Contractor hereby agrees to complete the work at the total bid and on the terms and conditions herein contained, and the City agrees to pay the Contractor as provided herein for the fulfillment of the work and the performance of the covenants set forth herein.

The further terms, conditions, and covenants of the Contract are set forth in the contract documents, each of which is by this reference made a part hereof.

Article 2. ENGINEER

The Project has been designed by ICM Group, Inc., who is hereinafter called Engineer and who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the contract documents in connection with completion of the Work in accordance with the contract documents.

Article 3. CONTRACT TIMES

3.1. The Work shall be completed within 150 calendar days for Substantial Completion and 165 calendar days for Final Completion after the date when the contract times commence to run as provided in Paragraph 2.03 of the General Conditions, and ready for final payment in accordance with Paragraph 14.07B of the General Conditions.

- 3.2. Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 3.1. above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$2,000 for each day that expires after the time specified in Paragraph 3.1. for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse or fail to complete the remaining Work within the time specified in Paragraph 3.1. for completion and readiness for final payment or any proper extension thereof granted by Owner, Contractor shall pay Owner \$1,000 for each day that expires after the time specified in Paragraph 3.1. for completion and readiness for final payment.

Article 4. PAYMENT PROCEDURES

Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Construction Manager as provided in the General Conditions.

Article 5. INTEREST

Payment of interest shall be as provided in the General Conditions.

Article 6. CONTRACTOR'S REPRESENTATIONS

In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

- 6.1. Contractor has thoroughly examined and carefully studied the contract documents (including the Addenda listed in Paragraph 8.) and the other related data identified in the Bidding Documents including "technical data."
- 6.2. Contractor has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work.
- 6.3. Contractor is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work.
- 6.4. Contractor has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating

to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02A. of the General Conditions.

Contractor accepts the determination set forth in Paragraph 4.02. of the Supplementary Conditions of the extent of the "technical data" contained in such reports and drawings upon which Contractor is entitled to rely as provided in Paragraph 4.02. of the General Conditions.

Contractor acknowledges that such reports and drawings are not contract documents and may not be complete for Contractor's purposes.

Contractor acknowledges that Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the contract documents with respect to Underground Facilities at or contiguous to the site.

Contractor has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto.

Contractor does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the performance and furnishing of the Work at the Contract Price, within the contract times and in accordance with the other terms and conditions of the contract documents.

- 6.5. Contractor is aware of the general nature of work to be performed by Owner and others at the site that relates to the Work as indicated in the contract documents.
- 6.6. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the site, reports and drawings identified in the contract documents and all additional examinations, investigations, explorations, tests, studies and data with the contract documents.
- 6.7. Contractor has given Owner written notice of all conflicts, errors, ambiguities or discrepancies in the contract documents and the written resolution thereof by Engineer through issued addendum or addenda is acceptable to Contractor, and the contract documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work. When said conflicts, etc., have not been resolved through interpretation or clarification by Owner, because of insufficient time or otherwise, Contractor has included in the Bid the greater quantity or better quality of

Work, or compliance with the more stringent requirement resulting in a greater cost; and said greater cost is included in the Contract Price.

Article 7. CONTRACT DOCUMENTS

The contract documents which comprise the entire agreement between Owner and Contractor concerning the Work consist of the following:

- 7.1. This Agreement.
- 7.2. Exhibits to this Agreement.
- 7.3. Performance, Payment, and other Bonds.
- 7.4. Notice to Proceed.
- 7.5. General Conditions.
- 7.6. Supplementary Conditions.
- 7.7. Specifications bearing the title Woodward Avenue Sewer & Storm Drain Project and consisting of 15 divisions, as listed in table of contents thereof.
- 7.8. Drawings consisting of a cover sheet and sheets numbered 1 through 27.
- 7.9. Addenda numbers _____ to _____, inclusive.
- 7.10. Bid Period Questions and Answers (Enclosure A).
- 7.11. Contractor's Bid (pages _____ to _____, inclusive) marked Exhibit _____.
- 7.12. Documentation submitted by Contractor prior to Notice of Award (pages _____ to _____ inclusive).
- 7.13. The following which may be delivered or issued after the Effective Date of the Agreement and are not attached thereto:
- 7.14. All written amendments and other documents amending, modifying or supplementing the contract documents pursuant to Paragraph 3.04 of the General Conditions.

There are no contract documents other than those listed above in this Article 7. The contract documents may only be amended, modified or supplemented as provided in Paragraph 3.04 of the General Conditions.

Article 8. MISCELLANEOUS

- 8.1. Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 8.2. No assignment by a party hereto of any rights under or interests in the contract documents will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the contract documents.
- 8.3. Owner and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the contract documents.
- 8.4. Any provision or part of the contract documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the contract documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, this agreement has been executed on this ____ day of _____, 20____.

Name of Contractor

CITY OF MANTECA

Signature of Contractor

Willie W. Weatherford, Mayor

Title of Signator

ATTEST

Address

Joann L. Tilton, City Clerk

Phone Number

APPROVED AS TO FORM

Contractor's License No.

John D. Brinton, City Attorney

****END OF SECTION****

SECTION 00610

FAITHFUL PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS, THAT, WHEREAS, City of Manteca, hereinafter designated the "City," has, on _____, 20____, awarded to _____, hereinafter designated as the "Principal," a Contract for the construction of the Influent Pump Station Rehabilitation Project.

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

NOW, THEREFORE, WE, the Principal, and _____, as Surety, are held and firmly bound unto the City the penal sum of _____, dollars (\$_____) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounden Principal, it or its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and faithfully perform the covenants, conditions, and agreements in the said contract and any alterations made as therein provided, on it or their part to be kept and performed, at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless, the City, its officers and agents as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

It is acknowledged that the Contract provides for one-year warranty period, during which time this bond remains in full force and effect.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall, in any way, affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the work or to the specifications. Said Surety hereby waives the provisions of Sections 2819 and 2845 of the Civil Code of the State of California.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this ____ day of ____, 20__, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

(Seal)

Principal

Signature for Principal

Title of Signator

(Seal)

Surety

Signature for Surety

Title of Signator

****END OF SECTION****

SECTION 00620

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS, THAT, WHEREAS, City of Manteca, hereinafter designated as the "City," has, on _____, 20____, awarded to _____, hereinafter designated as the "Principal," a Contract for the construction of the Influent Pump Station Rehabilitation Project, and

WHEREAS, said Principal is required to furnish a bond in connection and with said Contract, providing that if said Principal, or any of it or its subcontractors shall fail to pay for any materials, provisions, or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, the Surety of this bond will pay the same to the extent hereinafter set forth:

NOW, THEREFORE, we, the Principal, and _____, as Surety, are held and firmly bound unto the City the penal sum of _____ Dollars (\$ _____) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal, it or its heirs, executors, administrators, successors, or assigns, shall fail to pay for any materials, provisions, or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind or for amount due under the Unemployment Insurance Act with respect to such work or labor, or for any amounts due, or to be withheld pursuant to Sections 18806 of the Revenue and Taxation Code of the State of California with respect to such work or labor, then said surety will pay the same in or to an amount not exceeding the amount hereinabove set forth, and also will pay in case suit is brought upon this bond, such reasonable attorney's fees to the City as shall be fixed by the court.

This bond shall insure to the benefit of any and all persons, companies, and corporations named in Section 3181 of the Civil Code of the State of California so as to give a right of action to them or their assigns in any suit brought upon this bond.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition of 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 of this bond, and it does hereby waive notice of any change, extension of time, alteration, or addition to the terms of the contract or to the work or to the specifications. Said Surety hereby waives the provisions of Sections 2819 and 2845 of the Civil Code of the State of California.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this _____ day of _____, 200__, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Principal

(Seal)

Signature for Principal Title

Surety

(Seal)

Signature for Surety Title

*** END OF SECTION ***

SECTION 00630

WARRANTY BOND

Whereas, the City Council of the City of Manteca, State of California, and

(hereinafter designated as “Contractor”) have entered into a Contract whereby Contractor agrees to repair any improvements set forth in said Contract identified as the Influent Pump Station Rehabilitation Project and awarded by Resolution to Contractor on _____, 20____, is hereby referred to and made a part hereof, and

Whereas, the Contractor is required under the terms of said Contract to furnish a one year bond starting at Final Completion for the Warranty of Improvements of said Contract.

Now, therefore, we, the Contractor and _____ as surety, are held and firmly bound unto the City of Manteca, hereinafter called “City” in the penal sum of _____ dollars (\$_____) lawful money of the United States, for the payment of which sum well and truly to be made, we bond ourselves, our heirs, successors, executors and administrators, jointly and severally, firmly by these presents.

The condition of this obligation is such that if the above bounded Contractor, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and provisions in the said Contract and any alteration thereof made as therein provided, on his or their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the City of Manteca, its officers, agents and employees, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees, including reasonable attorney’s fees, incurred by City in successfully enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

In witness whereof, this instrument has been duly executed by the Contractor and surety above named, on _____, 20____.

Name of Contractor

Name of Surety

Address

Address and Telephone

Signature of Contractor

Signature of Surety

APPROVED AS TO FORM:

APPROVED AS TO SUFFICIENCY:

John D. Brinton, City Attorney

Director of Public Works

Attach Notary Form Here

*** END OF SECTION ***

SECTION 00650

WORKERS' COMPENSATION INSURANCE CERTIFICATE

In accordance with California Labor Code Section 1861, prior to commencement of work on the Contract, the Contractor shall sign and file with the District the following certification:

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

Signature

Name of Contractor

Title

Date

****END OF SECTION****

**STANDARD
GENERAL CONDITIONS
OF THE
CONSTRUCTION CONTRACT**

CITY OF MANTECA

These General Conditions are based in part on
EJCDC C-700 (2002 Copyrighted Edition)

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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in these General Conditions or in other Contract Documents, the terms listed below have the meanings indicated which are applicable to both the singular and plural thereof. Said terms are generally capitalized or written in italics, but not always. When used in a context consistent with the definition of a listed-defined term, the term shall have a meaning as defined below whether capitalized or italicized or otherwise.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids, which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*--The form acceptable to Construction Manager which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*--The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*--A document recommended by Construction Manager which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*-- Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*--The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Construction Manager's written recommendation of final payment.

15. *Contractor*--The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*--See Paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*--The individual or entity named as such in the Agreement.

20. *Field Order*--A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

22. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

23. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*--The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*--A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*--The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*--Polychlorinated biphenyls.

31. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*--A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Related Entity* -- An officer, director, partner, employee, agent, consultant, or subcontractor.

37. *Resident Project Representative*--The authorized representative of Construction Manager who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Schedule of Submittals*--A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

40. *Schedule of Values*--A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

41. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

42. *Site*--Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

43. *Specifications*--That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

44. *Subcontractor*--An individual or entity having a direct contract with Contractor or with any other

Subcontractor for the performance of a part of the Work at the Site.

45. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Construction Manager, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be safely and conveniently utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

46. *Successful Bidder*--The Bidder submitting a responsive Bid to whom Owner makes an award.

47. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

48. *Supplier*--A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. *Unit Price Work*--Work to be paid for on the basis of unit prices.

51. *Work*--The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

52. *Work Change Directive*--A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Construction Manager ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

53. *Construction Manager*--The individual or entity retained by the Owner to perform construction quality assurance and contract administration functions not involving reviews and interpretations with respect to design intent. The Construction Manager is a representative of the City, either an employee or consultant, employed to act as advisor to the City in construction matters related to the Contract.

1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. Intent of Certain Terms or Adjectives

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer or Construction Manager. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer or Construction Manager as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer or Construction Manager any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. Day

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents, or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or

c. has been damaged prior to --Construction Manager's recommendation of final payment (unless responsibility for the protection thereof has been assumed

by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. Furnish, Install, Perform, Provide, Supply

1. The word "Furnish" or the word "Install" or the word "Perform" or the word "Provide" or the word "Supply," or any combination or similar directive or usage thereof, shall mean FURNISHING AND INCORPORATING IN THE WORK including all necessary labor, materials, equipment, and everything necessary to perform the Work indicated, unless specifically limited in the context used.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 Copies of Documents

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement.

2.04 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 Before Starting Construction

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Construction Manager for timely review:

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 Preconstruction Conference

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Construction Manager and Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 Initial Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Construction Manager, and others as appropriate will be held to review for acceptability to Construction Manager as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Construction Manager if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Construction Manager responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the

Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Construction Manager and Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Construction Manager as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations with respect to the design intent of the Contract Documents shall be issued by Engineer through the Construction Manager, and clarifications and interpretations with respect to administrative matters shall be issued by the Construction Manager as provided in Article 9.

D. The Specifications may vary in form, format and style. Some specification sections are written in varying degrees of streamlined or declarative style and some sections may be relatively narrative by comparison. Omissions of such words and phrases as "the Contractor shall," "in conformity with," "as shown," or "as specified" are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the section. The Contractor shall not take advantage of any variation of form, format or style in making claims for extra Work.

E. The cross referencing of specification sections under the subparagraph heading "Related Sections include but are not necessarily limited to:" and elsewhere within each specification section is provided as an aid and convenience to the Contractor. The Contractor shall not rely on the cross referencing provided and shall be responsible to coordinate the entire work under the Contract Documents and provide a complete Project

whether or not the cross referencing is provided in each section or whether or not the cross referencing is complete.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, Engineer or Construction Manager, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer or Construction Manager, or any of their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Construction Manager any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer through Construction Manager before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Construction Manager in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to

the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner, Construction Manager or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

- a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Amending and Supplementing Contract Documents

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification of matters of design intent issued through the Construction Manager, and Construction Managers written interpretation or clarification of administrative matters.

3.05 Reuse of Documents

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other

documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adoption by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 Electronic Data

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or

extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

1. Where easement lines are shown on the Contract Drawings they shall be considered as shown in their final location unless stipulated otherwise in the Supplementary Conditions.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Construction Manager in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Construction Manager's and Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Construction Manager will promptly review the pertinent condition with Engineer as appropriate, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor and Engineer) of Construction Manager's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner, Engineer and Construction Manager, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

3. Pursuant to Government Code Section 4216-4216.9, the Contractor shall notify the appropriate regional notification center of all excavations as required under Government Code sections 4216 to 4216.9. The Contractor shall contact Underground Service Alert at 1-800-642-2444 for the location of subsurface installations. Contractor shall furnish to the Construction Manager written documentation of its contact(s) with Underground Service Alert within two (2) days after such contact(s).

4. At least two (2) days before performing any excavation work, the Contractor shall request the utility owners to mark or otherwise indicate the location of their service. Contractor shall furnish to the Construction Manager written documentation of its contact(s) with utility owners requesting them to mark or otherwise indicate the location of their respective facilities within three (3) days after such contact(s).

5. It shall be the Contractor's responsibility to determine the exact location and depth of all utilities, including service connections, which have been marked by the respective owners and which Contractor believes may affect or be affected by Contractor's operations. If no pay item is provided in the Contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.

B. Not Shown or Indicated

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Construction Manager. Construction Manager will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Construction Manager concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or

not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05. In accordance with Government Code Section 4215 the Contractor shall not be assessed liquidated damages for delay in completion of the project, when such delay is caused by the failure of the Owner or utility company to provide for the removal or relocation of facilities for which they are the responsible party

3. When the General Requirements, Specifications, or Construction Drawings indicate that a utility is to be relocated, altered or constructed by others, the City will conduct all negotiations with the utility company and the work will be done at no cost to the Contractor.

4. Temporary or permanent service, relocation or alteration of utilities desired by the Contractor for its own convenience shall be the Contractor's responsibility and it shall make arrangements and bear all costs.

5. Except where the owner of a damaged utility has advised that it intends to repair the damage through its own forces or forces that it will retain or has retained, Contractor shall, within 24 hours of receipt from the Owner of notice to commence correction of damage, notify the Construction Manager in writing if Contractor intends to repair the damage. During nights and weekends when work is not in progress, Owner may give such notice by telephone or by facsimile transmission to the Contractor's facsimile number and such notice will be immediately effective. The Contractor's failure to provide timely written notification that it intends to repair the damage shall be deemed its agreement that the Owner may repair the damage at Contractor's expense without further notice and without prejudice to any other remedy available to Owner. In such event, the Contractor may observe the Work if this can be done without in any way delaying the progress thereof, but may not contest any element of the expense of repair or the lack of further notice. This provision is in addition to any other remedy, including the remedy provided in 13.09, Owner May Correct Defective Work

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Construction Manager's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Construction Manager whenever any reference point or property monument is lost or destroyed or requires

relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by licensed land surveyor registered in the state of California.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Construction Manager (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Construction Manager concerning the necessity for Owner to retain a qualified

expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, Engineer and Construction Manager, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Engineer and Construction Manager, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous

Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

5.04 *Contractor's Liability Insurance*

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

- a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

- b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (subject to any customary exclusion regarding professional liability) Owner, Engineer and Construction Manager, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Contract Documents or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

- a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

8. With respect to all insurance required by this paragraph 5.04., Contractor agrees to waive all rights of subrogation against Owner, Engineer and Construction Manager, and each additional insured identified in the Supplemental Conditions.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, Engineer and Construction Manager, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, explosion, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, (other than caused by flood) and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, Engineer and Construction Manager with 30 days written notice to each other additional insured.

B. Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, Engineer and Construction Manager, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, Engineer and Construction Manager, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them

for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, Engineer and Construction Manager, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, Engineer and Construction Manager, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, Engineer or Construction Manager, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

1. All insurance required by the Contract Documents, or by laws or regulations shall remain in full force and effect on all phases of the Work, whether or not the Work is occupied or utilized by Owner, until all Work included in the agreement has been completed and final payment has been made.

2. Nothing contained in the insurance requirements shall be construed as limiting the extent of Contractor's responsibility for payment of damages resulting from Contractor's, subcontractors' or suppliers' operations under the Contract. Contractor agrees that Contractor alone shall be completely responsible for procuring and maintaining full insurance coverage as provided herein or as may be otherwise required by the Contract Documents. Any approval by Owner or Construction Manager shall not operate to the contrary.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. Means or methods of work suggested by the Owner, the Construction Manager, or the Engineer to the Contractor, but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor. The Owner, Construction Manager, or the Engineer assume no responsibility therefor, and in no way will be held liable for any defects in the Work which may result from or be caused by use of such plan or method of Work.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Construction Manager except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. In the absence of any Federal, state or local laws, regulations or covenants, the Contractor may conduct its performance of the Work at the Contractor's sole discretion, except that the cost of any overtime pay or other expense incurred by the Owner for Resident Project

Representative, Owner's Representative and construction observation services, occasioned by the conduct of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day, shall be reimbursed to the Owner by the Contractor. Contractor shall provide to Construction Manager 72-hour written notice of intent to work outside of regular working hours.

C. Prevailing Wage

1. In accordance with Section 1770 of the Labor Code, the City has ascertained and does hereby specify that the prevailing wage rates shall be those provided in Article 00100-22.00, WAGE RATES. The said rates shall include all employer payments that are required by Section 1773.1 of the Labor Code. The City will furnish to the Contractor, upon request, a copy of such prevailing rates. It shall be the duty of the Contractor to post a copy of such prevailing wages at the job site.

2. For each worker paid less than the stipulated rate in the execution of the Contract by the Contractor, or any subcontractor under it, in violation of the provisions of the Labor Code, and in particular, Section 1770 to Section 1780, inclusive, the Contractor shall be subject to the provisions and penalties of Section 1775 of the Labor Code. In addition to said penalty, and pursuant to said Section 1775, the difference between such stipulated prevailing wage rates and the amounts paid to each worker for each calendar day, or portion thereof, for which each worker was paid less than the stipulated prevailing rate shall be paid to each worker by the Contractor.

3. The wage rates set forth are the minimum that may be paid by the Contractor. Nothing herein contained shall be construed as preventing the Contractor from paying more than the minimum set forth.

4. No extra compensation whatever shall be allowed by the City due to the inability of the Contractor to hire labor at the minimum rate nor for any necessity for payment by the Contractor for subsistence, travel time, overtime, or other added compensation, all of which possibilities are elements to be considered and ascertained to the Contractor's own satisfaction in preparing the bid.

5. If it becomes necessary to employ a craft other than those listed in the prevailing rates, the Contractor shall notify the City immediately and the City will obtain the additional prevailing rate from the Director of the Department of Industrial Relations and the rate thus determined shall be applicable as a minimum at the time of initial employment.

6. The Contractor shall pay travel and subsistence payments to workers needed to execute the work as such travel and subsistence payments are defined in the applicable collective bargaining agreement filed with the Department of Industrial Relations pursuant to Labor Code Section 1773.8.

7. City and Contractor stipulate that Labor Code Section 1775 will be complied with.

8. The City will consider the type of work performed by classification traditionally employed to perform said work in San Joaquin County when determining appropriate craft, classification or type of worker under Section 1733.2 of the California Labor Code.

9. The City has determined that all installation of mechanical, pressure and/or process piping; soil, waste and vent piping, potable and non-potable piping shall be paid at the prevailing wage for a Plumber and/or Pipefitter.

10. Certified Payrolls - In accordance with Section 1776 of the Labor Code, each Contractor and subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor or the subcontractor in connection with the project.

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

12. A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or its authorized representative on request.

13. A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of the City, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.

14. A certified copy of all payroll records shall be made available upon request by the public in accordance with Section 1776 of the Labor Code.

15. The Contractor is responsible for its and its subcontractors' compliance with the provisions of Section 1776 of the Labor Code.

16. Overtime Requirements - The Contractor shall forfeit, as a penalty to the City, the penalty as provided in Section 1813 of the Labor Code for each worker employed in the execution of the Contract by the Contractor, or any subcontractor under the Contractor, for each day during which such worker is required or permitted to work more than eight (8) hours in any one day and forty (40) hours in any one week, in violation of the provisions of the Labor Code, and in particular, Section 1810 to Section 1815 thereof, inclusive, except that work performed by employees of Contractors in

excess of eight (8) hours a day and forty (40) hours during one week, shall be permitted upon compensation for all hours worked in excess of eight (8) hours per day, at not less than one and a half (1.5) times the basic rate of pay as provided for in Section 1815 of the Labor Code.

17. Apprentice and Trainee - Attention is directed to the provisions in Section 1777.5 of the Labor Code and in accordance with the regulations of the California Apprenticeship Council concerning the employment of apprentices by the Contractor or any subcontractor under the Contractor.

18. Section 1777.5 requires the Contractor or subcontractors employing tradespersons in any apprenticeable occupation to apply to the joint apprenticeship committee nearest the site of the project that administers the apprenticeship program in that trade for a certificate of approval. The Contractor and subcontractors are required to submit contract award information to the applicable joint apprenticeship committee. As provided for in Section 1777.5 of the Labor Code, the Contractor is required to make contributions to funds established for the administration of apprenticeship programs.

19. It shall be the responsibility of the Contractor to abide by the provisions of Section 1777.5 of the Labor Code and to require all subcontractors employed by or contracting with the Contractor to abide by said provisions. The Contractor shall furnish the City any and all evidence of compliance with this code section when requested by the City.

20. For failure to comply with Section 1777.5 of the Labor Code, the Contractor shall be subject to the penalties in Section 1777.7 of the Labor Code. The provisions of this paragraph apply only to the extent not preempted by Federal law.

21. Workers' Compensation Insurance - The Contractor is required to secure the payment of compensation to its employees in accordance with the provisions of Sections 1860 and 3700 of the Labor Code and Paragraph 00820-2.40, Workers' Compensation Insurance.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

1. Where the Work requires equipment be furnished, due to the lack of standardization of equipment as produced by the various manufacturers, it may become necessary to make minor modifications in the structures,

buildings, piping, mechanical work, electrical work, accessories, controls, or other work, to accommodate the particular equipment offered. Contractor's bid price for any equipment offered shall include the cost of making any necessary changes subject to the approval of Construction Manager.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer or Construction Manager, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

1. Materials and equipment, if furnished by the Owner, will be made available as designated in the General Requirements. The cost of unloading, hauling and handling, and placing Owner-furnished materials and equipment shall be considered as included in the price bid for the Contract item involving such Owner-furnished material.

2. Contractor shall inspect and assure itself of the amount and soundness of such materials and equipment.

3. The Contractor will be held responsible for all materials and equipment furnished to it and received by it, and shall pay all demurrage and storage charges. City-furnished materials and equipment lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the Owner for the cost of replacing Owner-furnished material and equipment and such costs may be deducted from any moneys due or to become due the Contractor.

D. All items of standard equipment shall be the latest model at the time of bid, unless otherwise specified.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Construction Manager for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Construction Manager from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Construction Manager for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer's Cost Reimbursement: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

Others

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner, Engineer, and Construction Manager for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner, Engineer or Construction Manager and any such Subcontractor, Supplier or other individual or entity, nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or

furnishing any of the Work to communicate with Construction Manager and Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner, Construction Manager and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Construction Manager and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 Patent Fees and Royalties

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Construction Manager and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process,

product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner, Construction Manager nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Construction Manager and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. Removal of Debris During Performance of the Work: During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. Cleaning: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. Loading Structures: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction.

These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Construction Manager for reference, and shall be current at the time of Contractor's submission of Application for Payment as a condition precedent for Construction Manager's recommendation of payment. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Construction Manager for Owner. Contractor shall include accurate locations for buried and imbedded items.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

1. At least two (2) days before performing any excavation work or other work that could damage existing improvements within, or adjacent to, the Work area, the Contractor shall notify the owners of properties adjacent to the Work area of intended commencement of such Work and request that such owners mark or otherwise indicate the location of underground improvements of which they are aware or other improvements not readily apparent from visual inspection of the adjacent property, such as survey points and utility service installations not owned by the appropriate utility. The Contractor shall also give two (2) days notice to occupants or owners of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers, and other improvements within the right-of-way that are designated for removal or would be destroyed because of the Work. Contractor shall furnish to the Construction Manager written

documentation of its contact(s) with property owners (1) requesting them to mark or otherwise indicate the location of their respective facilities, and (2) notifying them to salvage or relocate landscaping or improvements within or adjacent to the Work area within two (2) days after such contact(s).

2. It shall be the Contractor's responsibility to determine the exact location (including depth for underground improvements) and to document the existing condition of all existing improvements which are not designated for removal (e.g., curbs, sidewalks, survey points, fences, walls, signs, utility installations, pavements, structures, etc.) which the Contractor believes may affect or be affected by Contractor's operations.

3. In the event that existing improvements are found that have not been identified in the Contract Documents or indicated by the respective property owner, or are found to exist in a substantially different location than so indicated, the Contractor shall (1) immediately notify the Construction Manager thereof in writing, and (2) take steps to avoid damaging such improvements, including ascertaining their exact location if not yet known.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner, Construction Manager or Engineer, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

1. The Contractor shall immediately notify the Construction Manager and the property owner of any damage to any existing improvements that have not been designated to be removed. The Contractor shall be responsible for the cost of repairing or restoring all existing improvements which are not designated for removal (e.g., curbs, sidewalks, survey points, fences, walls, signs, utility installations, pavements, structures, etc.) and are damaged or removed as a result of its operations. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.

2. The Contractor shall protect from damage all landscaping (e.g., trees, lawns, shrubbery, etc.) adjacent to the Work area or within the Work area that have not been designated to be removed. The Contractor shall immediately notify the Construction Manager and the property owner of any damage to any such landscaping which is not designated for removal. The Contractor shall

be responsible for the cost of restoring or replacing such landscaping in as nearly the original conditions and location as it is reasonably possible. Lawns shall be re-seeded and covered with suitable mulch.

3. Except where an owner of damaged improvements or landscaping has advised that he or she intends to repair the damage himself or through forces that he or she will retain or has retained, Contractor shall, within 24 hours of receipt from the Owner of notice to commence correction of damage, notify the Construction Manager in writing if Contractor intends to repair the damage. During nights and weekends when work is not in progress, Owner may give such notice by telephone or by facsimile transmission to the Contractor's facsimile number designated and such notice will be immediately effective. The Contractor's failure to provide timely written notification that it intends to repair the damage shall be deemed its agreement that the Owner may repair the damage at Contractor's expense without further notice and without prejudice to any other remedy available to City. In such event, the Contractor may observe the Work if this can be done without in any way delaying the progress thereof, but may not contest any element of the expense of repair or the lack of further notice. This provision is in addition to any other remedy, including the remedy provided in 13.09, Owner May Correct Defective Work

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Construction Manager has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

E. The Contractor shall establish, implement, and maintain a Written injury prevention program as required by Labor Code Section 6401.7. This written program shall be submitted to the Construction Manager within five (5) days of Notice to Proceed. The Contractor's injury prevention program will not be reviewed for approval. Before proceeding with any construction work, the Contractor shall take the necessary action to comply with all provisions for safety and accident prevention. The Contractor shall develop and maintain for the duration of this Contract, a safety program that will effectively incorporate and implement all required safety provisions. The Contractor shall appoint an employee as safety supervisor who is qualified and authorized to supervise and enforce compliance with the safety program. The Contractor, as a part of its safety program, shall maintain at its office or other well-known place at the Site, safety equipment applicable to the Work as prescribed by the aforementioned authorities, all items necessary for giving first aid to the injured, and shall establish the procedure for the immediate removal to a hospital or a doctor's care of persons who may be injured on the jobsite.

1. In accordance with the provisions of Section 6705 of the Labor Code, the Contractor shall submit, in

advance of excavation 5 feet or more in depth, detailed plans showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during such excavation. If such plans vary from the shoring system standards set forth in the Construction Safety Orders in Title 8, California Code of Regulations, the plans shall be prepared and signed by a registered civil or structural engineer. Shoring, bracing, sloping, or other protective system shall not be less effective than required by the California Construction Safety orders. The Contractor shall designate in writing to the Construction Manager the "competent person" with the authority and responsibilities designated in the Construction Safety Orders.

2. If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Construction Manager and the City. In addition, the Contractor must promptly report in writing to the Construction Manager all accidents whatsoever arising out of, or in connection with, the performance of the Work whether on, or adjacent to, the Site, giving full details and statements of witnesses. The Contractor shall make all reports as are, or may be, required by any authority having jurisdiction, and permit all safety inspections of the work being performed under this Contract.

3. If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Construction Manager, giving full details of the claim.

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Construction Manager prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in

response to such an emergency, a Work Change Directive or Change Order will be issued.

B. If Contractor fails to take appropriate action in an emergency, the Owner also reserves the right to perform any portion of the work that threatens the safety or health of the public or Owner, and the safety of the work or any property or equipment. In the event the Owner performs work in an emergency, an appropriate Change Order shall be issued unilaterally deducting from the payments then or thereafter due the Contractor the cost for performing such Work, including compensation for the Engineer's, the Construction Manager's, and City's additional services made necessary by such emergency

6.17 *Shop Drawings and Samples*

A. Contractor shall submit required Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. Shop Drawings

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

c. Shop Drawings submitted as herein provided by Contractor and reviewed by Engineer for conformance with the design concept shall be executed in conformity with the Contract Documents unless otherwise required by Owner.

d. When Shop Drawings are submitted for the purpose of showing the installation in greater detail, their review shall not excuse Contractor from requirements shown on the drawings and Specifications.

e. For-Information-Only submittals upon which the Engineer is not expected to conduct review or take responsive action may be so identified in the Contract Documents.

2. *Samples*: Contractor shall also submit required Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation; otherwise Contractor will not be relieved of the responsibility of executing the Work in accordance with the Contract Documents, even though such Shop Drawings or Samples have been otherwise reviewed.

a. If a Shop Drawing or Sample, as submitted, indicates a variation from the Contract Requirements as set forth in the Contract Documents and Engineer finds same to be in the interest of Owner and to be so minor as not to involve a change in the Contract Price or time for performance, Engineer may approve the Shop Drawings or Samples; provided however, such departure is slight in nature and does not affect the design concept of the Work.

4. Contractor shall submit all Shop Drawings and Samples sufficiently in advance of construction requirements to allow ample time for checking, correcting, resubmitting and rechecking and to avoid any delay in progress of the Work.

5. Shop Drawings and Sample submittals not conforming to requirements of this paragraph 6.17D and Section 01340 will be returned to Contractor without action for resubmittal and the resulting delay shall be entirely the responsibility of Contractor.

D. Engineer's Review

1. Engineer will provide timely review of required Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

4. Engineer's check and review of Shop Drawings and Samples, Standard Specifications and descriptive literature submitted by Contractor will be only for general conformance with design concept, except as otherwise provided, and shall not be construed as:

a. permitting any departure from the Contract Requirements;

b. relieving Contractor of the responsibility for any error in details, dimensions or otherwise that may exist in such submittals;

c. constituting a blanket approval of dimensions, quantities, or details of the material or equipment shown; or

d. approving departures from additional details or instructions previously furnished by Engineer. Such check or review shall not relieve Contractor of the full responsibility of meeting all of the requirements of the Contract Documents.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Construction Manager and Engineer, and their Related Entities, shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Construction Manager and Engineer;

2. recommendation by Construction Manager or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Construction Manager or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 Indemnification

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Construction Manager and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Construction Manager and Engineer and their respective officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 Delegation of Professional Design Services

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the permanent Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to permanent systems, materials or equipment incorporated into the Work are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 - OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Construction Manager and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such

other work and promptly report to Construction Manager in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Construction Manager.

8.02 *Replacement of Construction Manager or Engineer*

A. In case of termination of the employment of either Construction Manager or Engineer, Owner shall appoint a Construction Manager or engineer to whom Contractor makes no reasonable objection, whose status under the

Contract Documents shall be that of the former Construction Manager or Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance*

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 – CONSTRUCTION MANAGER'S AND ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Construction Manager and Engineer will be Owner's representatives during the construction period. The duties and responsibilities and the limitations of authority of Construction Manager and Engineer as Owner's representatives during construction are set forth in the Contract Documents and will not be changed without written consent of Owner, Construction Manager and Engineer.

9.02 *Visits to Site*

A. Engineer may make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will endeavor to guard Owner against defective Work.

B. Construction Manager will make visits to the Site at intervals appropriate to the various stages of construction as Construction Manager deems necessary in order to observe the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Construction Manager, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Construction Manager will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Construction Manager's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Construction Manager will keep Owner informed of the progress of the

Work, and will endeavor to guard Owner against defective Work.

C. Engineer's and Construction Manager's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Construction Manager's Project Representative*

A. If Owner and Construction Manager agree, Construction Manager will furnish a Resident Project Representative to assist Construction Manager in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Construction Manager's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

B. Construction Manager's Resident Project Representative shall not authorize any deviation from the Contract Documents or substitutions of materials or equipment.

9.04 *Authorized Variations in Work*

A. Construction Manager or Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Construction Manager will have authority to reject Work which Construction Manager or Engineer believes to be defective, or that Construction Manager or Engineer believes will not produce a completed Project that

conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Construction Manager will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

B. The acceptance at any time of materials or equipment by or on behalf of Owner shall not be a bar to future rejection if they are subsequently found to be defective, inferior in quality, or not equal to the material or equipment specified, or are not as represented to Construction Manager, Engineer or Owner.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Construction Manager's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Construction Manager will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Construction Manager will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Construction Manager's written decision thereon will be final and binding (except as modified by Construction Manager to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents with respect to matters of design intent. Construction Manager will be the initial interpreter of the requirements of the Contract Documents with respect to administrative matters and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Construction Manager in

writing within 30 days of the event giving rise to the question.

B. Construction Manager or Engineer through Construction Manager will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Construction Manager's or Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Construction Manager's or Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Construction Manager and Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 Limitations on Construction Manager's and Engineer's Authority and Responsibilities

A. Neither Construction Manager's and Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Construction Manager or Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Construction Manager or Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Construction Manager or Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Construction Manager and Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Construction Manager and Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Construction Manager and Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Construction Manager's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be

delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

1. Change Proposal Request

a. When Owner requests Contractor to present a proposal to accomplish a change in the Work, the request will be made in the form of a Change Proposal Request (CPR) prepared by Construction Manager. The CPR will describe the change and request Contractor to propose a cost and Contract Price and/or Contract Time change. Contractor will propose cost and/or time changes, if any, sign the CPR and return it to Construction Manager. If requested by Owner or Construction Manager, Contractor shall provide an itemized breakdown of the cost of the change. Construction Manager will make recommendations to Owner concerning acceptance. If the CPR is approved by Owner, the CPR will be included in a Change Order. Contractor is not authorized to proceed with a change contained in a CPR until the Change Order is properly signed and issued.

b. When the Contractor desires to propose changes to the Work, it may initiate a CPR in the same form as provided in Paragraph 10.01A.1.a. and submit the CPR to the Construction Manager for the Engineer's review and recommendation.

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Construction Manager covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Construction Manager or by Engineer through Construction Manager pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Construction Manager's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Construction Manager for decision. A decision by Construction Manager shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Construction Manager and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Construction Manager and the other party to the Contract within 60 days after the start of such event (unless Construction Manager allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Construction Manager and the claimant within 30 days after receipt of the claimant's last submittal (unless Construction Manager allows additional time).

C. *Construction Manager's Action:* Construction Manager will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the parties that the Construction Manager is unable to resolve the Claim if, in the Construction Manager's sole discretion, it would be inappropriate for the Construction Manager to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Construction Manager does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Construction Manager's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. Costs Included: The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work, or the reasonable cost that would have been incurred in the case of deleted Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, training, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above. For Change Order pricing, the Labor Surcharge (social security contributions, unemployment excise, and payroll taxes) shall be 27 percent of the sum of the wages, vacation, and fringe benefits (workers' compensation, training, health and retirement benefits, sick leave, bonuses, and holiday pay).

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Construction Manager, which bids, if any, will be acceptable. If any subcontract

provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Construction Manager, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such

losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain. For Change Order pricing, bonds and insurance shall be 1 percent of the Change Order value for both additive and credit changes that are above the original Contract value and 0 percent of the Change Order value for both additive and credit changes that are below the original Contract value.

B. Costs Excluded: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. Contractor's Fee: When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Construction Manager an itemized cost breakdown together with supporting data.

11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Construction Manager.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Construction Manager to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times

the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Construction Manager subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item. Work described in the Contract Documents, or reasonably inferred as required for a functionally complete installation, but not identified in the listing of unit price items shall be considered incidental to unit price work listed and the cost of incidental work included as a part of the unit price.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the total cost of a particular item of Unit Price Work amounts to 10 percent or more of the Contract Price at time of Notice of Award and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and if there is no corresponding adjustment with respect to any other item of Work; and if Contractor believes that Contractor has incurred additional expense as a result thereof; or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, either Owner or Contractor may make a claim for an adjustment in the Contract Price in accordance with Article 11 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party

making the Claim to the Construction Manager and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum including overhead and profit not necessarily in accordance with Paragraph 12.01.C.2, and shall include the cost of any secondary impacts that are foreseeable at the time of pricing the cost of extra Work; or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (either by estimate before the work is performed or force account) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

- a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

- b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

- c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

- d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the reasonable cost that would have been incurred to perform the Work plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Construction Manager and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

C. No extension of the Contract Time will be allowed for additional Work or for claimed delay unless the additional Work contemplated or claimed delay is shown to be on the critical path of the Project's schedule of construction or Contractor can show by Critical Path Method analysis how the additional Work or claimed delay adversely affects the critical path.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Construction Manager, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be in accordance with Paragraph 12.02 C., and shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Construction Manager, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Construction Manager, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Construction Manager timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Construction Manager's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Construction Manager.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Construction Manager, it must, if requested by Construction Manager, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Construction Manager timely notice of Contractor's intention to cover the same and Construction Manager has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Construction Manager, it must, if requested by Construction Manager, be uncovered for Construction Manager's observation and replaced at Contractor's expense.

B. If Construction Manager considers it necessary or advisable that covered Work be observed by Construction Manager or inspected or tested by others, Contractor, at Construction Manager's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Construction Manager may require, that portion

of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); or Owner shall be entitled to accept defective Work in accordance paragraph 13.08 in which case Contractor shall still be responsible for all costs associated with exposing, observing, and testing the defective Work. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Construction Manager, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair

Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
2. correct such defective Work; or
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed

as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If (prior to Construction Manager's recommendation of final payment), instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Construction Manager as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Construction Manager's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Construction Manager to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, Construction Manager and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or

sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Construction Manager. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Construction Manager for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. Retention - The Owner will deduct from each progress payment and retain as part security, ten (10) percent of the amount earned until the final payment.

4. Pursuant to Public Contract Code Section 22300, for moneys earned by the Contractor and withheld by the Owner to ensure the performance of the Contract, the Contractor, may, at their option, choose to substitute securities meeting the requirements of said Section 22300. In the event the Contractor wishes to choose this option, the Contractor shall enter into an escrow agreement with the Owner and the escrow agent, a qualified bank to be acceptable to the Owner, in the form of the agreement included in the project specifications. The costs of such escrow shall be paid by the Contractor. The securities to be deposited in said escrow account shall be equivalent, in fair market value, to the amount to be withheld as performance retention. The securities shall be held in accordance with the provisions of Public Contract Code Section 22300, and the implementing agreement.

5. Contractor shall have the obligation of ensuring that such securities deposited are sufficient so as to maintain, in total fair market value, an amount equal to the cash amount of the sums to be withheld under the Contract. If, upon written notice from the Owner, or from the appropriate escrow agent, indicating that the fair market value of the securities has dropped below the dollar amount of moneys to be withheld by the Owner to ensure performance, Contractor shall, within five days of the date of such notice, post additional securities as necessary to ensure that the total fair market value of all such securities held by the Owner, or in escrow, is equivalent to the amount of money to be withheld by the Owner under the Contract.

6. Any Contractor wishing to exercise this option shall give notice in writing to Owner, and shall thereafter execute an escrow agreement in the form of the form included with these Contract Documents

7. Materials, as used herein, shall be considered to be those items that are fabricated and manufactured goods and equipment. Only those materials for which the Contractor can transfer clear title to the City will be qualified for partial payment. The Contractor may request payment of seventy-five (75) percent of the actual net cost of these materials, not to exceed fifty (50) percent of the total adjusted line item extension as found in the bid schedule.

8. To receive partial payment for materials and equipment delivered to the Site, but not incorporated in the Work, it shall be necessary for the Contractor to submit to the Construction Manager a list of such

materials, at least seven (7) days prior to submitting the monthly estimate of amount earned for work completed. At the Construction Manager's sole discretion, the Construction Manager will approve items for which partial payment is to be made subject to the following:

- a. Only equipment or materials that have received favorable review of shop drawings will qualify.
- b. Eligible equipment or materials must be delivered and properly stored, protected, and maintained in a manner favorably reviewed by the Construction Manager, at the job site or at a bonded warehouse.
- c. The Contractor's actual net cost for the materials must be supported by invoices of suppliers, or other documentation requested by the Construction Manager.
- d. Materials or equipment delivered to the Site less than thirty (30) days prior to their scheduled incorporation in the Work shall not qualify.
- e. Final payment shall be made only for materials actually incorporated in the Work. Upon acceptance of the Work, all materials remaining for which advance payments had been made shall revert to the Contractor, unless otherwise agreed, and partial payments made for these items shall be deducted from the final payment for the Work.
- f. Partial payments for materials and equipment on hand shall not be deemed to be final payment for the material nor relieve the Contractor of its obligations under the Contract.
- g. Partial payments for materials and equipment on hand shall be subject to retention in accordance with the Contract Documents

9. After receipt of the last progress payment, but prior to acceptance of the Work by the City, the Contractor shall send a letter to the Construction Manager. The letter, pursuant to California Public Contract Code Section 7 100, shall state that acceptance of the final payment described below shall operate as and shall be, a release to the City, the Construction Manager, the Designer, and their duly authorized agents, from all claim of and/or liability to the Contract arising by virtue of the Contract related to those amounts. Disputed Contract claims in stated amounts previously filed as provided in Paragraph 00700-7.03b, Claims, may be specifically excluded by the Contractor from the operation of the release.

B. Review of Applications

1. Construction Manager will, within 10 days after receipt of each Application for Payment, either

indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Construction Manager's recommendation of any payment requested in an Application for Payment will constitute a representation by Construction Manager to Owner, based on Construction Manager's observations on the Site of the executed Work as an experienced and qualified design professional and on Construction Manager's review of the Application for Payment and the accompanying data and schedules, that to the best of Construction Manager's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
- b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and
- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Construction Manager's responsibility to observe the Work.

3. By recommending any such payment Construction Manager will not thereby be deemed to have represented that:

- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Construction Manager in the Contract Documents; or
- b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Construction Manager's review of Contractor's Work for the purposes of recommending payments nor Construction Manager's recommendation of any payment, including final payment, will impose responsibility on Construction Manager:

- a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Construction Manager may refuse to recommend the whole or any part of any payment if, in Construction Manager's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Construction Manager may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Construction Manager's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Construction Manager has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Construction Manager's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor. Payment will be made by the Owner to the Contractor in accordance with Owner's normal accounts payable procedure.

D. Reduction in Payment

1. Owner may refuse to make payment of the full amount recommended by Construction Manager because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Construction Manager, Owner will give Contractor immediate written notice (with a copy to Construction Manager) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Construction Manager in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Construction Manager issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Construction Manager shall make an inspection of the Work to determine the status of completion. If Construction Manager does not consider the Work substantially complete, Construction Manager will notify Contractor in writing giving the reasons therefor.

C. If Construction Manager considers the Work substantially complete, Construction Manager will deliver to Owner a tentative certificate of Substantial Completion

which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Construction Manager as to any provisions of the certificate or attached list. If, after considering such objections, Construction Manager concludes that the Work is not substantially complete, Construction Manager will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Construction Manager considers the Work substantially complete, Construction Manager will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Construction Manager believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Construction Manager will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Construction Manager in writing prior to Construction Manager's issuing the definitive certificate of Substantial Completion, Construction Manager's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Construction Manager to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Construction Manager in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Construction Manager to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Construction Manager shall make an inspection of that part of the Work to determine its status of completion. If Construction Manager does not consider that part of the Work to be substantially complete, Construction Manager will notify Owner and Contractor in writing giving the reasons therefor. If Construction Manager considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Construction Manager will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. Application for Final Payment

1. After Contractor has, in the opinion of Construction Manager, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other

documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

- a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;
- b. consent of the surety, if any, to final payment;
- c. a list of all Claims against Owner that Contractor believes are unsettled; and
- d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Construction Manager's Review of Application and Acceptance

1. If, on the basis of Construction Manager's observation of the Work during construction and final inspection, and Construction Manager's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Construction Manager is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Construction Manager will, within ten days after receipt of the final Application for Payment, indicate in writing Construction Manager's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Construction Manager will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Construction Manager will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Forty-five days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Construction Manager, less any sum Owner is entitled to set off against Construction Manager's recommendation, including but not limited to liquidated damages, will become due and , will be paid by Owner to Contractor.

14.08 Final Completion Delayed

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Construction Manager so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Construction Manager, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Construction Manager with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work

on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Construction Manager or Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02A. occur, Owner will provide written notice to Contractor and Surety to arrange a conference with Contractor and Surety to address Contractor's failure to perform the Work. Conference shall be held not later than 15 days, after receipt of notice.

1. If the Owner, the Contractor, and the Surety do not agree to allow the Contractor to proceed to perform the Construction Contract, the Owner may, to the extent permitted by Laws and Regulations, declare a Contractor Default and formally terminate the Contractor's right to complete the Contract. Contractor Default shall not be declared earlier than 20 days after the Contractor and Surety have received notice of conference to address Contractor's failure to perform the Work.

2. If Contractor's services are terminated, Surety shall be obligated to take over and perform the Work. If Surety does not commence performance thereof within 15 consecutive calendar days after date of an additional written notice demanding Surety's performance of its obligations, then Owner, without process or action at law, may take over any portion of the Work and complete it as described below.

a. If Owner completes the Work, Owner may exclude Contractor and Surety from the site and take possession of the Work and of all tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by Contractor and Surety (without liability to Contractor and Surety for trespass or conversion), incorporate in the

Work all materials and equipment stored at the site or for which Owner has paid Contractor or Surety but which are stored elsewhere, and finish the Work as Owner may deem expedient.

3. Whether Owner or Surety completes the Work, Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses and damages sustained by Owner arising out of or resulting from completing the Work, such excess will be paid to Contractor. If such claims, costs, losses and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and when so approved by Engineer incorporated in a Change Order, provided that when exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

4. Neither Owner, Engineer, nor any of their respective consultants, agents, officers, directors or employees shall be in any way liable or accountable to Contractor or Surety for the method by which the completion of the said Work, or any portion thereof, may be accomplished or for the price paid therefor.

5. Owner, notwithstanding the method used in completing the Contract, shall not forfeit the right to recover damages from Contractor or Surety for Contractor's failure to timely complete the entire Contract. Contractor shall not be entitled to any claim for damages on account of the method used by Owner in completing the Contract.

6. Maintenance of the Work shall continue to be Contractor's and Surety's responsibilities as provided for in the bond requirements of the Contract Documents or any special guarantees provided for under the Contract Documents or any other obligations otherwise prescribed by law.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor, Construction Manager and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Construction Manager fails to act on any Application for Payment within 30 days after it is submitted, or (iii)

Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Construction Manager, and provided Owner or Construction Manager do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Construction Manager has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Construction Manager, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Construction Manager for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or

2. agrees with the other party to submit the Claim to another dispute resolution process, or

3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of

this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

B. No action or failure to act by the City, the Engineer, or the Construction Manager shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state of California.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

17.07 *Penalty for Collusion*

A. If, at any time, it is found that the person, firm, or corporation to whom the Contract has been awarded has, in presenting any bid or bids, colluded with any other party or parties, then the Contract shall be null and void, and the Contractor and its sureties shall be liable for loss or damage which the City may suffer thereby, and the City may advertise for new bids for said Work.

SECTION 00805

SUPPLEMENTARY CONDITIONS

1.01 SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend and supplement Section 00700, GENERAL CONDITIONS, and other provisions of the contract documents as indicated below. All provisions of the General Conditions that are amended or supplemented remain in full force and effect as so amended or supplemented. All provisions of the General Conditions which are not so amended or supplemented remain in full force and effect.

1.02 DEFINED TERMS

The terms used in these Supplementary Conditions which are defined in the General Conditions have the meaning assigned to them in the General Conditions.

1.03 AMENDMENTS AND SUPPLEMENTS

The following are instructions that amend or supplement specific paragraphs in the General Conditions and other contract documents:

A. Paragraph 00700-4.02A:

The following are reports of explorations and tests of subsurface conditions at the site of the Work:

None.

The following are reports of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are at or contiguous to the site of the Work:

Manteca Wastewater Treatment Plant Influent Pump Station Grating and Support Beam Condition Assessment Report, V&A, November 24, 2010.

City of Manteca Wastewater Quality Control Facility Influent Pump Station Condition Assessment Report, V&A, June 8, 2012.

Data in the above referenced reports shall be used in planning the work, along with information provided in the Plans and Specifications and other Appendices. Recommendations and opinions stated in the above referenced reports shall not be used by the Contractor.

A. Paragraph 00700-3.03.B.2:

Add the following paragraph:

Where conflicts exist among the Contract Documents and/or any reference specifications, such conflicts shall be clarified according to the following order, the first ranked taking precedence over the lower ranked:

1. Amendments, Change Orders or other modifications to the Contract Documents, as executed by the City in accordance with the requirements of the Contract Documents.
2. Agreement
3. Supplementary Conditions
4. General Conditions
5. Division 01 Documents
6. Plans and Technical Specifications
7. City's Standard Specifications
8. Notice Inviting Bids and Information to Bidders
10. Contract Payment Bond
11. Performance Bond
12. Warranty Bond (if required)
13. Any provisions required by law or valid regulations to be inserted in this contract, whether actually inserted or not
14. Appendices (photographs, data contained in reports, and other information).

Additional rules of interpretation:

1. Written numbers over figures, unless obviously incorrect.
2. Figured dimensions over scaled dimensions.
3. Large-scale Drawings over small-scale Drawings.
4. Any conflict between a bill or list of materials shown in the Contract Documents and the actual quantities required to complete the Work required by Contract Documents, will be resolved in favor of the actual quantities, date (i.e., the most recent document), and if the dates are the same or not determinable, then in favor of Specifications.

C. Paragraph 00700-5.04B:

The entities listed below are "additional insureds as their interest may appear" including their respective officers, directors, agents and employees.

Engineer: ICM Group, Inc.

The insured and the additional insured shall be listed in the insurance coverage by specific name and not by genre.

D. Paragraph 00700-12.03F:

Time extensions will not be granted for rain, wind, flood, or other natural phenomena of normal intensity for the locality where Work is performed. For purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the month involved with the average of the preceding 10-year climatic range during the same month based on U.S. Weather Bureau statistics for the locality where the Work is performed.

****END OF SECTION****

SECTION 01010

LOCATION AND SUMMARY OF WORK

PART 1 GENERAL

1.1 DESCRIPTION

This section contains a description of the Work location and a summary of the Scope of Work.

1.2 PROJECT LOCATION

Work associated with this Project will take place at the City of Manteca Wastewater Quality Control Facility located at 2450 West Yosemite Avenue, Manteca, California.

1.3 ACCESS TO THE SITE

The Manteca Wastewater Quality Control Facility is a secure facility. All visitors must sign in at the Facility Administration office. Construction vehicles must park in designated areas as shown on the Plans. Due to prior incidences of theft at the Facility, construction personnel shall stay within the immediate vicinity of their work zones and not wander around the facility.

1.4 SCOPE OF WORK

The Contractor is required to provide a functionally complete project and furnish all labor, equipment, and materials necessary to construct the Project complete and ready for operation. The work generally involves the following Features of Work:

A. Maintain Operational Capability of Wastewater Quality Control Facility.

All wastewater flow from the City of Manteca enters an Influent Room which is part of the Influent Pump Station (IPS). All flow enters the Influent Room via one of two 60 inch pipelines referred to as the north and south trunk sewers.

Wastewater from the Influent Room flows into the portion of the IPS referred to as the Wet Well. The Wet Well contains two bar screens, a small reservoir, and pump intakes.

All wastewater entering the Wet Well is screened to 3/8 inch. The City's screening system includes two bar screens, conveyors, a grinder/compactor, and a trash bin. The City disposes of all solids removed by their solids removal system.

The pump intakes in the Wet Well are connected to pumps located in the Dry Well. The Dry Well is a separate room in the IPS. The Dry Well has four pumps that distribute flow to two treatment systems referred to as the north and south plant.

The north plant (located on the northern portion of the plant property) is the original wastewater treatment plant built in the 1970s. The south plant (located on the southern

portion of the plant property) is a parallel treatment system built in the 2000s. Both the north and south plants have grit tanks, settling basins, aeration basins, and secondary clarifiers. Both the north and south plants send water to a UV tertiary treatment system and solids to two digesters and a solids handling building.

Any and all work performed by the Contractor shall not interfere or impair the operational capabilities of essential elements of the treatment process or reduce the capacity of the entire treatment plant below levels sufficient to treat raw wastewater to the water quality limitations specified in the discharge permit. The status of the treatment facility shall be defined as “operational” when the facility is capable of treating the entire quantity of wastewater received to the water quality limits specified in the discharge permit. The Contractor shall cooperate fully with the Construction Manager and the City in scheduling work activities, arranging for and installing temporary utilities, deliveries, testing and acceptance procedures, and facility start-up to avoid disruptions to facility operations.

B. Mobilization.

Mobilization shall consist of the preparatory work and operations, including but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all contractor offices and other facilities necessary for work on the project; for all temporary utility services; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various Features of Work on the project site.

C. Bypass Pumping.

Bypass Pumping shall consist of all work necessary to bypass pump wastewater from the north and south trunk sewers to the IPS Wet Well thus bypassing the Influent Room. This work includes installing and removing bulkheads in the north and south trunk sewers and in the wet well; and removing the buildup of solids in the pipelines.

Contractor is responsible for disposal of all solids that are not removed from the wastewater stream via the Plant’s bar screens.

D. Influent Pump Station Rehabilitation.

Influent Pump Station Rehabilitation shall consist of all work necessary for the repair of deteriorated concrete; lining of concrete surfaces; procurement and installation of an FRP hatch; and procurement and installation of an FRP grating system. This Feature of Work also includes removal and reinstallation of two 60” slide gates in the Influent Room, control of atmospheric conditions in the IPS, confined space entry, cleaning existing debris from the influent room and bar screen areas for City inspection, disposal of materials, and testing.

Bidders shall assume that fifty percent (50%) of the existing anchor bolts for the influent room gate frames and guides shall be replaced with new epoxy anchor bolts.

There is an uneven distribution of debris on the floor of the influent room and the floor of the wet well upstream of the bar screens that shall be removed and disposed of properly. Bidders shall assume that the amount of debris is equal to an average of 3 inches of debris on the floor of the influent room and the wet well upstream of the bar screens. Debris is a mixture of sludges and solids typically found in raw wastewater.

E. Modifications to the Foul Air System.

Modifications of the Foul Air System shall consist of all work necessary to extend, modify, and construct foul air ducting in the Influent Room, installation of a grease filter, installation of a new foul air fan connected to the Influent Pump Station dry well foul air duct, installation of an intake hood and replace exhaust registers. This Feature of Work includes all excavation, backfill, compaction, testing, replacement of sidewalks, confined space entry, and air ventilation necessary to complete the work.

F. Demobilization and Contract Closeout.

Demobilization and Contract Closeout shall include, upon substantial completion of the work, the removal of all signs, construction trailers, storage trailers and bins, temporary fencing, garbage, construction debris, equipment, utility services not to remain, portable toilets, and all excess construction materials. Work shall also include the repair, restoration and/or replacement of facilities damaged by the Contractor and/or subcontractors, including driveways, parking areas, streets, pipelines, and landscaping, and the submittal of Record Drawings. Work area shall be policed clean and restored to original condition or better.

END OF SECTION

SECTION 01015

CONTRACT TIME AND WORK SEQUENCING

PART 1 GENERAL

1.1 COMPLETION DATE

A. Time for Substantial Completion: 150 days

B. Time for Final Completion: 165 days

1.2 WORK SEQUENCING

A. General: The intent of work sequencing is to minimize bypass pumping. Work shall proceed in the order described below.

B. Rehabilitation Phase 1: Contractor shall repair concrete and install PVC liner system in the Influent Room starting approximately two feet above the grating up to the ceiling and into the upper deck penetrations. Complete foul air system modifications. Bypass pumping should not be required for Phase 1.

During Phase 1, remove and dispose of all loose debris and material on top of grating. Do not allow existing debris or Contractor created debris to enter the wastewater flow.

C. Rehabilitation Phase 2 (After Phase 1 is complete): Contractor shall clean out debris from the wet well and around the bar screen area for City inspection, repair concrete, install PVC liner system from approximately 2 feet above the grating to approximately 2 feet below top of existing PVC liner below the grating, and install new grating system. Bypass pumping will be required for Phase 2.

D. Other Work: Repairing concrete, installing PVC liner system, installing hatch, and other miscellaneous work may be scheduled during or after any of the phases with the limitation that all work below the grating system is restricted to Phase 2.

END OF SECTION

SECTION 01020

SCHEDULING AND SHUTDOWNS

PART 1 GENERAL

1.1 BACKGROUND

The City of Manteca Wastewater Quality Control Facility continuously receives and treats wastewater. The Contractor's work shall be planned and executed without interfering or interrupting City personnel, plant operations or treatment processes. Reliability of plant systems, operations, and utilities shall be maintained at all times. Access to facilities and shutdown of operating systems or processes will only be allowed when approved by the City, following a minimum of five (5) day notification provided by the Contractor. Contractor work associated with shutdowns may have to occur during off-peak hours, such as late nights and weekends. Contractor shall take into account the need to work during said off-peak hours within its bid proposal and no additional costs to the City will be allowed.

1.2 GENERAL SCHEDULING REQUIREMENTS

A. Project Schedule.

Contractor shall provide a baseline project schedule and monthly updates using Microsoft Project or Primavera software. Submit four color hard copies, a pdf version, and an electronic version in Project or Primavera format. The schedule shall show critical path.

B. 3 Week Look Ahead Schedule.

Contractor shall provide a three week look ahead schedule to the Construction Manager and City every week.

1.3 SHUTDOWNS

A. Wastewater Flow Data. Wastewater flow data is attached to the end of this section as follows:

- 1. Average total daily influent flow per month for a twelve month period (May 2012 to April 2013) and daily total influent flows for the same period.**
- 2. 24-hour graph of IPS discharge flows from Monday, May 20, 2013 to Sunday, May 26, 2013.**

3. Highest instantaneous flow per day on a month to month basis from April 2012 to April 2013.

B. Wastewater Flow in South and North Trunk Sewer.

- 1. In regards to total flow received by the treatment plant, the approximate portion of total influent flow from South Trunk Sewer: 25%**
- 2. In regards to total flow received by the treatment plant, the approximate portion of total influent flow from North Trunk Sewer: 75%**

C. Initial Sewer Overflow Location.

1. When the north trunk sewer is closed at or near the influent pump station, it is anticipated that, if the north trunk sewer were to overflow, the first place the sewer will overflow is in the farm field adjacent to Yosemite Avenue, on the north side of Yosemite Avenue.
2. When the south trunk sewer is closed at or near the influent pump station, it is anticipated that, if the sewer were to overflow, the first place the sewer will overflow is in the field between the influent pump station and the headmaker.

D. City's Ability For Wastewater Flow Reduction.

1. The City has the ability to reduce wastewater flow in the north and south trunk sewers by shutting down the City's wastewater distribution pump stations. However, this shutdown capability is for a short duration at night and the City does not have the capability to completely stop wastewater flow in the north and south trunk sewers. The City has in the past, and anticipates for this project, the shutdown of the wastewater distribution pump stations to reduce wastewater flow in the north and south trunk sewers. The distribution pump stations are anticipated to be shutdown at 11 p.m. and remain shutdown until 5 a.m. at which time they would need to be turned on and flow would then significantly increase in the north and south trunk sewers. **Therefore, if the influent gates are closed and the distribution pump stations are shutdown, Contractor shall plan for a four hour window of little flow into the IPS Influent Room.** The "little" flow into the IPS Influent Room will be from leakage around the influent gates, estimated to be approximately 5 gpm from each gate.

2. Assume, when the wastewater distribution pump stations connected to the North Trunk Sewer have been shut down for a period of approximately two hours, north trunk sewer wastewater flow at the north trunk sewer manhole adjacent to the Influent Pump Station will be approximately 100 gpm.

3. Assume, when the wastewater distribution pump stations connected to the South Trunk Sewer have been shut down for a period of approximately two hours,

south trunk sewer wastewater flow at the south trunk sewer manhole adjacent to the Influent Pump Station will be approximately 50 gpm.

E. South Trunk Sewer Bypass Logistics.

The South Trunk Sewer flow shall be bypassed as follows (See Drawings C2 and C3):

1. Bulkhead the south trunk sewer in or adjacent to the manhole adjacent to the IPS as shown on Drawing C2
2. Pump wastewater from the manhole indicated in 1.3.E.1 to the Wet Well bypass discharge location shown on C3.

F. North Trunk Sewer Bypass Logistics.

The North Trunk Sewer flow will be bypassed as follows (See Drawings C2 and C3):

1. Bulkhead the north trunk sewer in or adjacent to the manhole adjacent to the grinder/compactor as shown on Drawing C2. **Wastewater levels in the north trunk sewer shall remain one foot below the crown of the north trunk sewer pipeline at the bypass manhole.**
2. Pump wastewater from the manhole indicated in 1.3.F.1 to the Wet Well bypass discharge location shown on C3.

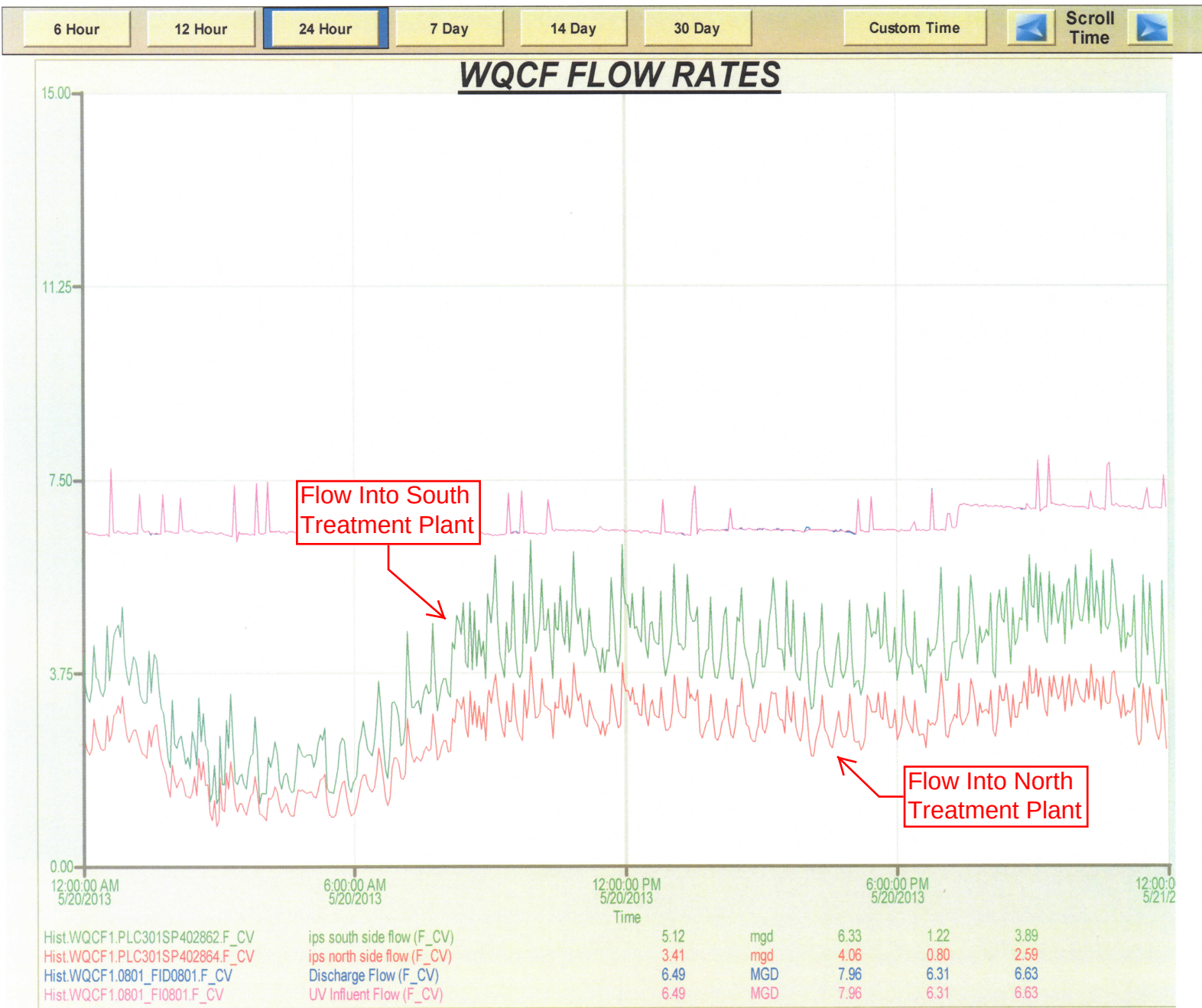
END OF SECTION

CITY OF MANTECA WQCF
INFLUENT FLOW
MAY 2012-APRIL 2013

DAY	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13
1	6.44	5.95	6.55	6.67	6.88	6.25	6.69	6.47	5.90	5.99	5.99	6.72
2	5.89	5.99	6.30	6.42	6.11	6.25	6.47	7.47	6.25	6.01	6.10	5.99
3	6.03	5.92	6.15	6.57	6.69	6.37	6.84	6.36	6.08	6.10	6.34	6.17
4	5.92	6.17	6.29	6.65	6.25	6.75	7.15	5.95	6.06	6.51	6.04	6.73
5	6.20	6.32	6.24	6.82	6.37	6.50	6.73	6.66	6.36	5.73	6.04	5.64
6	6.35	5.97	6.10	6.85	6.04	6.67	6.95	6.28	6.94	5.96	5.95	6.42
7	6.07	5.92	6.21	7.21	6.07	6.93	7.45	6.12	6.30	6.01	5.69	6.55
8	6.04	5.96	6.25	6.90	6.18	6.42	7.28	6.31	6.47	5.84	6.05	6.28
9	5.91	6.04	6.26	7.10	6.53	5.88	7.08	6.51	6.13	6.16	6.17	6.05
10	5.93	6.05	6.19	6.42	6.36	5.95	7.45	6.12	6.11	6.25	6.31	6.17
11	5.70	6.04	6.12	6.40	6.28	6.16	7.06	6.31	6.04	6.20	6.17	5.97
12	6.25	5.96	6.21	6.50	5.89	6.37	7.14	6.61	6.22	5.93	6.16	6.24
13	6.32	5.93	6.18	6.38	6.20	6.71	6.48	6.52	6.41	5.80	6.15	7.94
14	6.04	5.86	6.25	6.33	6.35	6.84	6.73	6.38	6.07	5.95	5.94	8.09
15	6.26	5.91	6.29	6.18	6.66	6.28	6.69	6.56	6.07	5.95	5.85	7.19
16	6.43	5.85	5.92	6.59	7.17	6.06	6.60	6.87	6.05	6.16	6.08	7.33
17	*	5.98	6.13	6.13	6.83	6.19	6.96	6.55	6.03	6.04	6.03	6.09
18	6.50	6.37	6.35	6.22	6.86	6.38	7.11	6.45	5.91	6.33	6.23	6.02
19	6.54	6.57	6.21	6.56	6.72	6.64	6.30	6.52	6.19	6.18	5.86	6.10
20	6.55	6.45	6.32	7.19	6.82	6.92	6.30	6.33	6.13	6.02	5.87	6.12
21	6.94	6.34	6.25	7.02	6.70	7.12	6.19	6.38	6.69	5.80	5.76	6.38
22	6.71	6.23	6.33	6.27	6.91	6.92	6.47	6.81	6.37	6.09	5.72	6.47
23	6.45	6.22	6.43	6.43	7.12	6.91	5.86	7.49	5.95	6.16	6.03	6.55
24	6.26	6.52	6.58	5.95	6.82	6.62	6.19	6.81	5.93	6.20	5.86	6.60
25	6.00	6.23	6.63	6.30	6.97	6.59	6.52	6.34	5.97	6.14	6.03	6.57
26	5.92	6.31	6.56	6.49	6.72	6.56	6.07	6.53	6.11	5.97	5.74	6.46
27	6.00	6.23	6.38	6.32	6.82	6.89	6.14	6.30	6.55	5.77	6.00	6.59
28	6.12	6.14	6.48	6.07	6.67	7.08	6.00	6.05	5.99	6.31	6.03	6.24
29	6.10	6.20	6.47	6.30	6.78	6.56	5.86	6.32	5.98		5.93	6.76
30	6.11	6.59	6.49	6.44	6.60	6.69	6.91	6.30	5.86		6.04	6.33
31	5.96		6.52	6.43		6.38		6.22	5.63		7.59	

MO AVG	6.20	6.14	6.31	6.52	6.58	6.54	6.66	6.48	6.15	6.06	6.06	6.49
MAX DAILY	6.94	6.59	6.63	7.21	7.17	7.12	7.45	7.49	6.94	6.51	7.59	8.09

Note: Daily values represent total flow for one day.



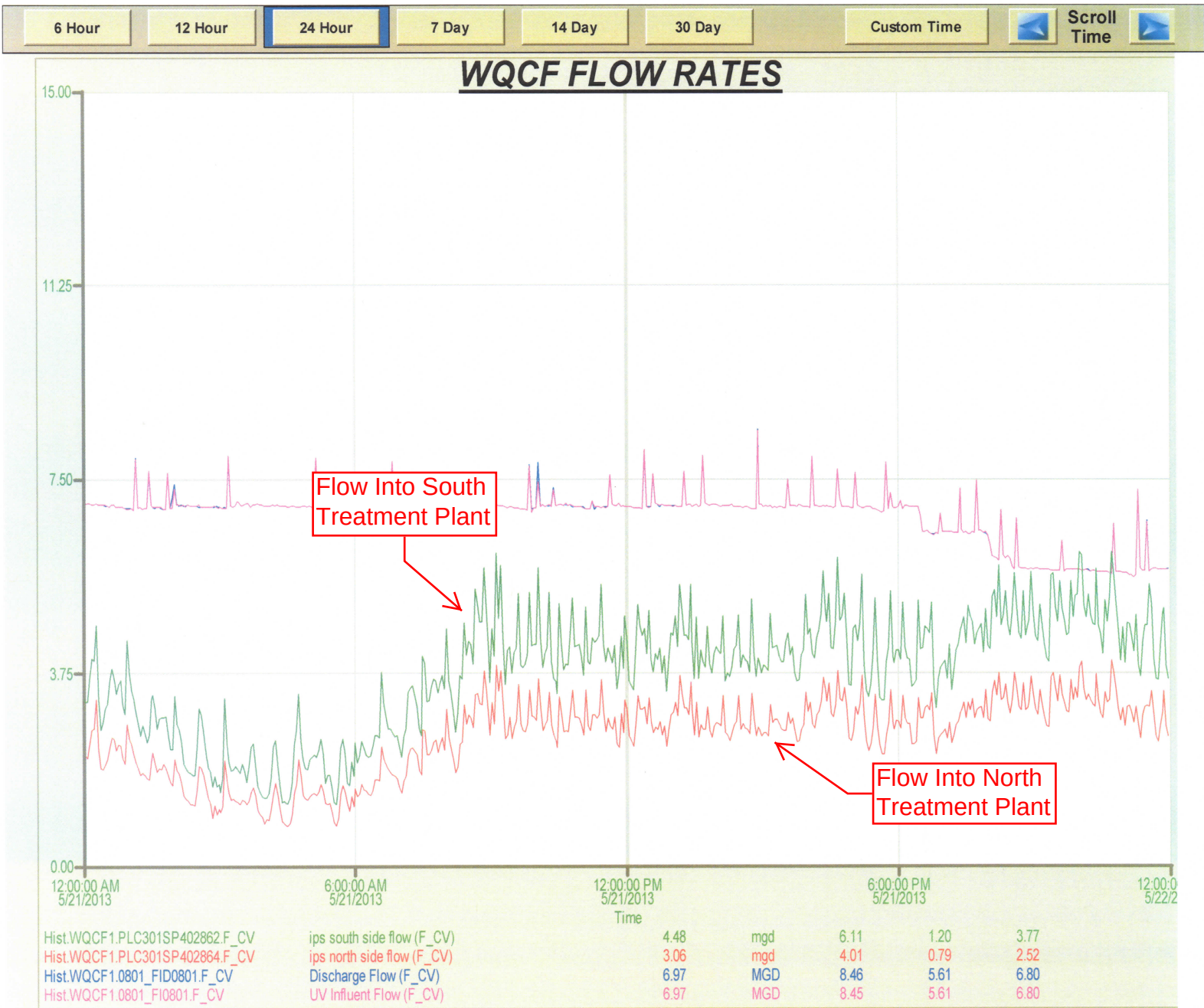
This graph provides a representation of influent flow fluctuation throughout a typical day. Sum flows shown by Green Pen + Red Pen to calculate total flow at a particular time of day.

Green Pen = Flow Into South Treatment Plant (not south trunk sewer flow)

Red Pen = Flow Into North Treatment Plant (not north trunk sewer flow)

Ignore **Purple Pen**

Ignore **Blue Pen**



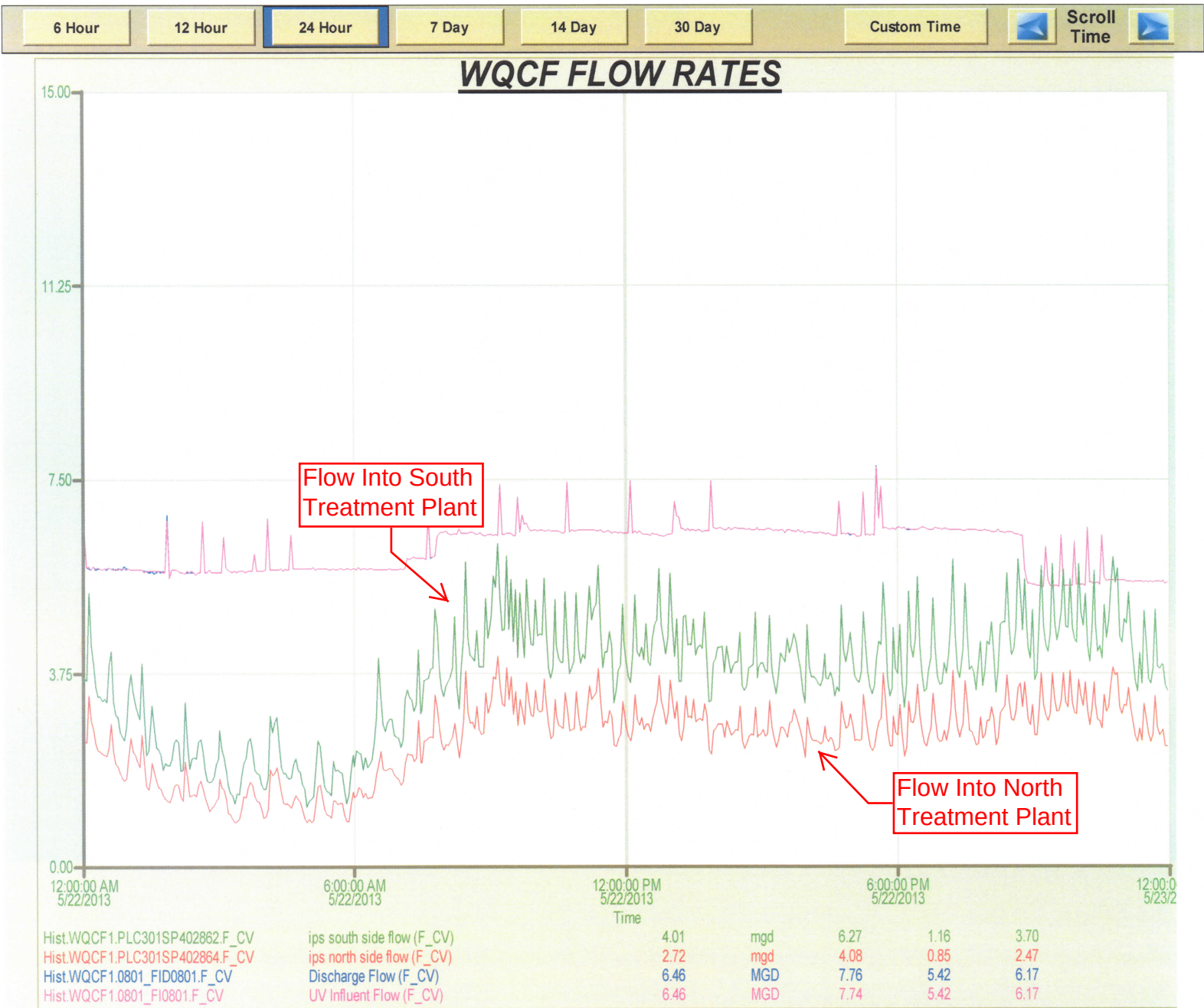
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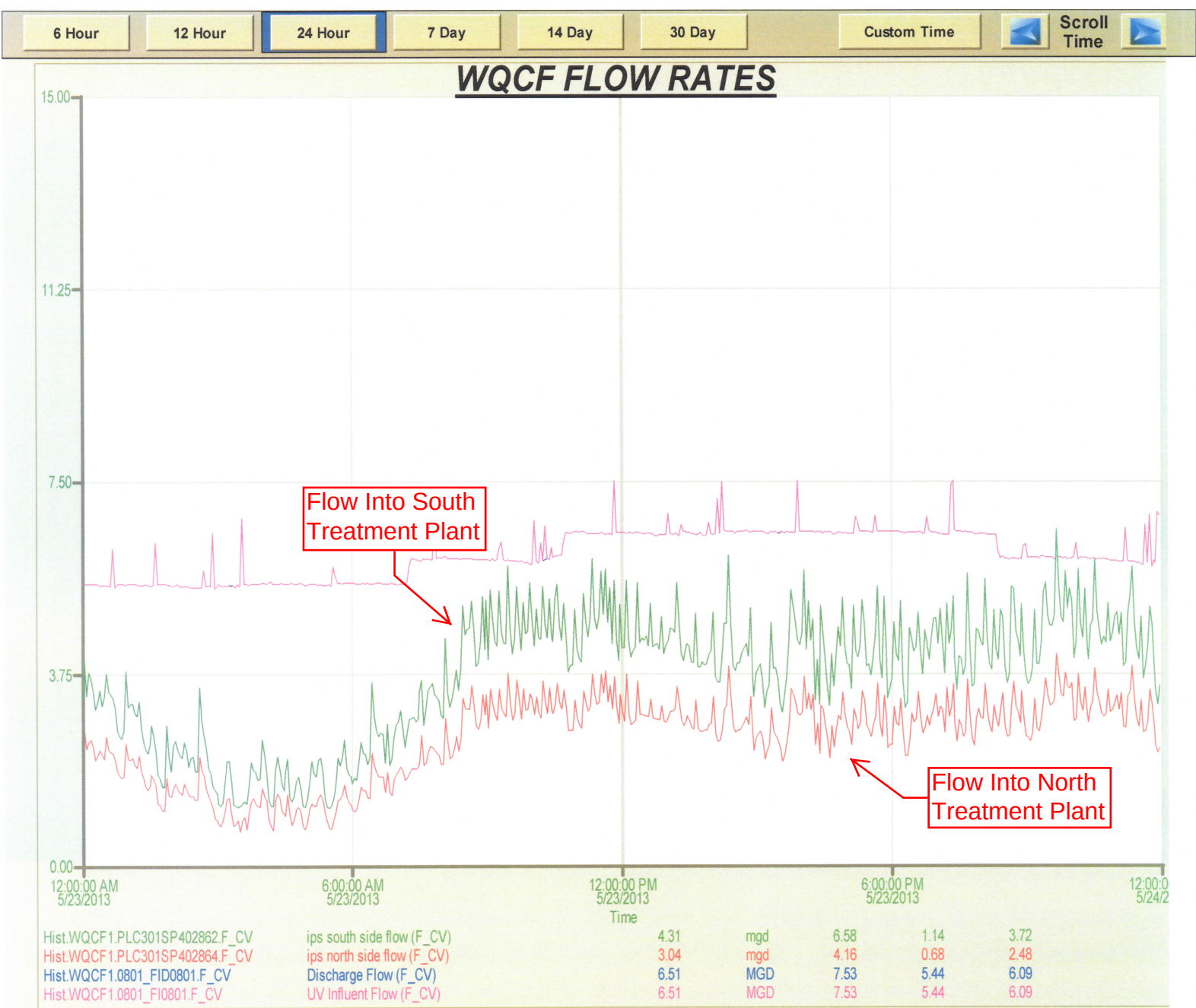
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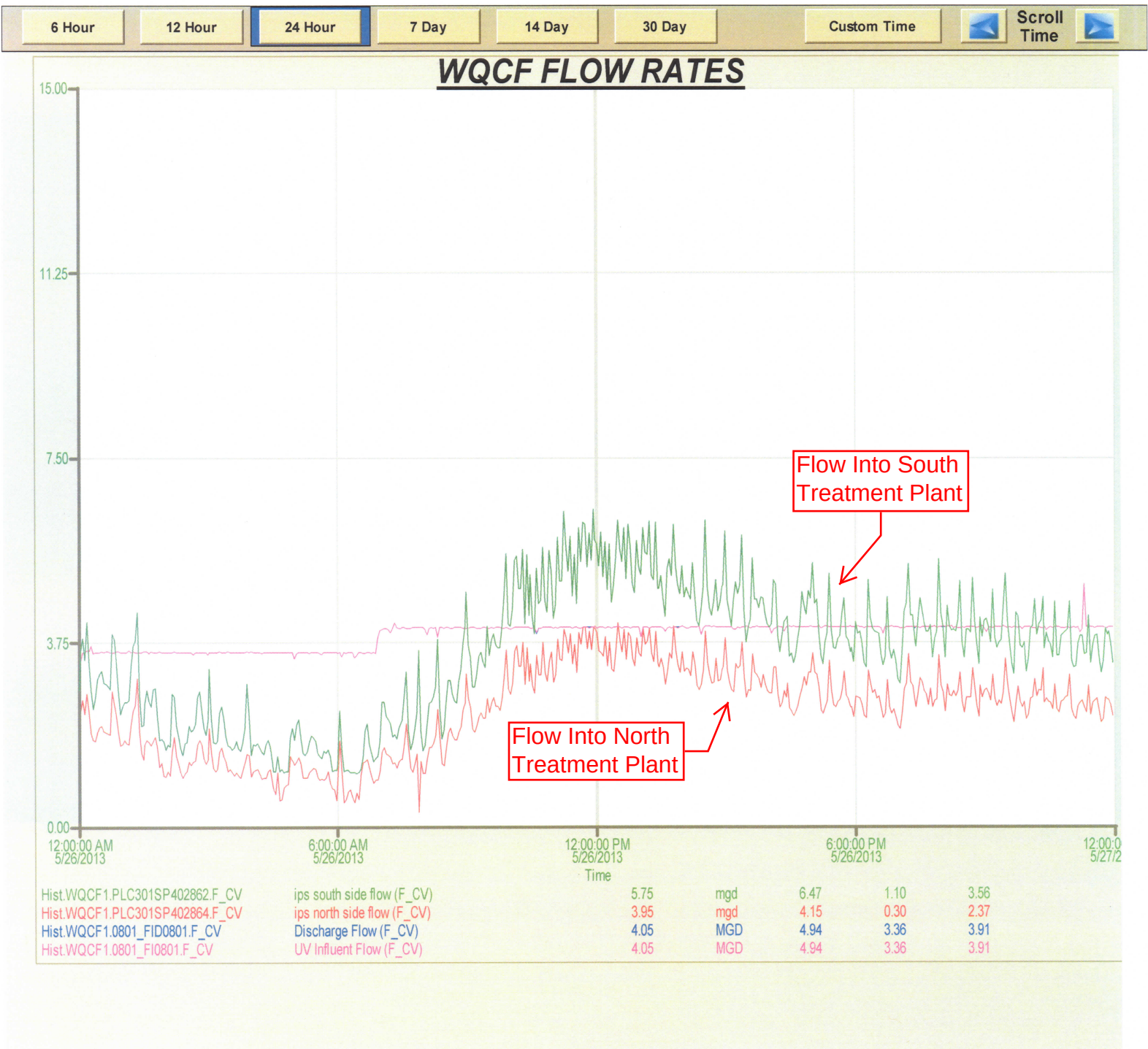
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Green Pen = Flow Into South Treatment Plant (not south trunk sewer flow)

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This graph provides a representation of influent flow fluctuation throughout a typical day. Sum flows shown by Green Pen + Red Pen to calculate total flow at a particular time of day.

Green Pen = Flow Into South Treatment Plant (not south trunk sewer flow)

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Ignore **Purple Pen**

Ignore **Blue Pen**

City of Manteca - WQCF Monthly Report

Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-Apr-2012	0.00	0.00	0.000	258.00	0.00	0.055	10.51	1.37	6.08	0.75	0.40	0.491
2-Apr-2012	0.00	0.00	0.000	141.00	0.00	0.063	9.56	1.45	6.24	1.06	0.47	0.541
3-Apr-2012	0.00	0.00	0.000	124.00	0.00	0.064	9.38	1.46	5.93	0.48	0.48	0.480
4-Apr-2012	0.00	0.00	0.000	135.00	0.00	0.064	10.38	1.40	6.24	0.48	0.48	0.480
5-Apr-2012	0.00	0.00	0.000	237.00	0.00	0.057	8.99	1.30	5.80	0.48	0.48	0.480
6-Apr-2012	0.00	0.00	0.000	109.00	0.00	0.054	10.14	1.25	5.87	1.69	0.48	0.784
7-Apr-2012	0.00	0.00	0.000	111.00	0.00	0.054	11.38	1.70	6.16	0.88	0.68	0.769
8-Apr-2012	0.00	0.00	0.000	97.00	0.00	0.048	10.54	1.29	5.86	0.71	0.50	0.598
9-Apr-2012	0.00	0.00	0.000	268.00	0.00	0.040	10.32	1.46	6.26	0.58	0.48	0.518
10-Apr-2012	0.00	0.00	0.000	233.00	0.00	0.034	14.77	-0.15	-145.62	0.77	0.44	0.513
11-Apr-2012	0.00	0.00	0.000	455.00	0.00	0.062	9.43	1.43	6.18	1.58	0.45	0.514
12-Apr-2012	0.00	0.00	0.000	238.00	0.00	0.046	10.58	2.61	6.38	0.65	0.41	0.483
13-Apr-2012	0.00	0.00	0.000	141.00	0.00	0.049	9.31	2.46	6.16	4.69	0.41	0.542
14-Apr-2012	0.00	0.00	0.000	261.00	0.00	0.061	10.48	1.33	6.28	0.57	0.48	0.517
15-Apr-2012	0.00	0.00	0.000	122.00	0.00	0.060	10.51	1.03	6.29	0.56	0.46	0.505
16-Apr-2012	0.00	0.00	0.000	119.00	0.00	0.059	9.21	1.75	6.01	0.62	0.44	0.507
17-Apr-2012	0.00	0.00	0.000	118.00	0.00	0.060	12.86	3.59	6.35	0.60	0.44	0.494
18-Apr-2012	0.00	0.00	0.000	234.00	0.00	0.040	10.45	1.31	6.16	0.59	0.41	0.497
19-Apr-2012	0.00	0.00	0.000	243.00	0.00	0.033	10.57	1.32	5.98	0.57	0.41	0.459
20-Apr-2012	0.00	0.00	0.000	127.00	0.00	0.058	9.84	1.59	6.01	0.56	0.40	0.446
21-Apr-2012	0.00	0.00	0.000	119.00	0.00	0.059	12.25	1.54	6.20	0.50	0.39	0.427
22-Apr-2012	0.00	0.00	0.000	115.00	0.00	0.044	11.19	1.32	6.37	0.51	0.38	0.423
23-Apr-2012	0.00	0.00	0.000	228.00	0.00	0.024	10.03	1.40	6.21	0.48	0.39	0.420
24-Apr-2012	0.00	0.00	0.000	219.00	0.00	0.022	10.15	1.45	6.01	0.55	0.40	0.435
25-Apr-2012	0.00	0.00	0.000	214.00	0.00	0.040	9.81	1.46	5.81	0.67	0.45	0.498
26-Apr-2012	0.00	0.00	0.000	135.00	0.00	0.067	11.57	1.33	6.06	0.62	0.44	0.505
27-Apr-2012	0.00	0.00	0.000	127.00	0.00	0.064	9.74	1.88	6.03	19.98	0.48	1.355
28-Apr-2012	0.00	0.00	0.000	130.00	0.00	0.061	11.13	1.40	6.11	1.23	0.45	0.578
29-Apr-2012	0.00	0.00	0.000	129.00	0.00	0.067	10.29	1.29	6.13	0.78	0.50	0.585
30-Apr-2012	0.00	0.00	0.000	129.00	0.00	0.068	9.45	1.34	6.03	0.65	0.52	0.569
1-May-2012	0.00	0.00	0.000	125.00	0.00	0.064	9.93	1.83	6.44	0.71	0.49	0.548
AVERAGE	0.000	0.000	0.000	175.516	0.000	0.053	10.477	1.523	1.227	1.469	0.455	0.547
MAX	0.000	0.000	0.000	455.000	0.000	0.068	14.773	3.586	6.444	19.980	0.680	1.355
MIN	0.000	0.000	0.000	97.000	0.000	0.022	8.986	-0.147	-145.620	0.480	0.380	0.420
TOTAL			0.000			1.642			38.035			16.962

City of Manteca - WQCF Monthly Report

Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-May-2012	0.00	0.00	0.000	125.00	0.00	0.064	9.93	1.83	6.44	0.71	0.49	0.548
2-May-2012	0.00	0.00	0.000	128.00	0.00	0.066	11.04	1.54	5.89	0.81	0.51	0.607
3-May-2012	0.00	0.00	0.000	248.00	0.00	0.045	10.33	1.67	6.03	0.78	0.51	0.585
4-May-2012	0.00	0.00	0.000	241.00	0.00	0.049	9.66	1.45	5.92	0.57	0.57	0.570
5-May-2012	0.00	0.00	0.000	115.00	0.00	0.048	10.43	1.49	6.20	0.57	0.57	0.570
6-May-2012	0.00	0.00	0.000	97.00	0.00	0.047	10.90	2.18	6.35	0.57	0.57	0.570
7-May-2012	0.00	0.00	0.000	93.00	0.00	0.048	11.50	1.33	6.07	0.57	0.57	0.570
8-May-2012	0.00	0.00	0.000	91.00	0.00	0.046	11.12	1.63	6.04	0.57	0.57	0.570
9-May-2012	0.00	0.00	0.000	206.00	0.00	0.040	9.95	1.39	5.91	0.57	0.57	0.570
10-May-2012	0.00	0.00	0.000	96.00	0.00	0.044	9.90	1.37	5.93	0.57	0.57	0.570
11-May-2012	0.00	0.00	0.000	240.00	0.00	0.031	14.87	-0.15	5.70	0.57	0.57	0.570
12-May-2012	0.00	0.00	0.000	236.00	0.00	0.053	10.10	1.41	6.25	0.57	0.57	0.570
13-May-2012	0.00	0.00	0.000	106.00	0.00	0.052	10.61	1.34	6.35	2.01	0.57	0.983
14-May-2012	0.00	0.00	0.000	108.00	0.00	0.053	10.20	1.61	6.04	1.25	0.89	1.048
15-May-2012	0.00	0.00	0.000	113.00	0.00	0.049	10.30	1.55	6.25	1.25	0.58	0.846
16-May-2012	0.00	0.00	0.000	256.00	0.00	-0.460	10.41	1.60	-60.73	0.79	0.51	0.634
17-May-2012	0.00	0.00	0.000	66.00	0.00	0.551	3.65	4.08	#VALUE!	0.57	0.57	0.570
18-May-2012	0.00	0.00	0.000	264.00	0.00	0.067	10.39	1.79	#VALUE!	0.85	0.41	0.464
19-May-2012	0.00	0.00	0.000	127.00	0.00	0.061	10.40	2.00	#VALUE!	0.46	0.36	0.401
20-May-2012	0.00	0.00	0.000	114.00	0.00	0.055	10.52	1.55	#VALUE!	4.16	0.35	0.477
21-May-2012	0.00	0.00	0.000	128.00	0.00	0.054	10.40	1.58	#VALUE!	0.62	0.34	0.410
22-May-2012	0.00	0.00	0.000	130.00	0.00	0.056	9.99	2.19	#VALUE!	0.61	0.35	0.407
23-May-2012	0.00	0.00	0.000	121.00	0.00	0.055	9.99	2.07	#VALUE!	0.43	0.35	0.384
24-May-2012	0.00	0.00	0.000	186.00	0.00	0.053	9.86	2.17	#VALUE!	0.44	0.34	0.373
25-May-2012	0.00	0.00	0.000	117.00	0.00	0.054	8.85	1.68	#VALUE!	0.57	0.33	0.395
26-May-2012	0.00	0.00	0.000	109.00	0.00	0.051	10.03	1.48	#VALUE!	0.53	0.38	0.446
27-May-2012	0.00	0.00	0.000	189.00	0.00	0.051	10.58	1.42	#VALUE!	0.56	0.40	0.466
28-May-2012	0.00	0.00	0.000	220.00	0.00	0.043	11.13	1.44	#VALUE!	0.62	0.40	0.493
29-May-2012	0.00	0.00	0.000	114.00	0.00	0.061	10.28	1.62	#VALUE!	0.61	0.41	0.486
30-May-2012	0.00	0.00	0.000	114.00	0.00	0.059	10.19	1.52	#VALUE!	0.62	0.44	0.516
31-May-2012	0.00	0.00	0.000	112.00	0.00	0.057	10.33	2.12	#VALUE!	0.85	0.45	0.530
AVERAGE	0.000	0.000	0.000	148.710	0.000	0.052	10.253	1.675	#VALUE!	0.814	0.486	0.555
MAX	0.000	0.000	0.000	264.000	0.000	0.551	14.866	4.078	#VALUE!	4.160	0.890	1.048
MIN	0.000	0.000	0.000	66.000	0.000	-0.460	3.655	-0.154	#VALUE!	0.430	0.330	0.373
TOTAL			0.000			1.604			#VALUE!			17.198

City of Manteca - WQCF Monthly Report

	SOUTH PLANT RECYCLE FLOW				S. PLANT GRIT FLOW				TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY			
	Max (GPM)	Min (GPM)	Total (MG)		Max (GPM)	Min (GPM)	Total (MG)		Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)	
Day															
1-Jun-2012	0.00	0.00	0.000		116.00	0.00	0.058		10.23	1.79	#VALUE!	0.77	0.45	0.546	
2-Jun-2012	0.00	0.00	0.000		114.00	0.00	0.057		10.51	1.42	#VALUE!	0.67	0.45	0.521	
3-Jun-2012	0.00	0.00	0.000		111.00	0.00	0.051		10.17	1.40	#VALUE!	0.81	0.45	0.568	
4-Jun-2012	0.00	0.00	0.000		113.00	0.00	0.060		9.34	1.41	#VALUE!	0.68	0.49	0.578	
5-Jun-2012	0.00	0.00	0.000		118.00	0.00	0.059		11.08	1.62	#VALUE!	0.71	0.49	0.571	
6-Jun-2012	0.00	0.00	0.000		113.00	0.00	0.058		9.97	1.66	#VALUE!	1.17	0.50	0.591	
7-Jun-2012	0.00	0.00	0.000		116.00	0.00	0.062		9.94	1.87	5.92	1.14	0.52	0.635	
8-Jun-2012	0.00	0.00	0.000		113.00	0.00	0.059		10.83	1.61	5.96	0.87	0.50	0.591	
9-Jun-2012	0.00	0.00	0.000		114.00	0.00	0.057		10.44	1.70	6.04	0.67	0.45	0.539	
10-Jun-2012	0.00	0.00	0.000		120.00	0.00	0.058		10.68	1.58	6.05	0.73	0.46	0.568	
11-Jun-2012	0.00	0.00	0.000		248.00	0.00	0.054		10.55	1.60	6.04	0.73	0.47	0.569	
12-Jun-2012	0.00	0.00	0.000		118.00	0.00	0.057		10.06	1.95	5.96	2.17	0.48	0.590	
13-Jun-2012	0.00	0.00	0.000		127.00	0.00	0.056		9.85	1.53	5.93	0.66	0.46	0.528	
14-Jun-2012	0.00	0.00	0.000		121.00	0.00	0.056		10.49	1.66	5.86	0.55	0.34	0.431	
15-Jun-2012	0.00	0.00	0.000		252.00	0.00	0.055		9.63	1.75	5.91	0.46	0.34	0.378	
16-Jun-2012	0.00	0.00	0.000		126.00	0.00	0.057		11.50	1.59	5.87	0.65	0.37	0.445	
17-Jun-2012	0.00	0.00	0.000		119.00	0.00	0.055		11.01	0.36	5.98	0.58	0.38	0.435	
18-Jun-2012	0.00	0.00	0.000		119.00	0.00	0.052		10.32	1.51	6.37	11.68	0.36	0.816	
19-Jun-2012	0.00	0.00	0.000		261.00	0.00	0.050		9.92	1.65	6.57	1.06	1.06	1.060	
20-Jun-2012	0.00	0.00	0.000		142.00	0.00	0.073		9.66	1.61	6.45	1.06	1.06	1.060	
21-Jun-2012	0.00	0.00	0.000		252.00	0.00	0.065		9.77	1.79	6.35	1.06	1.06	1.060	
22-Jun-2012	0.00	0.00	0.000		114.00	0.00	0.059		10.43	1.54	6.23	1.06	1.06	1.060	
23-Jun-2012	0.00	0.00	0.000		236.00	0.00	0.059		10.75	1.44	6.23	1.06	1.06	1.060	
24-Jun-2012	0.00	0.00	0.000		118.00	0.00	0.054		14.47	1.38	6.52	1.06	1.06	1.060	
25-Jun-2012	0.00	0.00	0.000		119.00	0.00	0.054		10.21	1.72	6.23	1.06	1.06	1.060	
26-Jun-2012	0.00	0.00	0.000		113.00	0.00	0.056		10.72	1.71	6.31	1.06	1.06	1.060	
27-Jun-2012	0.00	0.00	0.000		127.00	0.00	0.062		10.70	1.69	6.23	2.15	0.37	0.484	
28-Jun-2012	0.00	0.00	0.000		116.00	0.00	0.058		10.13	1.65	6.14	0.53	0.53	0.530	
29-Jun-2012	0.00	0.00	0.000		127.00	0.00	0.058		9.92	1.52	6.20	0.53	0.53	0.530	
30-Jun-2012	0.00	0.00	0.000		115.00	0.00	0.058		10.52	1.57	6.59	0.53	0.53	0.530	
1-Jul-2012	0.00	0.00	0.000		243.00	0.00	0.056		10.68	1.86	6.55	0.53	0.53	0.530	
AVERAGE	0.000	0.000	0.000		143.903	0.000	0.057		10.468	1.586	#VALUE!	1.240	0.611	0.677	
MAX	0.000	0.000	0.000		261.000	0.000	0.073		14.471	1.952	#VALUE!	11.680	1.060	1.060	
MIN	0.000	0.000	0.000		111.000	0.000	0.050		9.338	0.359	#VALUE!	0.460	0.340	0.378	
TOTAL			0.000				1.781				#VALUE!				20.984

City of Manteca - WQCF Monthly Report

Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-Jul-2012	0.00	0.00	0.000	243.00	0.00	0.056	10.68	1.86	6.55	0.53	0.53	0.530
2-Jul-2012	0.00	0.00	0.000	106.00	0.00	0.054	10.29	1.73	6.30	0.53	0.53	0.530
3-Jul-2012	0.00	0.00	0.000	107.00	0.00	0.054	10.16	1.59	6.15	0.53	0.53	0.530
4-Jul-2012	0.00	0.00	0.000	94.00	0.00	0.050	9.98	1.73	6.29	0.76	0.43	0.537
5-Jul-2012	0.00	0.00	0.000	94.00	0.00	0.040	10.06	1.51	6.24	0.44	0.30	0.369
6-Jul-2012	0.00	0.00	0.000	91.00	0.00	0.042	10.44	1.79	6.09	0.35	0.28	0.305
7-Jul-2012	0.00	0.00	0.000	220.00	0.00	0.042	11.65	1.57	6.21	0.35	0.27	0.305
8-Jul-2012	0.00	0.00	0.000	251.00	0.00	0.053	10.87	0.83	6.25	0.37	0.29	0.326
9-Jul-2012	0.00	0.00	0.000	123.00	0.00	0.056	10.24	1.85	6.26	0.74	0.31	0.378
10-Jul-2012	0.00	0.00	0.000	254.00	0.00	0.045	10.08	1.88	6.20	0.44	0.32	0.366
11-Jul-2012	0.00	0.00	0.000	219.00	0.00	0.070	10.10	2.18	6.12	0.54	0.31	0.428
12-Jul-2012	0.00	0.00	0.000	256.00	0.00	0.061	10.77	1.90	6.21	0.54	0.53	0.536
13-Jul-2012	0.00	0.00	0.000	114.00	0.00	0.056	9.79	1.89	6.17	0.54	0.53	0.538
14-Jul-2012	0.00	0.00	0.000	119.00	0.00	0.053	10.67	1.76	6.25	0.54	0.53	0.538
15-Jul-2012	0.00	0.00	0.000	113.00	0.00	0.048	10.78	1.45	6.29	0.54	0.53	0.538
16-Jul-2012	0.00	0.00	0.000	238.00	0.00	0.048	9.94	1.95	6.29	0.54	0.53	0.539
17-Jul-2012	0.00	0.00	0.000	145.00	0.00	0.063	9.28	1.65	6.12	0.54	0.53	0.539
18-Jul-2012	0.00	0.00	0.000	227.00	0.00	0.052	9.29	1.90	6.36	0.54	0.53	0.539
19-Jul-2012	0.00	0.00	0.000	123.00	0.00	0.056	10.56	1.90	6.21	0.54	0.53	0.538
20-Jul-2012	0.00	0.00	0.000	123.00	0.00	0.057	10.27	1.57	6.32	0.54	0.53	0.538
21-Jul-2012	0.00	0.00	0.000	229.00	0.00	0.049	10.79	1.48	6.25	0.54	0.53	0.537
22-Jul-2012	0.00	0.00	0.000	126.00	0.00	0.054	10.51	0.87	6.33	0.54	0.53	0.537
23-Jul-2012	0.00	0.00	0.000	109.00	0.00	0.051	10.68	1.77	6.43	0.69	0.49	0.558
24-Jul-2012	0.00	0.00	0.000	247.00	0.00	0.043	11.46	1.39	6.58	0.51	0.36	0.426
25-Jul-2012	0.00	0.00	0.000	218.00	0.00	0.048	11.40	1.31	6.63	0.66	0.31	0.461
26-Jul-2012	0.00	0.00	0.000	121.00	0.00	0.055	9.53	1.76	6.56	0.62	0.62	0.620
27-Jul-2012	0.00	0.00	0.000	119.00	0.00	0.046	14.07	-0.30	6.38	20.60	0.00	0.633
28-Jul-2012	0.00	0.00	0.000	241.00	0.00	0.042	10.88	1.50	6.48	1.75	0.58	0.831
29-Jul-2012	0.00	0.00	0.000	239.00	0.00	0.062	10.58	1.24	6.47	1.90	0.63	1.027
30-Jul-2012	0.00	0.00	0.000	132.00	0.00	0.064	11.06	1.61	6.49	1.78	1.77	1.780
31-Jul-2012	0.00	0.00	0.000	135.00	0.00	0.064	9.72	1.89	6.52	1.78	1.77	1.780
AVERAGE	0.000	0.000	0.000	166.968	0.000	0.053	10.535	1.581	6.323	1.349	0.531	0.601
MAX	0.000	0.000	0.000	256.000	0.000	0.070	14.074	2.177	6.632	20.600	1.770	1.780
MIN	0.000	0.000	0.000	91.000	0.000	0.040	9.276	-0.298	6.095	0.350	0.000	0.305
TOTAL			0.000			1.633			196.000			18.637

City of Manteca - WQCF Monthly Report

Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-Aug-2012	0.00	0.00	0.000	127.00	0.00	0.065	9.88	2.26	6.68	1.78	1.77	1.780
2-Aug-2012	0.00	0.00	0.000	131.00	0.00	0.063	9.99	1.65	6.42	1.78	1.77	1.780
3-Aug-2012	0.00	0.00	0.000	125.00	0.00	0.062	9.59	2.04	6.57	1.78	1.77	1.780
4-Aug-2012	0.00	0.00	0.000	127.00	0.00	0.064	10.45	1.38	6.65	1.78	1.77	1.780
5-Aug-2012	0.00	0.00	0.000	148.00	0.00	0.065	11.36	1.82	6.82	1.78	0.44	1.039
6-Aug-2012	0.00	0.00	0.000	126.00	0.00	0.065	9.74	0.37	6.85	0.55	0.35	0.411
7-Aug-2012	0.00	0.00	0.000	144.00	0.00	0.065	12.32	2.16	7.22	0.68	0.29	0.437
8-Aug-2012	0.00	0.00	0.000	128.00	0.00	0.065	11.17	1.90	6.90	0.71	0.39	0.506
9-Aug-2012	0.00	0.00	0.000	126.00	0.00	0.066	10.08	2.13	7.10	0.51	0.35	0.439
10-Aug-2012	0.00	0.00	0.000	122.00	0.00	0.060	12.65	-0.32	6.42	0.39	0.39	0.390
11-Aug-2012	0.00	0.00	0.000	137.00	0.00	0.057	11.14	2.05	6.40	0.39	0.39	0.390
12-Aug-2012	0.00	0.00	0.000	114.00	0.00	0.053	11.90	0.81	6.51	0.62	0.32	0.385
13-Aug-2012	0.00	0.00	0.000	124.00	0.00	0.055	10.30	1.92	6.38	0.46	0.29	0.350
14-Aug-2012	0.00	0.00	0.000	114.00	0.00	0.055	10.00	1.90	6.33	0.50	0.30	0.360
15-Aug-2012	0.00	0.00	0.000	223.00	0.00	0.056	10.39	1.42	6.18	0.37	0.36	0.363
16-Aug-2012	0.00	0.00	0.000	114.00	0.00	0.055	9.56	1.56	6.59	0.37	0.36	0.364
17-Aug-2012	0.00	0.00	0.000	118.00	0.00	0.051	9.67	1.51	6.13	0.82	0.36	0.414
18-Aug-2012	0.00	0.00	0.000	218.00	0.00	0.044	10.87	1.54	6.22	0.42	0.32	0.365
19-Aug-2012	0.00	0.00	0.000	117.00	0.00	0.053	11.15	-0.19	6.56	0.84	0.30	0.331
20-Aug-2012	0.00	0.00	0.000	108.00	0.00	0.055	11.55	1.38	7.19	5.98	0.28	0.373
21-Aug-2012	0.00	0.00	0.000	120.00	0.00	0.055	10.40	2.30	7.02	0.41	0.41	0.410
22-Aug-2012	0.00	0.00	0.000	108.00	0.00	0.055	10.48	1.67	6.27	0.41	0.41	0.410
23-Aug-2012	0.00	0.00	0.000	127.00	0.00	0.054	11.41	1.48	6.43	0.41	0.41	0.410
24-Aug-2012	0.00	0.00	0.000	108.00	0.00	0.054	10.02	1.43	5.95	0.41	0.41	0.410
25-Aug-2012	0.00	0.00	0.000	108.00	0.00	0.054	10.63	1.39	6.30	0.41	0.41	0.410
26-Aug-2012	0.00	0.00	0.000	108.00	0.00	0.054	11.14	1.17	6.50	0.41	0.41	0.410
27-Aug-2012	0.00	0.00	0.000	102.00	0.00	0.054	10.35	1.74	6.32	0.41	0.41	0.410
28-Aug-2012	0.00	0.00	0.000	118.00	0.00	0.059	10.27	1.44	6.07	0.41	0.41	0.410
29-Aug-2012	0.00	0.00	0.000	179.00	0.00	0.059	10.32	1.51	6.30	0.41	0.41	0.410
30-Aug-2012	0.00	0.00	0.000	248.00	0.00	0.051	10.25	1.78	6.44	0.41	0.41	0.410
31-Aug-2012	0.00	0.00	0.000	121.00	0.00	0.058	9.88	1.65	6.43	0.41	0.41	0.410
AVERAGE	0.000	0.000	0.000	133.484	0.000	0.057	10.610	1.511	6.520	0.872	0.551	0.598
MAX	0.000	0.000	0.000	248.000	0.000	0.066	12.650	2.296	7.216	5.980	1.770	1.780
MIN	0.000	0.000	0.000	102.000	0.000	0.044	9.557	-0.321	5.952	0.370	0.280	0.331
TOTAL			0.000			1.778			202.122			18.547

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Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-Sep-2012	0.00	0.00	0.000	526.00	0.00	0.059	11.05	1.52	6.89	1.42	0.41	0.591
2-Sep-2012	0.00	0.00	0.000	122.00	0.00	0.053	10.63	1.50	6.11	0.58	0.41	0.490
3-Sep-2012	0.00	0.00	0.000	114.00	0.00	0.051	11.68	-0.25	6.69	0.63	0.36	0.405
4-Sep-2012	0.00	0.00	0.000	271.00	0.00	0.031	10.48	1.38	6.25	1.52	0.29	0.336
5-Sep-2012	0.00	0.00	0.000	113.00	0.00	0.057	11.04	1.34	6.36	0.44	0.28	0.320
6-Sep-2012	0.00	0.00	0.000	239.00	0.00	0.052	10.20	1.53	6.04	0.43	0.32	0.373
7-Sep-2012	0.00	0.00	0.000	112.00	0.00	0.060	9.16	1.51	6.07	1.13	0.34	0.421
8-Sep-2012	0.00	0.00	0.000	116.00	0.00	0.060	10.87	1.65	6.18	0.46	0.36	0.391
9-Sep-2012	0.00	0.00	0.000	225.00	0.00	0.056	12.26	1.38	6.53	0.47	0.35	0.400
10-Sep-2012	0.00	0.00	0.000	112.00	0.00	0.058	10.02	1.65	6.36	0.43	0.37	0.388
11-Sep-2012	0.00	0.00	0.000	124.00	0.00	0.059	9.95	2.21	6.28	0.62	0.36	0.413
12-Sep-2012	0.00	0.00	0.000	111.00	0.00	0.059	10.25	1.80	5.88	0.55	0.41	0.462
13-Sep-2012	0.00	0.00	0.000	110.00	0.00	0.055	10.32	1.76	6.20	2.98	0.43	0.658
14-Sep-2012	0.00	0.00	0.000	102.00	0.00	0.054	9.59	1.81	6.35	1.02	0.53	0.754
15-Sep-2012	0.00	0.00	0.000	212.00	0.00	0.052	11.92	1.58	6.65	1.11	0.68	0.897
16-Sep-2012	0.00	0.00	0.000	112.00	0.00	0.058	11.25	1.62	7.17	19.98	0.21	1.594
17-Sep-2012	0.00	0.00	0.000	113.00	0.00	0.059	10.30	2.05	6.83	0.71	0.45	0.552
18-Sep-2012	0.00	0.00	0.000	112.00	0.00	0.058	10.18	1.66	6.85	0.74	0.48	0.584
19-Sep-2012	0.00	0.00	0.000	111.00	0.00	0.059	10.10	1.84	6.72	0.88	0.53	0.645
20-Sep-2012	0.00	0.00	0.000	110.00	0.00	0.058	10.87	1.65	6.82	1.02	0.58	0.747
21-Sep-2012	0.00	0.00	0.000	113.00	0.00	0.058	10.26	1.66	6.70	1.21	0.71	0.933
22-Sep-2012	0.00	0.00	0.000	115.00	0.00	0.059	11.37	1.77	6.91	1.74	0.78	1.104
23-Sep-2012	0.00	0.00	0.000	116.00	0.00	0.058	11.34	1.03	7.12	1.55	0.85	1.135
24-Sep-2012	0.00	0.00	0.000	118.00	0.00	0.059	11.08	1.72	6.82	1.15	0.70	0.897
25-Sep-2012	0.00	0.00	0.000	110.00	0.00	0.059	9.93	1.54	6.97	1.25	0.69	0.956
26-Sep-2012	0.00	0.00	0.000	114.00	0.00	0.056	10.22	1.71	6.72	1.22	0.75	0.934
27-Sep-2012	0.00	0.00	0.000	118.00	0.00	0.057	10.91	1.82	6.82	1.38	0.70	0.940
28-Sep-2012	0.00	0.00	0.000	109.00	0.00	0.058	9.64	1.62	6.66	1.10	0.67	0.872
29-Sep-2012	0.00	0.00	0.000	117.00	0.00	0.058	11.50	2.19	6.78	1.18	0.66	0.873
30-Sep-2012	0.00	0.00	0.000	113.00	0.00	0.056	11.35	0.97	6.60	1.06	0.64	0.820
1-Oct-2012	0.00	0.00	0.000	113.00	0.00	0.055	10.40	1.31	6.25	1.13	0.65	0.820
AVERAGE	0.000	0.000	0.000	142.677	0.000	0.056	10.649	1.565	6.567	1.648	0.515	0.700
MAX	0.000	0.000	0.000	526.000	0.000	0.060	12.256	2.211	7.168	19.980	0.850	1.594
MIN	0.000	0.000	0.000	102.000	0.000	0.031	9.161	-0.248	5.884	0.430	0.210	0.320
TOTAL			0.000			1.741			203.574			21.705

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	SOUTH PLANT RECYCLE FLOW				S. PLANT GRIT FLOW				TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)		Max (GPM)	Min (GPM)	Total (MG)		Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
Day														
1-Oct-2012	0.00	0.00	0.000		113.00	0.00	0.055		10.40	1.31	6.25	1.13	0.65	0.820
2-Oct-2012	0.00	0.00	0.000		121.00	0.00	0.058		8.99	1.24	6.25	1.01	0.62	0.774
3-Oct-2012	0.00	0.00	0.000		111.00	0.00	0.058		9.66	1.23	6.37	1.05	0.55	0.740
4-Oct-2012	0.00	0.00	0.000		110.00	0.00	0.059		8.54	1.68	6.75	1.02	0.60	0.738
5-Oct-2012	0.00	0.00	0.000		114.00	0.00	0.059		8.74	1.81	6.50	0.99	0.61	0.733
6-Oct-2012	0.00	0.00	0.000		217.00	0.00	0.052		10.56	1.36	6.67	1.16	0.62	0.786
7-Oct-2012	0.00	0.00	0.000		183.00	0.00	0.048		10.73	1.02	6.93	1.07	0.62	0.785
8-Oct-2012	0.00	0.00	0.000		117.00	0.00	0.062		9.46	2.20	6.42	1.03	0.64	0.766
9-Oct-2012	0.00	0.00	0.000		117.00	0.00	0.061		9.57	1.35	5.88	1.05	0.62	0.752
10-Oct-2012	0.00	0.00	0.000		116.00	0.00	0.061		9.57	1.46	5.95	19.98	0.45	6.795
11-Oct-2012	0.00	0.00	0.000		116.00	0.00	0.061		9.67	1.47	6.16	0.56	0.28	0.409
12-Oct-2012	0.00	0.00	0.000		119.00	0.00	0.061		8.91	1.40	6.37	0.49	0.32	0.390
13-Oct-2012	0.00	0.00	0.000		116.00	0.00	0.062		10.31	1.63	6.71	0.52	0.43	0.493
14-Oct-2012	0.00	0.00	0.000		121.00	0.00	0.062		10.49	1.59	6.84	1.20	0.52	0.678
15-Oct-2012	0.00	0.00	0.000		131.00	0.00	0.062		9.08	2.12	6.28	0.72	0.49	0.553
16-Oct-2012	0.00	0.00	0.000		248.00	0.00	0.057		9.34	1.49	6.06	0.80	0.42	0.562
17-Oct-2012	0.00	0.00	0.000		140.00	0.00	0.061		9.48	1.82	6.19	0.76	0.48	0.559
18-Oct-2012	0.00	0.00	0.000		114.00	0.00	0.056		9.11	1.20	6.38	0.60	0.45	0.515
19-Oct-2012	0.00	0.00	0.000		104.00	0.00	0.050		8.98	1.53	6.64	0.64	0.45	0.519
20-Oct-2012	0.00	0.00	0.000		125.00	0.00	0.058		10.38	1.56	6.92	0.64	0.48	0.555
21-Oct-2012	0.00	0.00	0.000		200.00	0.00	0.052		10.85	1.58	7.12	19.12	0.44	0.592
22-Oct-2012	0.00	0.00	0.000		106.00	0.00	0.052		9.69	1.58	6.92	0.90	0.41	0.534
23-Oct-2012	0.00	0.00	0.000		111.00	0.00	0.053		10.01	1.63	6.91	0.55	0.42	0.472
24-Oct-2012	0.00	0.00	0.000		109.00	0.00	0.055		9.54	1.65	6.62	0.54	0.39	0.443
25-Oct-2012	0.00	0.00	0.000		116.00	0.00	0.056		9.64	1.67	6.59	0.48	0.38	0.425
26-Oct-2012	0.00	0.00	0.000		106.00	0.00	0.055		8.86	1.75	6.56	0.50	0.38	0.427
27-Oct-2012	0.00	0.00	0.000		231.00	0.00	0.055		10.49	1.62	6.89	0.69	0.38	0.475
28-Oct-2012	0.00	0.00	0.000		109.00	0.00	0.057		10.32	1.57	7.08	0.49	0.36	0.415
29-Oct-2012	0.00	0.00	0.000		112.00	0.00	0.054		9.43	2.08	6.56	6.06	0.35	0.461
30-Oct-2012	0.00	0.00	0.000		250.00	0.00	0.058		10.18	2.08	6.69	0.41	0.30	0.341
31-Oct-2012	0.00	0.00	0.000		246.00	0.00	0.047		9.32	1.95	6.38	0.53	0.30	0.322
AVERAGE	0.000	0.000	0.000		140.290	0.000	0.057		9.688	1.601	6.544	2.151	0.465	0.769
MAX	0.000	0.000	0.000		250.000	0.000	0.062		10.851	2.203	7.116	19.980	0.650	6.795
MIN	0.000	0.000	0.000		104.000	0.000	0.047		8.543	1.022	5.885	0.410	0.280	0.322
TOTAL			0.000				1.758				202.872			23.828

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Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-Nov-2012	0.00	0.00	0.000	116.00	0.00	0.062	9.66	1.45	6.69	2.21	0.29	0.646
2-Nov-2012	0.00	0.00	0.000	120.00	0.00	0.061	9.47	1.83	6.47	0.44	0.28	0.328
3-Nov-2012	0.00	0.00	0.000	164.00	0.00	0.057	11.09	1.48	6.84	0.38	0.28	0.329
4-Nov-2012	0.00	0.00	0.000	114.00	0.00	0.059	10.96	1.31	7.32	0.38	0.29	0.343
5-Nov-2012	0.00	0.00	0.000	112.00	0.00	0.057	10.10	1.76	6.73	6.00	0.31	0.387
6-Nov-2012	0.00	0.00	0.000	107.00	0.00	0.049	9.60	1.44	6.95	2.65	0.31	0.992
7-Nov-2012	0.00	0.00	0.000	245.00	0.00	0.059	9.86	2.14	7.45	0.61	0.32	0.368
8-Nov-2012	0.00	0.00	0.000	121.00	0.00	0.065	10.11	2.00	7.28	4.29	0.32	0.411
9-Nov-2012	0.00	0.00	0.000	130.00	0.00	0.065	9.49	2.18	7.07	1.49	0.31	0.375
10-Nov-2012	0.00	0.00	0.000	121.00	0.00	0.065	11.42	2.00	7.45	0.41	0.29	0.346
11-Nov-2012	0.00	0.00	0.000	127.00	0.00	0.064	10.56	1.59	7.06	0.40	0.31	0.335
12-Nov-2012	0.00	0.00	0.000	123.00	0.00	0.058	11.10	1.92	7.14	0.38	0.29	0.325
13-Nov-2012	0.00	0.00	0.000	242.00	0.00	0.019	9.28	1.41	6.48	0.36	0.27	0.310
14-Nov-2012	0.00	0.00	0.000	176.00	0.00	0.049	9.54	1.69	6.73	1.07	0.27	0.318
15-Nov-2012	0.00	0.00	0.000	242.00	0.00	0.053	10.01	1.67	6.69	0.50	0.27	0.303
16-Nov-2012	0.00	0.00	0.000	99.00	0.00	0.050	9.18	1.63	6.60	0.69	0.26	0.312
17-Nov-2012	0.00	0.00	0.000	242.00	0.00	0.054	10.81	1.69	6.95	1.27	0.28	0.368
18-Nov-2012	0.00	0.00	0.000	219.00	0.00	0.049	10.20	1.86	7.11	0.88	0.28	0.343
19-Nov-2012	0.00	0.00	0.000	117.00	0.00	0.057	8.90	2.22	6.30	0.38	0.29	0.334
20-Nov-2012	0.00	0.00	0.000	116.00	0.00	0.058	9.82	1.39	6.30	0.41	0.30	0.352
21-Nov-2012	0.00	0.00	0.000	112.00	0.00	0.058	9.43	1.57	6.19	0.45	0.32	0.381
22-Nov-2012	0.00	0.00	0.000	220.00	0.00	0.052	11.45	1.47	6.47	1.43	0.35	0.612
23-Nov-2012	0.00	0.00	0.000	241.00	0.00	0.055	10.03	1.62	5.86	0.43	0.33	0.373
24-Nov-2012	0.00	0.00	0.000	118.00	0.00	0.057	10.61	1.50	6.19	0.48	0.32	0.385
25-Nov-2012	0.00	0.00	0.000	116.00	0.00	0.057	10.78	1.42	6.52	0.46	0.33	0.390
26-Nov-2012	0.00	0.00	0.000	214.00	0.00	0.055	9.53	1.48	6.07	0.55	0.34	0.392
27-Nov-2012	0.00	0.00	0.000	233.00	0.00	0.050	9.13	1.51	6.14	0.48	0.33	0.396
28-Nov-2012	0.00	0.00	0.000	101.00	0.00	0.051	9.74	1.67	6.00	0.55	0.36	0.437
29-Nov-2012	0.00	0.00	0.000	105.00	0.00	0.050	9.53	1.47	5.86	0.49	0.36	0.409
30-Nov-2012	0.00	0.00	0.000	213.00	0.00	0.048	11.10	1.63	6.91	19.98	0.35	0.595
1-Dec-2012	0.00	0.00	0.000	111.00	0.00	0.041	10.33	1.63	6.47	0.45	0.33	0.381
AVERAGE	0.000	0.000	0.000	156.032	0.000	0.054	10.091	1.665	6.655	1.644	0.308	0.406
MAX	0.000	0.000	0.000	245.000	0.000	0.065	11.445	2.220	7.452	19.980	0.360	0.992
MIN	0.000	0.000	0.000	99.000	0.000	0.019	8.901	1.306	5.861	0.360	0.260	0.303
TOTAL			0.000			1.683			206.309			12.576

City of Manteca - WQCF Monthly Report

	SOUTH PLANT RECYCLE FLOW				S. PLANT GRIT FLOW				TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY			
	Max (GPM)	Min (GPM)	Total (MG)		Max (GPM)	Min (GPM)	Total (MG)		Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)	
Day															
1-Dec-2012	0.00	0.00	0.000		111.00	0.00	0.041		10.33	1.63	6.47	0.45	0.33	0.381	
2-Dec-2012	0.00	0.00	0.000		225.00	0.00	0.046		11.34	1.40	7.47	0.57	0.33	0.408	
3-Dec-2012	0.00	0.00	0.000		130.00	0.00	0.063		9.50	1.19	6.36	0.46	0.34	0.389	
4-Dec-2012	0.00	0.00	0.000		127.00	0.00	0.063		9.31	1.71	5.95	0.66	0.32	0.378	
5-Dec-2012	0.00	0.00	0.000		129.00	0.00	0.064		9.98	1.64	6.66	0.49	0.30	0.365	
6-Dec-2012	0.00	0.00	0.000		219.00	0.00	0.056		9.18	1.64	6.28	4.63	0.30	0.421	
7-Dec-2012	0.00	0.00	0.000		230.00	0.00	0.050		8.70	2.11	6.12	3.18	0.28	0.423	
8-Dec-2012	0.00	0.00	0.000		237.00	0.00	0.043		10.74	1.54	6.31	1.91	0.29	0.456	
9-Dec-2012	0.00	0.00	0.000		137.00	0.00	0.041		10.49	1.61	6.51	1.73	0.33	0.486	
10-Dec-2012	0.00	0.00	0.000		246.00	0.00	0.058		9.66	1.85	6.12	1.03	0.29	0.434	
11-Dec-2012	0.00	0.00	0.000		228.00	0.00	0.055		9.41	1.65	6.31	0.99	0.28	0.400	
12-Dec-2012	0.00	0.00	0.000		104.00	0.00	0.051		9.91	1.67	6.61	0.44	0.31	0.360	
13-Dec-2012	0.00	0.00	0.000		233.00	0.00	0.042		9.78	1.70	6.52	0.69	0.30	0.363	
14-Dec-2012	0.00	0.00	0.000		110.00	0.00	0.055		8.90	1.73	6.38	0.53	0.30	0.327	
15-Dec-2012	0.00	0.00	0.000		234.00	0.00	0.049		10.41	1.54	6.56	0.62	0.28	0.344	
16-Dec-2012	0.00	0.00	0.000		252.00	0.00	0.038		10.22	1.63	6.87	0.39	0.28	0.332	
17-Dec-2012	0.00	0.00	0.000		107.00	0.00	0.053		9.66	1.79	6.55	7.20	0.13	0.408	
18-Dec-2012	0.00	0.00	0.000		215.00	0.00	0.050		9.53	1.55	6.45	0.91	0.31	0.419	
19-Dec-2012	0.00	0.00	0.000		253.00	0.00	0.042		9.47	1.38	6.52	0.41	0.31	0.356	
20-Dec-2012	0.00	0.00	0.000		237.00	0.00	0.055		9.30	1.70	6.33	0.42	0.30	0.355	
21-Dec-2012	0.00	0.00	0.000		117.00	0.00	0.056		10.29	1.86	6.38	0.42	0.31	0.364	
22-Dec-2012	0.00	0.00	0.000		120.00	0.00	0.055		9.49	1.55	6.81	0.71	0.33	0.387	
23-Dec-2012	0.00	0.00	0.000		108.00	0.00	0.047		11.98	1.51	7.49	1.77	0.34	0.425	
24-Dec-2012	0.00	0.00	0.000		219.00	0.00	0.043		11.43	1.62	6.81	0.50	0.34	0.410	
25-Dec-2012	0.00	0.00	0.000		224.00	0.00	0.050		10.50	1.60	6.34	0.46	0.32	0.381	
26-Dec-2012	0.00	0.00	0.000		118.00	0.00	0.058		10.55	2.11	6.53	0.46	0.32	0.378	
27-Dec-2012	0.00	0.00	0.000		256.00	0.00	0.056		9.42	1.93	6.30	0.81	0.34	0.441	
28-Dec-2012	0.00	0.00	0.000		128.00	0.00	0.058		9.44	1.63	6.04	0.46	0.31	0.390	
29-Dec-2012	0.00	0.00	0.000		228.00	0.00	0.058		10.34	1.60	6.32	0.92	0.44	0.512	
30-Dec-2012	0.00	0.00	0.000		219.00	0.00	0.047		10.34	1.65	6.30	0.53	0.35	0.435	
31-Dec-2012	0.00	0.00	0.000		215.00	0.00	0.059		10.92	1.71	6.22	0.53	0.37	0.441	
AVERAGE	0.000	0.000	0.000		184.387	0.000	0.052		10.016	1.660	6.481	1.138	0.312	0.399	
MAX	0.000	0.000	0.000		256.000	0.000	0.064		11.982	2.114	7.487	7.200	0.440	0.512	
MIN	0.000	0.000	0.000		104.000	0.000	0.038		8.702	1.188	5.948	0.390	0.130	0.327	
TOTAL			0.000				1.602				200.911				12.367

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	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
Day												
1-Jan-2013	0.00	0.00	0.000	235.00	0.00	0.058	10.06	1.70	5.90	0.51	0.35	0.409
2-Jan-2013	0.00	0.00	0.000	110.00	0.00	0.050	10.57	1.69	6.25	2.47	0.34	0.680
3-Jan-2013	0.00	0.00	0.000	225.00	0.00	0.051	9.80	1.88	6.08	0.45	0.30	0.370
4-Jan-2013	0.00	0.00	0.000	224.00	0.00	0.054	9.09	1.66	6.06	0.54	0.34	0.404
5-Jan-2013	0.00	0.00	0.000	217.00	0.00	0.055	10.13	1.56	6.36	8.33	0.35	0.590
6-Jan-2013	0.00	0.00	0.000	228.00	0.00	0.053	11.33	1.35	6.94	0.59	0.31	0.358
7-Jan-2013	0.00	0.00	0.000	234.00	0.00	0.052	9.34	1.72	6.30	0.52	0.36	0.415
8-Jan-2013	0.00	0.00	0.000	230.00	0.00	0.047	8.66	1.77	6.47	0.49	0.34	0.402
9-Jan-2013	0.00	0.00	0.000	232.00	0.00	0.037	10.04	1.65	6.13	10.09	0.31	0.428
10-Jan-2013	0.00	0.00	0.000	108.00	0.00	0.054	8.94	1.60	6.11	0.37	0.29	0.322
11-Jan-2013	0.00	0.00	0.000	116.00	0.00	0.054	9.16	1.73	6.04	0.39	0.29	0.322
12-Jan-2013	0.00	0.00	0.000	112.00	0.00	0.057	10.10	1.64	6.22	0.48	0.30	0.359
13-Jan-2013	0.00	0.00	0.000	109.00	0.00	0.057	10.47	1.34	6.41	0.42	0.29	0.339
14-Jan-2013	0.00	0.00	0.000	114.00	0.00	0.053	9.08	1.66	6.07	0.89	0.30	0.417
15-Jan-2013	0.00	0.00	0.000	214.00	0.00	0.054	9.65	1.69	6.08	0.53	0.42	0.461
16-Jan-2013	0.00	0.00	0.000	249.00	0.00	0.051	11.72	1.66	6.04	0.52	0.39	0.453
17-Jan-2013	0.00	0.00	0.000	217.00	0.00	0.044	9.30	1.60	6.03	0.54	0.41	0.467
18-Jan-2013	0.00	0.00	0.000	116.00	0.00	0.058	9.40	1.59	5.91	0.54	0.41	0.469
19-Jan-2013	0.00	0.00	0.000	221.00	0.00	0.055	10.43	1.25	6.19	0.66	0.40	0.508
20-Jan-2013	0.00	0.00	0.000	234.00	0.00	0.058	11.39	1.22	6.13	0.87	0.43	0.559
21-Jan-2013	0.00	0.00	0.000	116.00	0.00	0.058	10.01	1.34	6.69	0.77	0.44	0.532
22-Jan-2013	0.00	0.00	0.000	168.00	0.00	0.056	9.14	2.10	6.37	0.57	0.43	0.477
23-Jan-2013	0.00	0.00	0.000	112.00	0.00	0.057	9.06	1.48	5.95	0.53	0.38	0.417
24-Jan-2013	0.00	0.00	0.000	123.00	0.00	0.059	9.59	1.49	5.93	0.51	0.36	0.405
25-Jan-2013	0.00	0.00	0.000	122.00	0.00	0.059	9.39	1.65	5.97	0.50	0.36	0.430
26-Jan-2013	0.00	0.00	0.000	219.00	0.00	0.051	9.84	1.30	6.12	0.54	0.38	0.452
27-Jan-2013	0.00	0.00	0.000	236.00	0.00	0.059	10.70	0.74	6.55	19.69	0.37	0.817
28-Jan-2013	0.00	0.00	0.000	113.00	0.00	0.054	9.59	1.34	5.99	0.51	0.35	0.426
29-Jan-2013	0.00	0.00	0.000	109.00	0.00	0.056	9.48	1.39	5.98	0.56	0.40	0.454
30-Jan-2013	0.00	0.00	0.000	109.00	0.00	0.056	8.89	1.71	5.87	0.67	0.40	0.503
31-Jan-2013	0.00	0.00	0.000	213.00	0.00	0.056	8.31	1.32	5.63	0.64	0.42	0.502
AVERAGE	0.000	0.000	0.000	173.710	0.000	0.054	9.763	1.544	6.154	1.796	0.362	0.456
MAX	0.000	0.000	0.000	249.000	0.000	0.059	11.718	2.103	6.939	19.690	0.440	0.817
MIN	0.000	0.000	0.000	108.000	0.000	0.037	8.313	0.744	5.631	0.370	0.290	0.322
TOTAL			0.000			1.673			190.763			14.147

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	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
Day												
1-Feb-2013	0.00	0.00	0.000	213.00	0.00	0.059	8.86	1.54	5.99	0.64	0.39	0.489
2-Feb-2013	0.00	0.00	0.000	113.00	0.00	0.052	10.34	1.42	6.01	0.60	0.39	0.484
3-Feb-2013	0.00	0.00	0.000	226.00	0.00	0.047	10.07	1.17	6.09	0.66	0.40	0.466
4-Feb-2013	0.00	0.00	0.000	100.00	0.00	0.052	12.73	3.11	6.51	0.56	0.38	0.460
5-Feb-2013	0.00	0.00	0.000	98.00	0.00	0.021	9.22	1.56	5.76	0.63	0.40	0.445
6-Feb-2013	0.00	0.00	0.000	262.00	0.00	0.032	9.08	1.42	5.96	0.60	0.36	0.423
7-Feb-2013	0.00	0.00	0.000	236.00	0.00	0.055	9.25	1.43	6.01	0.47	0.37	0.409
8-Feb-2013	0.00	0.00	0.000	258.00	0.00	0.052	9.79	1.49	5.84	0.51	0.36	0.416
9-Feb-2013	0.00	0.00	0.000	230.00	0.00	0.050	10.70	1.40	6.17	17.88	0.42	0.551
10-Feb-2013	0.00	0.00	0.000	104.00	0.00	0.051	10.18	1.49	6.25	0.51	0.37	0.435
11-Feb-2013	0.00	0.00	0.000	99.00	0.00	0.047	9.12	1.68	6.20	0.48	0.30	0.377
12-Feb-2013	0.00	0.00	0.000	223.00	0.00	0.050	9.39	1.64	5.93	0.50	0.30	0.357
13-Feb-2013	0.00	0.00	0.000	107.00	0.00	0.052	9.32	1.44	5.81	0.44	0.34	0.390
14-Feb-2013	0.00	0.00	0.000	220.00	0.00	0.052	9.02	1.59	5.95	0.48	0.35	0.408
15-Feb-2013	0.00	0.00	0.000	108.00	0.00	0.053	9.09	1.66	5.95	0.53	0.37	0.443
16-Feb-2013	0.00	0.00	0.000	116.00	0.00	0.043	11.07	1.47	6.16	1.50	0.39	0.511
17-Feb-2013	0.00	0.00	0.000	240.00	0.00	0.041	9.81	1.43	6.04	0.53	0.36	0.427
18-Feb-2013	0.00	0.00	0.000	120.00	0.00	0.061	10.06	1.35	6.33	0.48	0.35	0.398
19-Feb-2013	0.00	0.00	0.000	129.00	0.00	0.061	9.40	1.37	6.19	0.56	0.36	0.396
20-Feb-2013	0.00	0.00	0.000	121.00	0.00	0.063	9.88	1.35	6.02	0.47	0.35	0.400
21-Feb-2013	0.00	0.00	0.000	205.00	0.00	0.061	8.36	1.44	5.80	0.52	0.35	0.417
22-Feb-2013	0.00	0.00	0.000	128.00	0.00	0.055	9.19	1.33	6.10	0.51	0.38	0.440
23-Feb-2013	0.00	0.00	0.000	232.00	0.00	0.048	10.83	1.44	6.16	0.71	0.37	0.481
24-Feb-2013	0.00	0.00	0.000	116.00	0.00	0.056	9.99	1.31	6.20	0.55	0.36	0.409
25-Feb-2013	0.00	0.00	0.000	114.00	0.00	0.057	9.82	1.36	6.14	0.51	0.34	0.412
26-Feb-2013	0.00	0.00	0.000	112.00	0.00	0.057	9.30	1.41	5.97	0.56	0.33	0.401
27-Feb-2013	0.00	0.00	0.000	134.00	0.00	0.058	9.03	1.42	5.77	1.20	0.32	0.423
28-Feb-2013	0.00	0.00	0.000	215.00	0.00	0.055	9.33	1.38	6.31	0.51	0.33	0.388
1-Mar-2013	0.00	0.00	0.000	221.00	0.00	0.054	8.82	1.88	5.99	0.52	0.35	0.408
2-Mar-2013	0.00	0.00	0.000	214.00	0.00	0.050	10.29	1.33	6.10	19.98	0.33	0.647
3-Mar-2013	0.00	0.00	0.000	162.00	0.00	0.065	9.94	1.16	6.34	0.42	0.31	0.348
AVERAGE	0.000	0.000	0.000	166.968	0.000	0.052	9.719	1.499	6.066	1.775	0.357	0.434
MAX	0.000	0.000	0.000	262.000	0.000	0.065	12.735	3.112	6.509	19.980	0.420	0.647
MIN	0.000	0.000	0.000	98.000	0.000	0.021	8.360	1.164	5.764	0.420	0.300	0.348
TOTAL			0.000			1.613			188.045			13.460

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Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-Mar-2013	0.00	0.00	0.000	221.00	0.00	0.054	8.82	1.88	5.99	0.52	0.35	0.408
2-Mar-2013	0.00	0.00	0.000	214.00	0.00	0.050	10.29	1.33	6.10	19.98	0.33	0.647
3-Mar-2013	0.00	0.00	0.000	162.00	0.00	0.065	9.94	1.16	6.34	0.42	0.31	0.348
4-Mar-2013	0.00	0.00	0.000	143.00	0.00	0.074	9.22	1.40	6.04	0.34	0.34	0.340
5-Mar-2013	0.00	0.00	0.000	251.00	0.00	0.064	9.73	1.68	6.04	0.34	0.34	0.340
6-Mar-2013	0.00	0.00	0.000	109.00	0.00	0.051	9.14	1.55	5.95	0.34	0.34	0.340
7-Mar-2013	0.00	0.00	0.000	242.00	0.00	0.049	8.75	1.39	5.69	0.34	0.34	0.340
8-Mar-2013	0.00	0.00	0.000	241.00	0.00	0.043	8.76	1.38	6.05	0.34	0.34	0.340
9-Mar-2013	0.00	0.00	0.000	106.00	0.00	0.050	9.30	1.38	6.17	0.98	0.34	0.454
10-Mar-2013	0.00	0.00	0.000	109.00	0.00	0.050	9.76	1.53	6.15	0.48	0.28	0.361
11-Mar-2013	0.00	0.00	0.000	107.00	0.00	0.052	9.47	1.40	6.17	0.46	0.30	0.360
12-Mar-2013	0.00	0.00	0.000	107.00	0.00	0.044	9.36	1.68	6.16	4.06	0.28	0.436
13-Mar-2013	0.00	0.00	0.000	257.00	0.00	0.037	9.03	1.63	6.15	0.68	0.32	0.412
14-Mar-2013	0.00	0.00	0.000	107.00	0.00	0.054	9.68	1.45	5.94	0.41	0.30	0.349
15-Mar-2013	0.00	0.00	0.000	116.00	0.00	0.057	9.27	1.46	5.85	0.51	0.32	0.384
16-Mar-2013	0.00	0.00	0.000	125.00	0.00	0.060	11.00	1.42	6.08	0.52	0.36	0.424
17-Mar-2013	0.00	0.00	0.000	124.00	0.00	0.060	9.85	1.12	6.03	0.45	0.35	0.390
18-Mar-2013	0.00	0.00	0.000	117.00	0.00	0.062	9.72	1.18	6.23	0.56	0.35	0.414
19-Mar-2013	0.00	0.00	0.000	124.00	0.00	0.055	10.17	1.33	5.87	0.46	0.33	0.380
20-Mar-2013	0.00	0.00	0.000	215.00	0.00	0.045	9.54	1.36	5.87	0.42	0.31	0.362
21-Mar-2013	0.00	0.00	0.000	230.00	0.00	0.053	9.96	1.34	5.76	0.58	0.30	0.361
22-Mar-2013	0.00	0.00	0.000	230.00	0.00	0.054	9.45	1.39	5.72	0.40	0.29	0.333
23-Mar-2013	0.00	0.00	0.000	231.00	0.00	0.053	10.48	1.30	6.03	0.42	0.27	0.317
24-Mar-2013	0.00	0.00	0.000	109.00	0.00	0.051	9.70	1.17	5.86	0.40	0.27	0.325
25-Mar-2013	0.00	0.00	0.000	185.00	0.00	0.051	9.63	1.22	6.03	0.38	0.27	0.320
26-Mar-2013	0.00	0.00	0.000	113.00	0.00	0.057	9.14	1.58	5.74	0.41	0.29	0.330
27-Mar-2013	0.00	0.00	0.000	110.00	0.00	0.053	9.29	1.34	6.00	0.44	0.27	0.314
28-Mar-2013	0.00	0.00	0.000	122.00	0.00	0.055	9.50	1.33	6.03	0.38	0.26	0.302
29-Mar-2013	0.00	0.00	0.000	114.00	0.00	0.058	9.87	1.49	5.93	0.39	0.25	0.291
30-Mar-2013	0.00	0.00	0.000	113.00	0.00	0.059	10.28	1.40	6.04	0.36	0.26	0.297
31-Mar-2013	0.00	0.00	0.000	112.00	0.00	0.056	14.13	1.72	7.59	19.94	0.28	0.734
AVERAGE	0.000	0.000	0.000	156.968	0.000	0.054	9.749	1.420	6.052	1.829	0.308	0.379
MAX	0.000	0.000	0.000	257.000	0.000	0.074	14.128	1.883	7.595	19.980	0.360	0.734
MIN	0.000	0.000	0.000	106.000	0.000	0.037	8.753	1.118	5.689	0.340	0.250	0.291
TOTAL			0.000			1.677			187.615			11.753

City of Manteca - WQCF Monthly Report

Day	SOUTH PLANT RECYCLE FLOW			S. PLANT GRIT FLOW			TOTAL PLANT FLOW INSTANTANEOUS			FINAL EFFLUENT TURBIDITY		
	Max (GPM)	Min (GPM)	Total (MG)	Max (GPM)	Min (GPM)	Total (MG)	Max (MGD)	Min (MGD)	Total (MG)	Max (NTU)	Min (NTU)	Average (NTU)
1-Apr-2013	0.00	0.00	0.000	241.00	0.00	0.050	10.29	1.81	6.72	0.31	0.25	0.276
2-Apr-2013	0.00	0.00	0.000	234.00	0.00	0.042	9.01	1.36	5.99	0.35	0.26	0.296
3-Apr-2013	0.00	0.00	0.000	133.00	0.00	0.058	9.41	1.65	6.17	0.99	0.26	0.373
4-Apr-2013	0.00	0.00	0.000	238.00	0.00	0.056	12.99	1.72	6.73	0.47	0.32	0.378
5-Apr-2013	0.00	0.00	0.000	228.00	0.00	0.055	10.08	1.87	6.54	0.40	0.30	0.341
6-Apr-2013	0.00	0.00	0.000	116.00	0.00	0.058	10.87	1.78	6.42	0.48	0.31	0.350
7-Apr-2013	0.00	0.00	0.000	112.00	0.00	0.052	10.20	1.80	6.56	2.04	0.26	0.564
8-Apr-2013	0.00	0.00	0.000	222.00	0.00	0.050	9.66	1.51	6.28	0.41	0.25	0.310
9-Apr-2013	0.00	0.00	0.000	114.00	0.00	0.059	9.82	1.37	6.05	0.40	0.27	0.322
10-Apr-2013	0.00	0.00	0.000	234.00	0.00	0.060	10.03	1.66	6.17	0.44	0.27	0.331
11-Apr-2013	0.00	0.00	0.000	116.00	0.00	0.057	9.94	1.68	5.97	0.38	0.28	0.322
12-Apr-2013	0.00	0.00	0.000	243.00	0.00	0.050	12.16	1.44	6.24	0.49	0.29	0.358
13-Apr-2013	0.00	0.00	0.000	108.00	0.00	0.055	12.56	3.23	7.94	0.47	0.36	0.404
14-Apr-2013	0.00	0.00	0.000	230.00	0.00	0.055	12.42	3.21	8.09	0.53	0.30	0.397
15-Apr-2013	0.00	0.00	0.000	116.00	0.00	0.056	10.60	3.39	7.19	1.17	0.48	0.525
16-Apr-2013	0.00	0.00	0.000	231.00	0.00	0.052	10.80	3.23	7.33	0.50	0.49	0.499
17-Apr-2013	0.00	0.00	0.000	114.00	0.00	0.057	9.77	1.35	6.09	0.50	0.49	0.499
18-Apr-2013	0.00	0.00	0.000	109.00	0.00	0.057	9.85	1.45	6.02	0.50	0.49	0.499
19-Apr-2013	0.00	0.00	0.000	110.00	0.00	0.055	9.31	1.32	6.10	0.50	0.49	0.498
20-Apr-2013	0.00	0.00	0.000	210.00	0.00	0.052	10.49	1.39	6.12	0.86	0.49	0.558
21-Apr-2013	0.00	0.00	0.000	106.00	0.00	0.055	10.40	1.45	6.38	0.56	0.34	0.453
22-Apr-2013	0.00	0.00	0.000	104.00	0.00	0.054	9.83	1.70	6.47	0.52	0.31	0.393
23-Apr-2013	0.00	0.00	0.000	103.00	0.00	0.052	10.13	1.92	6.55	0.40	0.32	0.371
24-Apr-2013	0.00	0.00	0.000	223.00	0.00	0.055	10.33	1.74	6.60	0.39	0.32	0.342
25-Apr-2013	0.00	0.00	0.000	236.00	0.00	0.056	10.34	2.09	6.57	0.35	0.29	0.311
26-Apr-2013	0.00	0.00	0.000	122.00	0.00	0.060	9.11	1.78	6.46	0.37	0.29	0.311
27-Apr-2013	0.00	0.00	0.000	229.00	0.00	0.053	10.81	1.92	6.59	0.34	0.34	0.340
28-Apr-2013	0.00	0.00	0.000	239.00	0.00	0.045	11.07	1.28	6.24	0.34	0.34	0.340
29-Apr-2013	0.00	0.00	0.000	246.00	0.00	0.050	10.37	0.75	6.77	0.34	0.34	0.340
30-Apr-2013	0.00	0.00	0.000	241.00	0.00	0.051	9.70	1.72	6.33	0.34	0.34	0.340
1-May-2013	0.00	0.00	0.000	115.00	0.00	0.058	9.83	1.75	6.48	0.34	0.34	0.340
AVERAGE	0.000	0.000	0.000	174.935	0.000	0.054	10.393	1.817	6.521	0.532	0.338	0.387
MAX	0.000	0.000	0.000	246.000	0.000	0.060	12.993	3.393	8.088	2.040	0.490	0.564
MIN	0.000	0.000	0.000	103.000	0.000	0.042	9.008	0.753	5.973	0.310	0.250	0.276
TOTAL			0.000			1.672			202.154			11.982

SECTION 01060

SAFETY AND HEALTH

PART 1 GENERAL

1.1 GENERAL

A. RAW WASTEWATER.

Portions of the wastewater quality control facility, including the wet well and trunk sewers, are exposed to raw wastewater. Other portions of the facility are exposed to wastewaters of varying degrees of treatment. The Contractor certifies that he is experienced and qualified to anticipate and meet the safety and health requirements of this project.

Workmen involved in the removal, renovation, or installation of equipment within the treatment plant may be exposed to disease-producing organisms. The Contractor shall require his personnel to observe proper hygienic and safety precautions. Solvents, gasoline, and other hazardous material enter the plant with incoming sewage, and, therefore, certain areas are hazardous to open flame, sparks, or unventilated occupancy. The Contractor shall take measures to assure his personnel observe proper safety precautions when working in these areas.

B. WET WELL PERMITTED CONFINED SPACE.

The wet side of the Influent Pump Station including the wet well and influent room is a permitted confined space and shall be treated as such. Elevated levels of hydrogen sulfide gas have been encountered in the Influent Pump Station. An odalog graph of hydrogen sulfide gas concentrations taken within the influent room of the Influent Pump Station is attached to this specification section. The odalog data record was located approximately 2 feet above the grating next to the entrance of the north truck sewer. Measurements were taken from May 10 to May 18, 2012 and represent hydrogen sulfide gas concentrations for those days only. The Contractor should expect hydrogen sulfide gas concentrations to vary. Additional dangers in the influent room include, but may not be limited to, falling debris, unstable walking surfaces, entrapment hazards, and engulfment hazards.

- C. Other confined spaces, both permitted and not permitted, may be located at the Facility. The Contractor shall conduct construction operations within the requirements of CalOSHA regulations for all confined spaces.

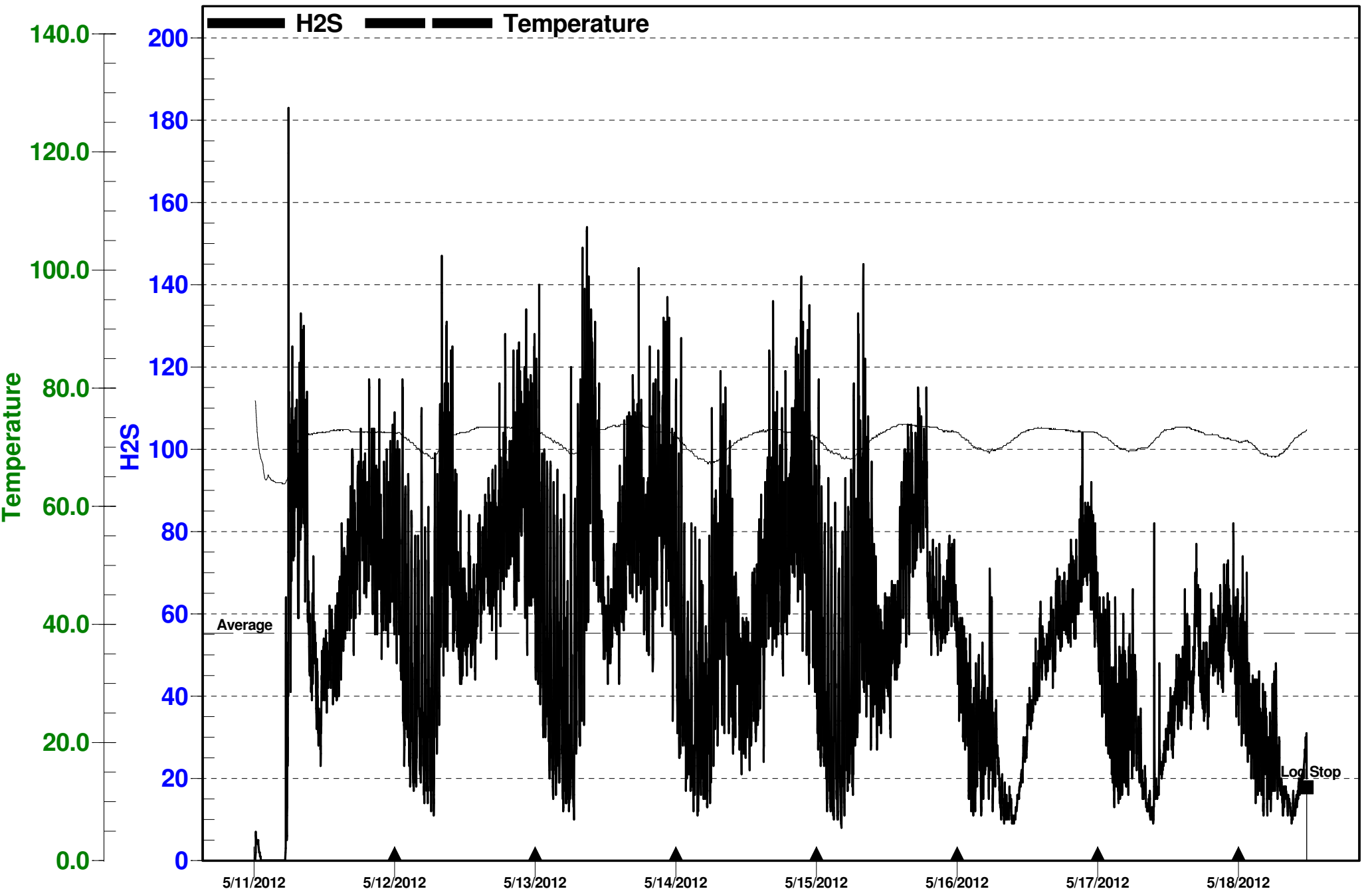
1.2 SAFETY AND HEALTH REGULATIONS

The Contractor shall comply with Safety and Health Regulations for Construction, as promulgated by Federal Regulations. The Contractor shall comply with Federal and State of California Occupational Safety and Health Act, as amended.

END OF SECTION

Detection Instruments Capital Unit - OdaLog s/n 06900700

Manteca IPS: Session 3



Period Displayed: 5/10/2012 - 5/18/2012 (Oda File: Manteca IPS.oda -- Serial Number: OdaLog Type L2-RTx 06900700 Instrument Range 0-1000PPM)

		Average	55		Month Transition	Min	0	Max	183	(Use Screen Data Only)
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SECTION 01200

COMMUNICATION AND PROJECT MEETINGS

PART 1 GENERAL

1.1 COMMUNICATION

- A. Request For Information (RFI) shall be used by the Contractor to ask the Design Engineer or City for additional technical information.
- B. Outage Request Form shall be used by the Contractor to request shutdown or outage of City systems.
- C. Email is acceptable for project correspondence.

1.2 MEETING SUMMARY

- A. Any time during progress of the work, the City and the Construction Manager shall have the authority to require the Contractor and any subcontractor, supplier, or service providers to participate in job-site conferences on matters which require immediate or special attention. Any notice of such conference shall be duly observed and complied with by the Contractor and subcontractors, suppliers, or service providers without extra cost to the City. Participation to be defined as via teleconference, video conference, or on-site conferences.
- B. Minutes will be taken by the Construction Manager for the Pre-Construction Conference(s) and all Progress and Coordination Meetings hereinafter described. Copies of meeting minutes will be distributed to all attendees by the Construction Manager.
- C. Representatives of entities participating in meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.3 PRECONSTRUCTION CONFERENCE

- A. At the beginning of the project, the Construction Manager will schedule a preconstruction conference and organizational meeting at a suitable conference room at the City's offices or other suitable location. The Construction Manager will preside at the conference.
- B. Attending the Preconstruction Conference: Contractor's Project Manager, Contractor's Superintendent, City, Construction Manager, Inspection staff, Design Engineer, City's

subconsultants, major subcontractors and others involved in performance of the Work, and others necessary to agenda.

- C. The preconstruction conference will be held to establish a working understanding among the parties as to the Work, and to discuss the project schedule, procedures for handling shop drawings and other submittals, processing Applications for Payment, and maintaining required records.

1.4 PROGRESS MEETINGS

- A. Regular progress meetings shall be conducted at least once a week.
- B. The Contractor's superintendent and subcontractors who are or are proximate to be actively involved in the Work, or who are necessary to agenda shall attend.
- C. The City, Construction Manager, or other City's representatives, and others necessary to agenda will attend.
- D. The Construction Manager shall preside at meetings.

1.5 SPECIAL MEETINGS

Any time during progress of the work, the City and the Construction Manager shall have the authority to require the Contractor and any subcontractor, suppliers, or service providers to attend job-site conferences on matters which require immediate or special attention. Any notice of such conference shall be duly observed and complied with by the Contractor and subcontractors, suppliers, or service providers without extra cost to City.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 DESCRIPTION

Submittals covered by these requirements include manufacturers' information, shop drawings, test procedures, test results, samples, requests for substitutions, trench safety plan and miscellaneous work-related submittals. Submittals shall also include, but not be limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, detailed piping layout drawings, and conduit details. The Contractor shall furnish all drawings, specifications, descriptive data, certificates, samples, tests, methods, schedules, and manufacturer's installation and other instructions as specifically required in the contract documents to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the Contract Documents.

1.2 SUBMITTAL PROCEDURE

- A. The Contractor shall prepare and submit to the Owner, at the start of the project, a complete list of shop drawings and material submittals intended to be delivered.
- B. At least 15 days prior to his need for approval, the Contractor shall forward to the Construction Manager all submittals required by the individual sections of the specifications. Unless a different number is called for in the individual sections, submit eight copies of each shop drawing, five copies of all operation and maintenance manuals, and three specimens of each sample requested. Two copies of each submittal will be returned to the Contractor, except all sample specimens will be retained by the Construction Manager.
- C. Identify all submittals including schedules and operation and maintenance manuals on the transmittal. Submittals must include submittal number, specification section, plan page reference number (where applicable), the supplier, etc. The Contractor shall also indicate under "Remarks", if the submittal is on the critical path and requires an expedited review. If the Contractor desires more than two copies, he shall transfer the Construction Manager's comments onto additional copies at his own expense.
- D. Submittals that are related to or affect each other shall be forwarded simultaneously as a package to facilitate coordinated review. Uncoordinated submittals will be rejected. Do not combine unrelated materials in the same submittal.
- E. The Construction Manager reserves the right to require submittals in addition to those called for in individual sections.
- F. The Contractor shall schedule submittals to avoid concentration of submittals in a short time period. Scheduling of submittals shall be included in the Contractor's Progress Schedule.

- G. If the Contractor submits shop drawings of equipment by manufacturers other than those listed in the specifications, he shall provide the following information with the submittal:
1. The name and address of at least three companies or agencies who are currently using the equipment.
 2. The name and telephone number of at least one person at each of the above companies or agencies whom the Construction Manager may contact.
 3. A description of the equipment that was installed at the above locations. The description shall be in sufficient detail to allow the Construction Manager to compare it with the equipment that is proposed to be installed in this project.
 4. Refer to Construction Manager's approval (1.05, Part C).

1.3 SHOP DRAWINGS

- A. The term "shop drawings" includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the Contract.
- B. The Contractor shall coordinate all such drawings, and review them for legibility, accuracy, completeness, and compliance with contract requirements, and shall indicate his/her approval thereon as evidence of such coordination and review. Shop drawings submitted to the Construction Manager without evidence of the Contractor's approval will be returned for resubmission.
- C. Approval by the Construction Manager shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with requirements of this Contract, except with respect to variations described and approved in accordance with Paragraph D below.
- D. If shop drawings show variations from contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at time of submission. Each variation must be specifically approved by the Construction Manager.

1.4 DESIGN ENGINEER'S APPROVAL

- A. The Design Engineer shall have 15 days to review a submittal and will indicate his acceptance or disapproval of each submittal, and his reasons for disapproval.
1. If no corrections are required, the copies will be returned marked "NO EXCEPTIONS TAKEN" and work may begin immediately on incorporating the material and equipment covered by the submittal into the project.
 2. If limited corrections are required, the copies will be returned marked "MAKE CORRECTIONS NOTED". Work may begin immediately on incorporating the material and equipment covered by the corrected submittal into the project.

3. If insufficient or incorrect data has been submitted, the copies will be returned marked "AMEND & RESUBMIT". No work incorporating the material and equipment covered by this submittal into the project may begin until the submittal has been revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
 4. If the submittal is unacceptable, the copies will be returned marked "REJECTED - SEE REMARKS". No work incorporating the material and equipment covered by this submittal into the project may begin until a new submittal has been made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
- B. The Contractor shall not change any drawing after it has been marked NO EXCEPTIONS TAKEN or MAKE CORRECTIONS NOTED, or change any approved equipment or material without written permission of the Design Engineer. The Contractor shall comply with all submittals as marked by the Design Engineer, to the extent applicable.
- C. If more than TWO submittals for a single item are required because of incorrect or insufficient data, or the submittal is unacceptable, or because the Contractor wishes to change previously approved material, then all costs incurred by the Owner for the additional review shall be deducted from monies due the Contractor.

1.5 OPERATION AND MAINTENANCE MANUALS

Manufacturer's printed instructions shall include installation instructions, operating instructions, schematics for electrical and hydraulic systems, maintenance literature, lubrication requirements, and parts lists.

1.6 CERTIFICATES

For those items called for in individual sections, furnish certificates from manufacturers, suppliers, or others certifying that materials or equipment being furnished under the Contract comply with the requirements of these specifications.

1.7 SAMPLES

Samples shall be of sufficient size to clearly illustrate functional characteristics and full range of color, texture, and pattern. A completed submittal review transmittal form must accompany each submitted sample.

1.8 SCHEDULE OF VALUES

Submit a schedule of dollar values. The schedule shall be based on the Contract Bid Schedule or Bid Form and shall include all bid items. The schedule of values in conjunction with the construction schedule will be the basis of the monthly progress payments.

PART 2 MATERIALS: Not Used.

PART 3 EXECUTION

3.1 CONTRACTOR'S JOBSITE DRAWINGS

- A. Provide and maintain on the jobsite one complete set of prints of all drawings which form a part of the contract. Immediately after each portion of the work is installed, indicate all deviations from the original design shown on the drawings either by additional sketches or ink thereon. All RFIs and Clarifications shall be posted on drawings. Upon completion of the project, deliver this record set to the Owner's Representative.
- B. A condition of the processing of Progress Payments shall be the satisfactory maintenance of the Contractor's Record Documents, as determined by the Construction Manager. The Contractor prepared progress payment estimates shall include an initial block for Contractor Representative and Owner's Representative to acknowledge the satisfactory maintenance of the As-Built Drawings.

END OF SECTION

SECTION 01620

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL

Materials and equipment shall be shipped, handled, stored, and installed by methods which will prevent damage to the items. Damaged items will not be permitted as part of the work except in cases of minor damage that have been satisfactorily repaired and are acceptable to the Construction Manager. Acceptance of spare parts shall be at such times as determined by the Construction Manager.

1.02 EQUIPMENT

A. Definition

For the purpose of this section, equipment refers to any mechanical, electrical, or instrumentation devices, and other items with one or more moving parts requiring an electrical, pneumatic, electronic or hydraulic connection.

B. Packing and Marking

All equipment shall be adequately and effectively protected against damage from moisture, dust, handling, or other cause during transport from manufacturer's premises to site. Each item or package shall be clearly marked with the number unique to the specification reference covering the item. Each separate portion of equipment shall receive, as far as practicable, a fitting or distinguishing mark which shall be shown on the packing lists. Stiffeners shall be used where necessary to maintain shapes and to give rigidity. Parts of equipment shall be delivered in assembled or subassembled units where possible.

C. Identification of Equipment

All equipment items and valves with an assigned equipment number shall have affixed to them in a prominent location, a label or tag displaying the assigned equipment number. Equipment item and valves lacking a number shall have a similar tag providing a unique description of the item. Markers shall be of stainless steel or aluminum, affixed to the item in question with stainless steel fasteners or as otherwise approved by the Construction Manager. Plastic tape labels will not be acceptable.

D. Storage of Equipment

During the interval between delivery and installation, all equipment to be incorporated into the project shall be stored in enclosed, weathertight bonded commercial warehouses

equipped with fire detection and sprinkler systems as specified in Section 00700, GENERAL CONDITIONS. Environmental controls such as heaters or protective encapsulation shall be provided to ensure against condensation and moisture damage. In the event prolonged (more than 90 days) storage is required for any item of rotative equipment, the Contractor shall institute a preventive maintenance program which shall include grease protection of bare metal surfaces, periodic indexing of rotating parts, renewal of grease in bearings and any procedures recommended by the manufacturer. The Contractor shall maintain adequate records to demonstrate full compliance with these requirements. All equipment shall be available for inspection by the Construction Manager.

Spare parts shall be stored by the Contractor until final acceptance of a system or equipment by the City.

E. Protection of Equipment After Installation

After each equipment item is installed, it shall be protected from damage, including but not limited to, dust, abrasive particles, debris and dirt generated by the placement, chipping, sandblasting, cutting, finishing and grinding of new or existing concrete, terrazzo and metal; and the fumes, particulate matter, and splatter from welding, brazing and painting of new or existing piping and equipment. The Contractor is advised that as a minimum, vacuum cleaning, blowers with filters, protective shieldings, and other dust suppression methods will be required at all times to adequately protect all equipment. During concreting, including finishing, all equipment that may be affected by cement dust must be completely covered. During painting operations, all grease fittings and similar openings shall be covered to prevent the entry of paint. Electrical switchgear, unit substation, and motor load centers shall not be installed until after all concrete work and sandblasting in those areas have been completed and accepted.

E. Coatings

Equipment shall have factory coating with prime coat and final coat, minimum 15 mils thickness. Equipment with only a factory prime coat shall receive two finish coats in the field, minimum 5 mils each. Provide submittal for field coatings.

Exterior HVAC ductwork shall be coated with a prime coat and final coats, minimum 15 mils thickness. Provide submittal for HVAC ductwork coating.

1.03 DELIVERY OF MATERIAL OR EQUIPMENT

The City's personnel or representatives will not accept materials or equipment deliveries for the Contractor.

1.04 PROTECTION OF EXISTING EQUIPMENT, MATERIALS AND STRUCTURES

The Contractor shall repair and/or replace all existing equipment, materials, structures, slabs, ground cover materials, etc. damaged by Contractor with similar equipment, materials, structures, slabs, ground cover materials, etc. in the same or better condition.

****END OF SECTION****

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies site preparation which consists of clearing, grubbing, demolition, and disposal of materials.

1.02 JOB CONDITIONS

A. Existing Conditions

The Contractor shall determine the actual condition of the site as it affects this portion of work.

B. Protection

Site preparation shall not damage structures, landscaping or vegetation adjacent to the site. The Contractor shall repair, or replace any damaged property. To the maximum extent practicable, dust generated during construction activities shall be minimized. If require by the Construction Manager, submit a dust control plan to the City for approval in accordance with Section 01300, SUBMITTALS.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 GENERAL

The Contractor shall notify the City when site preparation is complete. Further work shall not be started until the conditions defined herein are satisfied.

3.02 PERFORMANCE

A. Clearing and Grubbing

Unless otherwise specified, the Contractor shall remove obstructions such as brush, trees, logs, stumps, roots, heavy sod, vegetation, rock, stones larger than 6 inches in any dimension, broken or old concrete and pavement, debris, piping and structures where the completion of the work require their removal except those trees indicated on the drawings to be left intact. In general, the depth of stripping shall be 1-3 in. over the majority of the site. Material that is removed and is not to be incorporated in the work shall be disposed of off the site.

B. Leveling/Smoothing

After grubbing operations are completed, the clearing and grubbing area shall be leveled/smoothed so that the surface is left without obvious holes (from tree and root removals), ridges or mounds. The project area after the leveling/smoothing operations are completed shall not have any exposed objectionable materials and the surface slopes shall not have mounds or depressions in excess of 1 ft when measured with a 20 ft long straight edge.

C. Demolition and Removal

1. Pavement: When portions of asphalt pavements and concrete pads are to be removed and later construction is to be connected, edges shall be sawcut, on a neat line at right angles to the curb face.
2. Salvage: City has the right to salvage any items scheduled for removal. The Contractor shall notify the City 5 days prior to any salvage or demolition work to determine the disposition of items to be removed. The City will mark items to be salvaged. Such items shall be properly disconnected, removed from their foundations, cleaned, and stored at a location on the site as indicated by the City.

D. Utility Interference

Where existing utilities interfere with the prosecution of the work, the Contractor shall relocate them in accordance with City Standards.

E. Protection

The Contractor shall provide protection devices, including barricades, fencing, warning signs, lights and other items necessary to ensure the security of, and safety within, the project site during this phase of the work.

F. Cleanup

Remove and transport debris, rubbish, and excess material from the site in a manner that will prevent spillage on streets or adjacent areas. Clean up spillage from streets and adjacent areas. Comply with Federal, State, and local hauling disposal regulations. Cleanup shall be an ongoing activity throughout the contract period.

G. Disposal of Materials

All materials removed from clearing and grubbing shall become the property of the Contractor unless designated by the City and shall be removed from the project site. Contractor shall make his own arrangements for disposing of materials outside the project site and he shall pay all costs involved. Arrangements shall include, but not be limited to, entering into agreements with property owners and obtaining necessary permits, licenses and environmental clearances.

****END OF SECTION****

SECTION 02140

BYPASS PUMPING

PART 1 GENERAL

1.1 DESCRIPTION

Provide a bypass pumping system that will pump the entire City's wastewater flow from the north and south trunk sewer manholes into the wet well of the Influent Pump Station; bypassing the influent room. Discharge location shall be as shown on Sheet C3 such that the wastewater flow will go through the City's bar screens.

1.2 SUBMITTALS

- A. The Contractor shall prepare and submit to the Owner, the following submittals:
 - 1. Bypass pumping plan with a backup plan. Backup plan shall be based on the scenario of a pump failure and a power failure.
 - 2. Engineering calculations and data on pumps verifying they are adequate to perform.
 - 3. Engineering calculations for bulkhead system.
 - 4. Bulkhead design. Since worker safety will be relying on the integrity of the bulkheads, bulkhead design shall be signed and stamped by a licensed California professional engineer.
 - 5. Bulkhead installation and removal plan with existing structure repair procedures.

1.3 PUMPING SYSTEM

- A. The Contractor shall select pumps and piping adequate to pump the wastewater influent from the north and south trunk sewers to the Influent Pump Station Wet Well. Contractor shall provide engineering calculations.
- B. Calculations shall be based on information provided in Section 01020, as well as other pertinent information.
- C. Do not create an overflow or spill occurrence. Section 01020 provides information on the sewer system.
- D. The Contractor shall have backup systems for each system and backup components for all components.
- E. The Contractor shall have an operator experienced with pumping systems onsite 24/7 until the bulkheads have been removed and the bypass pumping terminated.
- F. Power for pumping system shall be provided by the Contractor.

1.4 WASTEWATER DISCHARGE

- A. The Contractor shall discharge wastewater into the wet well, upstream of the bar screens. The discharge piping shall extend to the bottom of the wet well in a way that minimizes splashing.

1.5 BULKHEADS

- A. The Contractor shall install bulkheads within the trunk sewers or trunk sewer manholes that will prevent wastewater from entering the Influent Room during work below the grating level.

- B. The Contractor shall install bulkheads at the interface between the influent room and wet well such that wastewater does not flow into the influent room from the bar screen area when work is being performed in the influent room.
- C. Contractor shall construct other bulkheads as required to perform their work.
- D. Bulkheads shall be designed by an licensed California professional engineer.
- E. The Contractor shall remove bulkheads and repair damage to trunk sewer pipe/manhole , concrete walls, and liner systems.

1.6 SOLIDS HANDLING

- A. Normal plant operation is for all wastewater entering the Wet Well to be screened to 3/8 inch. The City's screening system includes two bar screens, screw conveyor, a grinder/compactor, and a trash bin. The City will dispose of all solids removed by their bar screens.
- B. Solids contained in the bypass wastewater discharge upstream of the City's bar screen will be screened by the bar screens and disposed of by the City.
- C. Approximate total solids removed by the bar screens is 500 lbs per day. It is anticipated that solids will accumulate in the trunk sewer when the bulkheads are installed. Contractor shall remove and properly dispose of accumulated solids in the trunk sewer before the bulkheads are removed.
- D. Contractor shall be responsible to dispose of all wastewater solids that are not removed by the City's bar screens. Contractor shall be responsible for disposing of solids in conformance with all federal, state, and local waste disposal regulations. All debris disposal from the job site shall be through the City of Manteca Solids Waste Division and paid for by the Contractor.

1.7 ENVIRONMENTAL REGULATIONS AND VIOLATIONS

- A. Contractor is responsible for compliance with all federal, state, and local laws, regulations, and codes. Contractor is responsible to pay all fines, fees, penalties, and assessments levied against the City caused by Contractor's operations and/or violations.

PART 2 MATERIALS: Not Used.

PART 3 EXECUTION

3.1 SHUTDOWN OF NORTH AND SOUTH TRUNK SYSTEM

- A. See Section 01020 for information on shutdown of the City's north and south trunk sewers.

END OF SECTION

SECTION 02201
TRENCHING, PIPE EMBEDMENT, AND TRENCH BACKFILL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Clearing, grubbing and site preparation.
 - 2. Removal and disposal of debris.
 - 3. Handling, storage, transportation and disposal of excavated material.
 - 4. Sheeting, shoring, bracing and protection Work.
 - 5. Pumping and dewatering trenches.
 - 6. Backfilling.
 - 7. Pipe embedment.
 - 8. Potholing of existing utilities at treatment facility site.
 - 9. Appurtenant Work.

1.02 QUALITY ASSURANCE

- A. Labor Code 6705 – Protection of Workers in Excavations:

As required by Section 6705 of the California Labor Code and in addition thereto, whenever work under the Contract involves the excavation of any trench or trenches 5 feet or more in depth, the Contractor shall submit for acceptance by the Owner or by a registered civil or structural engineer, employed by the Owner, to whom authority to accept has been delegated, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for work protection from the hazard of caving ground during the excavation, of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, the plan shall be prepared by a registered civil or structural engineer employed by the Contractor, and all costs therefore shall be included in the price named in the Contract for completion of the Work as set forth in the Contract Documents. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose tort liability on the Owner, or any of their officers, agents, representatives, or employees.
- B. Requirements of Regulatory Agencies:
 - 1. Comply with all requirements of local, county and state agencies.

1.03 JOB CONDITIONS

- A. Protection:
 - 1. Protect adjacent structures and surrounding areas from damage during excavation, filling, and backfilling.
 - 2. Do not remove trees from outside excavation or fill areas unless authorized by the Engineer; protect from permanent damage by construction activities in accordance with Section 01050.
 - 3. Protect Work from erosion or other similar types of damage until the Project has been

completed.

B. Weather:

1. Do not backfill during freezing weather or during periods of heavy rainfall when soil moisture conditions will not permit achieving required compaction.
2. Do not use frozen materials, snow, or ice in any backfill.

1.04 SUBMITTALS

A. Gradation Curves:

1. Pipe embedment.

B. Dewatering:

1. Proposed equipment.
2. Well or sump location, size, and details of construction.
3. Size and layout of discharge headers.

C. Potholing Report:

1. Do not prepare any shop drawings for, or make final order for, or design any pipe materials for any particular section of pipeline until all utilities in that section of pipeline have been exposed, and until such time as no interferences are found between said existing utilities and the proposed pipeline alignment. If interferences are found in any particular section of pipeline, do not prepare any shop drawings for, or make final order for, or design any pipe materials for that particular section of pipeline until the pipeline alignment has been modified by the Engineer to eliminate all such interferences.
2. The number and location of the potholes to be made shall be determined by the Contractor in advance and submitted in writing to the Engineer. If such conflicts are discovered, they shall be immediately reported to the Engineer by the Contractor.
3. Submit report to Engineer with potholing results for the Grease Receiving Station Utilities:
 - a. Utility location in Plan.
 - b. Material type.
 - c. Material size (diameter)
 - d. Utility depth, IE.
4. Submit potholing report to Engineer at least 2 weeks in advance of desired work by Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Classification of Excavated Materials:

1. None.
2. Remove and handle excavated materials regardless of its type, character, composition, condition, or depth.
3. No blasting allowed due to proximity of essential treatment plant facilities.

B. Topsoil:

1. Native material removed and stockpiled before excavation.

2. Free from trash, debris and surface vegetation.
- C. Pipe Embedment:
1. Sand: Clean sand with not more than 25 percent retained on No. 4 sieve and not more than 7 percent passing No. 200 sieve and effective size 0.10-0.30 mm.
 2. Bedding:
 - a. 4 inches minimum in bottom of trench excavation.
 - b. Bedding material continuous around pipe, extend to minimum 6 inches above top of pipe., or as indicated on drawings.
 - c. Compact bedding material to 90% relative compaction.
 - d. Gradation requirements:

1) Percent Passing 3/8" sieve	90-100
2) Percent Passing No 4 sieve	55-100
3) Percent Passing No 200 sieve	1-4
 - e. Bedding material shall be clean material, free of organic matter and clay; with a chloride content of <300 ppm.
- D. Trench Backfill: (above pipe embedment)
1. Compacted backfill:
 - a. Job excavated material:
 - 1) Approved select fill.
 - 2) Finely divided, free of debris organic material, and stones larger than 1-1/2 inches in greatest dimension.
 - 3) Liquid limit <40.
 - 4) Plasticity Index <20.
 - 5) Passing No. 200 sieve <50% by weight.
 2. Cover:
 - a. Free of brush, debris, and roots.
 - b. May contain rubble and detritus from rock excavation, stones and boulders if well separated and arranged to not interfere with backfill settlement.
 - c. In upper 18 inches no rock or excavated detritus except with specific approval of Engineer.
 - d. No stones larger than three (3) inches in greatest dimension within three (3) feet of top of pipe.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Field verify the location of all underground utilities, pipelines and structures. **Special attention is directed to existing pipes and electrical conduits on site, which must remain in service throughout construction.**
1. Clear sites to be occupied by permanent construction of logs, trees, roots, brush, tree trimmings, and other objectionable material and debris.
 2. Grub stumps.
 3. Clean and strip subgrade for fills and embankments of surface vegetation, sod, and organic topsoil.
 4. Remove waste materials from site and dispose weekly.
 5. No burning onsite is allowed.

3.02 EXISTING UTILITIES

- A. The Contractor shall excavate and locate (pothole) existing pipelines, conduits and facilities within two feet of a proposed excavations.
- B. The known existing buried utilities and pipelines are shown on the Drawings in their approximate location. The Contractor shall exercise care in avoiding damage to all utilities and will be held responsible for repair if damaged. There is no guarantee that all utilities or obstructions are shown, or that locations indicated are accurate. Utilities are piping, conduits, wire, cable, ducts, maintenance holes, pull boxes and the like, located at the project site and adjoining construction locations.
- C. Clearly paint the location of all affected utility underground pipes, conduits and other utilities on the pavement or identify the location with suitable markers if not on pavement. In addition to the location of metallic pipes and conduits, non-metallic pipe, ducts and conduits shall also be similarly located using surface indicators, and detection tape if present and shall then be similarly marked.
- D. After the utility survey is completed, commence "potholing" to determine the actual location and elevation of all utilities where crossings, interferences, or connections to new pipelines or other facilities are shown on the Drawings, marked by the utility companies, or indicated by surface signs. **Prior to the preparation of piping shop drawings, or the excavating for any new pipelines or structures, the Contractor shall locate and uncover these existing utilities to a point 1 foot below the utility.** Submit a report identifying each underground utility and its depth and location. Any variation in the actual elevations and the indicated elevations shall be brought to the Resident Engineer's attention.
- E. Excavations around underground electrical ducts and conduits shall be performed using extreme caution to prevent injury to workmen or damage to electrical ducts or conduits. Similar precautions shall be exercised around gas lines and telephone cables.
- F. Backfill after completing potholing. In existing pavement, pave with 1 inch of cold mix asphalt concrete.
- G. Contractor may be requested to submit a method to correct the interferences. The Engineer will provide the selected method for correcting said interferences to the Contractor. **If the Contractor does not expose all required utilities prior to shop drawing preparation, he shall not be entitled to additional compensation for work necessary to avoid interferences, nor for repair to damaged utilities.**
- H. Any necessary relocations of utilities, whether shown on the Drawings or not, shall be coordinated with the affected utility. The Contractor shall perform the relocation only if instructed to do so in writing from the utility and the Resident Engineer. The Contractor shall also protect any utilities encountered in the work.
- I. Shutdowns: Planned utility service shutdowns shall be accomplished during period of minimum use. In some cases this may require night or weekend work. Such work shall be at no additional

cost to the District. Program work so that service will be restored in the minimum possible time, and shall cooperate with the utility companies in reducing shutdowns of utility systems to a minimum.

1. Disconnections: No utility shall be disconnected without prior written approval from the utility owner. When it is necessary to disconnect a utility, the Contractor shall give the utility owner not less than 72 hours notice when requesting written approval. The Contractor shall program his work so that service will be restored in the minimum possible time.

- J. Overhead Facilities: Overhead lines exist in the project area and must be flagged and protected by the Contractor from damage. These overhead utilities are not shown on the Drawings. Extreme caution shall be used when working in the vicinity of overhead utilities so as to prevent injury to workmen or damage to the utilities. The Contractor shall be required to comply with the applicable provisions of the California Construction Safety Orders when working anywhere on this project.

3.03 OBSERVATION OF STAINED OR ODOROUS SOIL

- A. Contractor shall notify Engineer and immediately stop work in an area if soil, debris, water or other substances at an area of the Site ("Affected Area") are observed, uncovered, or otherwise discovered because the soil, concrete or debris is discolored, oily or exhibits an odor. Promptly confirm this oral notice in writing. The District will consider such conditions and determine a course of action. The Contractor shall continue to work in areas not affected and shall resume work in the Affected Area only after being notified by the Engineer.

3.04 PERFORMANCE - GENERAL

- A. General:
 1. Perform Work in a safe and proper manner with appropriate precautions against hazard.
 2. Provide adequate working space and clearances for Work performed within excavations and for installation and removal of concrete forms.
 3. Clean subgrades of loose material before concrete is placed thereon.
 5. Preservation of trees:
 - a. Do not remove trees outside fill or excavated areas, except as authorized by Engineer.
 - b. Protect trees left standing from permanent damage by construction operation.
 - c. Trim standing trees as directed by Engineer.
 6. Except as otherwise authorized, indicated, or specified, replace all material excavated below the bottom of concrete walls, footings, slabs on grade and foundations with concrete placed at the same time and monolithic with the concrete above.
 7. Remove soft soil materials, loose materials, wood, debris and deleterious substances encountered within excavated areas.
- B. Blasting: Not permitted.
- C. Topsoil:
 1. Remove and stockpile sufficient topsoil to surface to a minimum depth of 4 inches fill, embankment and other areas where the original topsoil will be removed or damaged.
 2. At the completion of other Work in each area, place and grade topsoil to Engineer's satisfaction.

D. Dewatering:

1. Contractor shall remove all sediment from water pumped or otherwise removed from trenches before disposing of it in a natural stream or water course (flowing or not).
2. All dewatering activities to be in accordance with local codes and regulations.
3. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the Work.
4. Keep each excavation dry during subgrade preparation and continually thereafter until the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
7. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12 inches below the bottom of the excavation.
8. Divert surface water or otherwise prevent it from entering trenches to the extent practical without damaging adjacent property.
9. Contractor is responsible for the condition of any pipe or conduit he uses for drainage; all drainage pipes shall be left clean and free of sediment.
10. Obtain all required local and State permits required to discharge water pumped from the excavations.
11. Provide stable excavation slopes, walls and bottom.
12. Filter native soil and prevent loss of ground from dispersion and erosion
13. Prevent soil piping and groundwater boring through the excavation bottom
14. Prevent damaging settlement to nearby structures, utilities, and pipelines
15. Dewatering to be installed and removed in accordance with governing agency
16. Allow for controlled release of groundwater to its static level in a manner that prevents disturbance of the bottom soils and prevents flotation or movement of structures, pipelines or utilities

E. Sheet piling, Shoring and Bracing:

1. The Contractor shall obtain an excavation permit from COSHA for any excavations over 5 feet. The trench width shall not be more than 2 feet wider than the outside diameter of the pipeline or less than the OSHA requirements.
3. Provide proper and substantial sheet piling, shoring and bracing, as required, to prevent caving or sliding, to protect workmen and the Work, and to protect existing structures and facilities.
4. Design and build sheet piling, shoring and bracing to withstand all loads that might be caused by earth movement or pressure, and to be rigid, maintaining shape and position under all circumstances.
5. Submit sheet pile cut-off wall design calculations, stamped by a California registered professional engineer.
6. Do not pull trench sheet piling before backfilling.
7. All sheet piling, shoring and bracing in accordance with OSHA and UBC requirements.
8. All sheet pile cut-off walls to be removed at the end of the Project.

F. Stabilization:

1. Thoroughly compact and consolidate subgrades for trench bottoms so they remain firm, dense and intact during required construction activities.
2. Remove all mud and muck during excavation.
3. Reinforce subgrades with crushed rock or gravel if they become mucky during construction activities, as directed by Engineer.
4. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on Drawings.

5. Scarify subgrade to a depth of 6 to 8 inches and prior to subgrade compaction.

G. Trench Excavation:

1. Do not open more trench in advance of pipe laying than is necessary to expedite the Work; not more than the shorter of 400 feet or one (1) block length.
2. Except where tunneling is indicated on the Drawings, specified, or permitted by Engineer, excavate trenches by open cut from the surface.
3. Alignment, grade and minimum cover:
 - a. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings.
 - b. Comply with pipe specification sections regarding vertical and horizontal alignment and maximum joint deflection.
 - c. Where grades or elevations are not fixed on the Drawings, excavate trenches to provide a minimum depth of backfill cover over top of the pipe:
 - 1) 36 inches for water piping.
 - 2) 36 inches in other locations.
 - 3) Increase depth as required at vertical curves and for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades.
 - 4) Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation, or to future lower surface elevations where indicated on Drawings.
4. Maintain excavation spoils on uphill side of trench and provide erosion containment measures on downhill side.
5. Limiting trench widths:
 - a. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and placement of embedment.
 - b. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than one (1) foot above the top of the pipe.
 - c. Stipulated minimum clearances are minimum clear distances, not minimum average distances.
 - d. Maximum trench width six (6) inches above the top of the installed pipe: Pipe O.D. plus 24 inches, or as otherwise indicated on drawings..
 - e. Minimum permissible clearances between installed pipe and trench wall:

<u>Pipe Size</u>	<u>Minimum Clearance</u>
<8 inches	8 inches
8 inches and Larger	12 inches

6. If the width of the lower portion of the trench exceeds the maximum permitted, provide pipe of adequate strength, special pipe embedment, or arch concrete encasement as required by loading conditions and as determined by Engineer.
7. Mechanical excavation:
 - a. Do not use where its operation would damage trees, buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas.
 - b. Use mechanical equipment of a type, design, and construction and operated so that:
 - 1) Rough trench bottom elevation can be controlled.

- 2) Uniform trench widths and vertical sidewalls are obtained from one (1) foot above the top of the installed pipe to the bottom of the trench.
 - 3) Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls.
- c. Do not undercut trench sidewalls.
8. Excavation below pipe subgrade:
 - a. Except as otherwise required, excavate trenches below the underside of pipes as indicated on Drawings, according to pipe and soil type, to provide for installation of embedment pipe foundation material.
 - b. Where in earth, trench bottoms for six (6) inches and smaller pipe may be excavated below pipe subgrade and embedment provided or the trench may be graded to provide uniform and continuous support (between bell holes or end joints) of the installed pipe, Contractor's option.
 - c. Pipe may not be laid directly on trench bottom.
9. Artificial foundation in trenches:
 - a. Whenever so directed by Engineer, excavate to such depth below a grade as Engineer directs and bring the trench bottom to grade with such material as Engineer may direct.
 - b. Provide timber, concrete, or other foundations made necessary by unstable soil as directed by Engineer.
 - c. District shall compensate Contractor for artificial foundations in accordance with the Contract provisions for extra Work, except as provided for in the Contract unit prices.
10. Bell holes:
 - a. Excavate to provide adequate clearance for tools and methods of pipe installation.
 - b. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined.
- H. Pipe Embedment:
 1. Embed pipes above and below the bottom of pipe as indicated on Drawings and as specified.
 2. Spread and surface grade embedment to provide continuous and uniform support beneath pipe at all points between bell holes or pipe joints.
 3. Slightly disturbing finished subgrade surface during withdrawal of slings and lifting tackle is permissible.
 4. After grading, aligning and placing pipe in final position, and shoring home, deposit and compact sufficient embedment under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent operations.
 5. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent lateral displacement.
 6. Granular:
 - a. Maximum uncompacted thickness of layers: Six (6) inches.
 - b. Compact by slicing with shovel or vibrating.
 7. Compacted embedment:
 - a. Maximum uncompacted thickness of layers: eight (8) inches.
 - b. Compact to 90 percent maximum density as determined by ASTM D1557.
 - c. For Class C embedment, compact to top of pipe.
 8. Jetting and ponding not permitted.
- I. Trench Backfill:
 1. Compacted backfill:

- a. Provide for the full depth of trench above embedment at all locations.
 - b. Where the trench for one (1) pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench.
 - c. Finish the top portion beneath established sodded areas with 12 inches minimum, topsoil corresponding to, or better than, underlying adjacent sodded areas.
 - d. Suitable job excavated material, or graded gravel, Contractor's option.
 - e. Job excavated materials:
 - 1) Place in eight (8)-inch maximum uncompacted thickness, uniform layers.
 - 2) Increased layer thickness may be permitted for non-cohesive material if Contractor demonstrates to Engineer's satisfaction that specified compacted density will be achieved.
 - 3) Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging shocks to pipe.
 - 4) Roadways and under structures: Compact to 95 percent of maximum density at optimum moisture content per ASTM D1557 or to 70 percent relative density per ASTM D4253 and D4254 when appropriate.
 - 5) Other locations, compact to 90 percent of maximum density at optimum moisture content per ASTM D1557 or to 70 percent of relative density per ASTM D4253 and D4254.
 - f. Graded gravel:
 - 1) Deposit in uniform layers of 12 inches maximum uncompacted thickness.
 - 2) Compact with suitable vibrating roller or platform vibrator to not less than 70 percent relative density per ASTM D4253 and D4254.
 - 2. Water settled backfill: Not allowed.
 - 3. Finish the top portion of backfill with at least 12 inches of topsoil corresponding to, or better than, that underlying adjoining areas.
- J. Drainage Maintenance:
- 1. Do not backfill trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or water courses prior to backfilling the trench on the upstream side of the trafficway to prevent impounding water after pipe is laid.
 - 2. Backfill so that water does not accumulate in unfilled or partially filled trenches.
 - 3. Remove materials deposited in roadway ditches or other water courses crossed by the trench line immediately after backfilling is completed and restore ditches and water courses to original section, grade, and contours.
 - 4. Do not obstruct surface drainage any longer than necessary.
- K. Protection of Trench Backfill:
- 1. Where trenches are constructed in ditches or other water courses, protect backfill from erosion.
 - 2. Install ditch checks where the ditch grade exceeds one (1) percent.
 - 3. Minimum depth: Two (2) feet below the original ditch or water course bottom for the full bottom width.
 - 4. Minimum width: 18 inches into the side slopes.
 - 5. Minimum thickness: 12 inches.
- L. Disposal of Excess Excavated Materials:
- 1. Except as otherwise permitted, dispose of excess excavated materials away from the site of the Work as directed by Engineer and areas designated by the District.

2. Distribute excess earth from excavations located in unimproved property directly over the pipe trench and within the pipeline right-of-way to a maximum depth of six (6) inches above the original ground surface elevation at and across the trench and sloping uniformly each way:
 - a. Carefully finish material thus wasted with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point.
 - b. Do not waste excess excavated material in the above manner where the trench line crosses or is within a railroad, public road, or highway right-of-way.
 - c. Distribute and level to thicknesses noted on the Drawings.
- M. Final Grading and Topsoil Replacement:
1. After completion of all other outside Work and after backfilling is completed and settled, bring to grade at the indicated elevations, slopes and contours, all areas of the site to be graded.
 2. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand Work.
 3. Grade all surfaces for effective drainage.
 4. Provide a one (1) percent minimum slope except as otherwise required.
 5. Place topsoil at locations and to limits indicated on Drawings.
 6. Grade and surface to Engineer's satisfaction.

3.05 FIELD QUALITY CONTROL

- A. District will pay for all laboratory and field tests to determine compliance of in-place and backfill materials and compaction with the Specifications. Contractor to coordinate field sampling schedule with Resident Inspector to provide the specified number of tests.
- B. Pipe Embedment and Backfill:
1. Two initial gradation tests for each type of material plus one (1) additional test for each 500 cubic yards of each material.
 2. Two modified Proctor compaction tests, ASTM D1557, or two (2) relative density tests, ASTM D4253 and D4254, as appropriate, for each type of embedment on backfill material proposed, except granular embedment material.
 3. Minimum of one (1) in-place compaction test, **ASTM D2922**, for every two (2)-foot depth of backfill per 100-foot interval will be required.
 4. Contractor shall, when requested, excavate to the required depth so density tests may be taken and bring such excavations to required density after testing at no additional cost to the District.
- C. Retests of failed compaction shall be performed by the District, but shall be paid for by the Contractor.

3.06 SCHEDULES

- A. Pipeline Embedment:
1. Class A arch encasement: Where indicated on Drawings and as required by improper trenching or unexpected trench conditions as determined by Engineer.
 2. Class B bedding:
 - a. All pipe and buried fiberglass duct.

END OF SECTION

SECTION 03002

CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Cast-in-place concrete and grout.
 2. **This Section does not include concrete repair for the Influent Pump Station influent room and wet well. That information is specified elsewhere.**

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. American Concrete Institute (ACI):
 - a. 116R, Cement and Concrete Terminology.
 - b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
 - c. 212.3R, Chemical Admixtures for Concrete.
 - d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - e. 304.2R, Placing Concrete by Pumping Methods.
 - f. 305R, Hot Weather Concreting.
 - g. 306R, Cold Weather Concreting.
 - h. 318, Building Code Requirements for Structural Concrete.
 - i. 347R, Recommended Practice for Concrete Formwork.
 2. American Society for Testing and Materials (ASTM):
 - a. A82, Standard Specification Steel Wire, Plain, for Concrete Reinforcement.
 - b. A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - c. A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (Including Supplementary Requirements S1).
 - d. A775, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - e. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - f. C33, Standard Specification for Concrete Aggregates.
 - g. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - h. C94, Standard Specification for Ready-Mixed Concrete.
 - i. C138, Standard Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
 - j. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
 - k. C150, Standard Specification for Portland Cement.
 - l. C157, Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
 - m. C171, Standard Specification for Sheet Materials for Curing Concrete.
 - n. C172, Standard Practice for Sampling Freshly Mixed Concrete.
 - o. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - p. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

- q. C260, Standard Specification for Air Entraining Admixtures for Concrete.
 - r. C289, Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
 - s. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - t. C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
 - u. C494, Standard Specification for Chemical Admixtures for Concrete.
 - v. C496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - w. C567, Standard Test Method for Unit Weight of Structural Lightweight Concrete.
 - x. C595, Standard Specification for Blended Hydraulic Cements.
 - y. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 - z. D1056, Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.
 - aa. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - bb. E329, Standard Specification for Agencies Engages in the Testing and/or Inspection of Materials Used in Construction.
 - 3. Federal Specification (FS):
 - a. CEGS 03300, Vegetable Fiber.
 - 4. Corps of Engineers: Specification CRD-C572 Polyvinyl Waterstops.
- B. Quality Control:
- 1. Concrete testing agency.
 - a. Contractor to employ and pay for services of a testing laboratory to:
 - 1) Perform materials evaluation.
 - 2) Design concrete mixes.
 - b. Concrete testing agency to meet requirements of ASTM E329.
 - 2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
 - a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
 - 3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
 - a. Do not use revised concrete mixes until submitted to and approved by Engineer.
 - 4. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.
- C. Qualifications:
- 1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).
 - 2. Formwork, shoring and reshoring for slabs and beams except where cast on ground to be designed by a professional engineer currently registered in the states where the project is located.

1.3 DEFINITIONS

- A. Per ACI 116R except as modified herein:
 - 1. Concrete fill: Non-structural concrete.
 - 2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
 - 3. Exposed concrete: Exposed to view after construction is complete.
 - 4. Indicated: Indicated by Contract Documents.
 - 5. Lean concrete: Concrete with low cement content.
 - 6. Nonexposed concrete: Not exposed to view after construction is complete.
 - 7. Required: Required by Contract Documents.
 - 8. Specified strength: Specified compressive strength at 28 days.
 - 9. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Section 01340.
 - 2. Concrete mix designs proposed for use. Concrete mix design submittal to include the following information:
 - a. Sieve analysis and source of fine and coarse aggregates.
 - b. Test for aggregate organic impurities.
 - c. Test for deleterious aggregate per ASTM C289.
 - d. Proportioning of all materials.
 - e. Type of cement with mill certificate for cement.
 - f. Type of fly ash with certificate of conformance to specification requirements.
 - g. Slump.
 - h. Air content.
 - i. Brand, type, ASTM designation, and quantity of each admixture proposed for use.
 - j. 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
 - k. Shrinkage test results.
 - l. Standard deviation value for concrete production facility.
 - m. Contractor's proposed pour sequence. Provide 1/8 IN = 1 FT - 0 IN minimum scaled drawings indicating:
 - 1) Location of all construction joints.
 - 2) Location and type of waterstops.
 - 3) Any proposed deviations from Contract Drawings must be clearly indicated.
 - 4) Reproductions of Contract Drawings are acceptable for this purpose.
 - 3. Manufacturer and type of joint filler, joint sealant, curing agent and chemical floor hardener.
 - 4. Manufacturer and type of bonding and patching mortar and bonding adhesive used at construction joints.
 - 5. Manufacturer and type of nonshrink grout and the cure/seal compound required for the nonshrink grout.
 - 6. Reinforcing steel: Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
 - a. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.

- b. Obtain approval of shop drawings by Engineer before fabrication.
 - c. Mill certificates.
- 7. Strength test results of in place concrete including slump, air content and concrete temperature.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:

- 1. Cement and fly ash:
 - a. Store in moistureproof, weathertight enclosures.
 - b. Do not use if caked or lumpy.
- 2. Aggregate:
 - a. Store to prevent segregation and contamination with other sizes or foreign materials.
 - b. Obtain samples for testing from aggregates at point of batching.
 - c. Do not use frozen or partially frozen aggregates.
 - d. Do not use bottom 6 IN of stockpiles in contact with ground.
 - e. Allow sand to drain until moisture content is uniform prior to use.
- 3. Admixtures:
 - a. Protect from contamination, evaporation, freezing, or damage.
 - b. Maintain within temperature range recommended by manufacturer.
 - c. Completely mix solutions and suspensions prior to use.
- 4. Reinforcing steel:
 - a. Support and store all rebars above ground.

B. Delivery:

- 1. Concrete:
 - a. Prepare a delivery ticket for each load for ready-mixed concrete.
 - b. Truck operator shall hand ticket to Engineer at the time of delivery.
 - c. Ticket to show:
 - 1) Mix identification mark.
 - 2) Quantity delivered.
 - 3) Amount of each material in batch.
 - 4) Outdoor temp in the shade.
 - 5) Time at which cement was added.
 - 6) Numerical sequence of the delivery.
 - 7) Amount of water added.
- 2. Reinforcing steel: Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
 - a. Mark numbers to match shop drawing mark number.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Nonshrink grout:
 - a. Sika "SikaGrout 212."
 - b. Gifford Hill "Supreme Grout."
 - c. Master Builders "Masterflow 713."
 - 2. Epoxy grout:
 - a. Master Builders "Brutem MPG."

- b. Euclid Chemical Company, "High Strength Grout."
 - c. Fosroc, "Conbextra EPHF".
- 3. Expansion joint fillers:
 - a. Permaglaze Co.
 - b. Rubatex Corp.
 - c. Williams Products, Inc.
- 4. Waterstops, PVC:
 - a. Greenstreak Plastic Products, Inc.
 - b. W.R. Meadows, Inc.
 - c. Burke Company.
- 5. Form coating:
 - a. Richmond "Rich Cote."
 - b. Industrial Lubricants "Nox-Crete Form Coating."
 - c. Protex "Pro-Cote."
- 6. Prefabricated forms:
 - a. Simplex "Industrial Steel Frame Forms."
 - b. Symons "Steel Ply."
 - c. Universal "Uniform."
- 7. Chemical Floor Hardeners.
 - a. L & M Construction Chemicals, Inc.
 - b. Euclid Chemicals Inc.
 - c. Dayton Superior.
- 8. Bonding agents:
 - a. Euclid Chemical Co.
 - b. Master Builders Inc.
 - c. L&M construction Chemicals Inc.

2.2 MATERIALS

- A. Portland Cement: Conform to ASTM C150 Type IP(MS), II, or V, Low Alkali (LA).
- B. Fly Ash:
 - 1. ASTM C618, Class F or Class C.
 - 2. Nonstaining.
 - a. Hardened concrete containing fly ash to be uniform light gray color. Specifier: May use 6 percent loss on ignition for non-air-entrained concrete.
 - 3. Maximum loss on ignition: 4 percent.
 - 4. Compatible with other concrete ingredients.
 - 5. Obtain proposed fly ash from a source approved by the State Highway Department in the state where the Project is located for use in concrete for bridges.
- C. Admixtures:
 - 1. Air entraining admixtures: ASTM C260.
 - 2. Water reducing, retarding, and accelerating admixtures:
 - a. ASTM C494 Type A through E.
 - b. Conform to provisions of ACI 212.3R.
 - c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Engineer and at no cost to Owner.
 - d. Follow manufacturer's instructions.
 - e. Use chloride free admixtures only.
 - 3. Maximum total water soluble chloride ion content contributed from all ingredients of concrete including water, aggregates, cementitious materials and admixtures by weight percent of cement:

- a. 0.10 all concrete.
 - 4. Do not use calcium chloride.
 - 5. Pozzolanic admixtures: ASTM C618.
 - 6. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.
- D. Water: Potable, clean, free of oils, acids and organic matter.
- E. Aggregates:
- 1. Normal weight concrete: ASTM C33, except as modified below.
 - 2. Fine aggregate: Clean natural sand.
 - a. No manufactured or artificial sand.
 - 3. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material.
 - a. Maximum amount of clay or shale particles: 1 percent.
 - 4. Gradation of coarse aggregate:
 - a. Lean concrete and concrete topping: Size #7.
 - b. All other concrete: Size #57 or #67.
- F. Concrete Grout:
- 1. Nonshrink grout:
 - a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
 - b. Grout to produce a positive but controlled expansion.
 - c. Mass expansion not to be created by gas liberation.
 - d. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.
 - 2. Epoxy grout:
 - a. 3-component epoxy resin system.
 - 1) Two liquid epoxy components.
 - 2) One inert aggregate filler component.
 - b. Each component packaged separately for mixing at jobsite.
- G. Reinforcing Steel:
- 1. Reinforcing bars: ASTM A615, Grade 60, epoxy coated.
 - 2. Welded wire fabric: ASTM A185.
 - a. Minimum yield strength: 60,000 psi.
 - 3. Column spirals: ASTM A82.
- H. Forms:
- 1. Prefabricated or job built.
 - 2. Wood forms:
 - a. New 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
 - b. Built-in-place or prefabricated type panel.
 - c. 4 x 8 FT sheets for built-in-place type except where smaller pieces will cover entire area.
 - d. When approved, plywood may be reused.
 - 3. Metal forms:
 - a. Metal forms excluding aluminum may be used.
 - b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
 - 4. Chamfer strips: Clear white pine, surface against concrete planed.
 - 5. Form ties: Removable end, permanently embedded body type with cones on outer ends not requiring auxiliary spreaders.
 - a. Cone diameter: 3/4 IN minimum to 1 IN maximum.
 - b. Embedded portion 1 IN minimum back from concrete face.

- c. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.
 - d. Provide ties with built-in waterstops at all walls that will be in contact with process liquid during plant operation.
- 6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.
- I. Waterstops:
 - 1. Plastic: Corp of Engineers Specification CRD-C572.
 - 2. Serrated with center bulb.
 - 3. Thickness: 3/8 IN.
 - 4. Length (general use): 6 IN unless indicated otherwise.
 - 5. Expansion joints:
 - a. Length: 9 IN.
 - b. Center bulb: 1 IN OD x 1/2 IN ID.
 - 6. Provide hog rings or grommets spaced at maximum 12 IN OC along the length of the water stop.
 - 7. Provide factory made waterstop fabrications at all changes of direction, intersections and transitions leaving only straight butt splices for the field.
- J. Chairs, Runners, Bolsters, Spacers, and Hangers:
 - 1. Stainless steel, epoxy coated, or plastic coated metal.
 - a. Plastic coated: Rebar support tips in contact with the forms only.
- K. Chemical Floor Sealer, Hardener, Densifier:
 - 1. Colorless, no VOC, odorless chemical solution containing alkaline siliconates.
 - 2. Will not support bacteria growth.
 - 3. 10-year manufacturers warranty.
 - 4. Similar to L&M construction Chemicals Inc. "Seal Hard".
- L. Membrane Curing Compound: ASTM C309, Type I-D.
 - 1. Resin based, dissipates upon exposure to UV light.
 - 2. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.
 - 3. Curing compounds used in water treatment plant construction to be nontoxic and taste and odor free.
- M. Expansion Joint Filler:
 - 1. In contact with water or sewage:
 - a. Closed cell neoprene.
 - b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 psi compression deflection (Grade SCE41).
 - 2. Exterior driveways, curbs and sidewalks:
 - a. Asphalt expansion joint filler.
 - b. ASTM D994.
 - 3. Other use:
 - a. Fiber expansion joint filler.
 - b. ASTM D1751.
- N. Materials.
 - 1. Bonding agent:
 - a. High solids acrylic latex base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.

- b. Euclid Chemical Co. "Flex-Con".
- c. Master Builders Inc. "Acryl-Set".
- d. L&M construction Chemicals "Everbond".
- e. Thoro System Products "Acryl 60".

2.3 CONCRETE MIXES

A. General:

- 1. All concrete to be ready mixed concrete conforming to ASTM C94.
- 2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
- 3. All concrete to be normal weight concrete.

B. Strength:

- 1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
=====	=====	=====
All general use Concrete	Normal weight	4000 psi
Precast Concrete	Normal weight	5000 psi

*Minimum 28-day compressive strength.

- C. Air Entrainment: Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
=====	=====
1 IN or 3/4 IN	5 to 7
1/2 IN	5-1/2 to 8
3/8 pea gravel	5 to 7 (lean concrete and topping only)

- 1. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump: 4 IN maximum, 1 IN minimum.

- 1. Measured at point of discharge of the concrete into the concrete construction member.
- 2. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
- 3. Pumped concrete:
 - a. Provide additional water at batch plant to allow for slump loss due to pumping.
 - b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.
- 4. Determine slump per ASTM C143.

E. Selection of Proportions:

- 1. General - Proportion ingredients to:
 - a. Produce proper workability, durability, strength, and other required properties.
 - b. Prevent segregation and collection of excessive free water on surface.
- 2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH =====	MINIMUM CEMENT, LB/CY =====			MAXIMUM WATER CEMENT RATIO BY WEIGHT =====
	MAXIMUM AGGREGATE SIZE, IN			
	1/2 or 3/8	3/4	1	
	=====			
4000	611	611	611	0.45
5000	---	686	665	0.40

3. Substitution of fly ash:
 - a. Maximum of 25 percent by weight of cement at rate of 1 LB fly ash for 1 LB of cement.
 4. Sand cement grout:
 - a. Three parts sand.
 - b. One part portland cement.
 - c. Entrained air: Six percent plus or minus one percent.
 - d. Sufficient water for required workability.
 - e. Minimum 28-day compressive strength: 3,000 psi.
 5. Submit mix design data as required by this specification section.
 6. Normal weight concrete: Proportion mixture to provide desired characteristics using one of methods described below:
 - a. Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
 - 1) Air content within range specified above.
 - 2) Record and report temperature of trial mixes.
 - 3) Proportion trial mixes per ACI 211.1.
 - b. Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
 - 1) Field test records must be acceptable to Engineer to use this method.
 - 2) Test records shall represent materials, proportions and conditions similar to those specified.
 7. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of paragraph 5.3 of ACI 318 using the standard deviation of the proposed concrete production facility as described in paragraph 5.3.1 of ACI 318.
 8. Clarifier concrete topping:
 - a. 3/8 IN pea gravel for aggregate.
- F. Allowable 21-day shrinkage for lab mixed trial batches: 0.040 percent per ASTM C157 as modified by SEAOC.

PART 3 - EXECUTION

3.1 FORMING AND PLACING CONCRETE

- A. General:
1. Contractor is responsible for design and erection of formwork.
 2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
 - a. Allowable tolerances: As recommended in ACI 347R.
 3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains.

- a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
 - b. Do not place floor drains through beams.
- B. Openings: Provide openings in formwork to accommodate work of other trades.
 - 1. Accurately place and securely support items built into forms.
- C. Chamfer Strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.
- D. Reinforcement:
 - 1. Position, support and secure reinforcement against displacement.
 - 2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
 - 3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
 - 4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
 - 5. Extend reinforcement to within 2 IN of concrete perimeter edges.
 - a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
 - 6. Unless otherwise indicated, provide minimum concrete cover as follows:
 - a. Concrete deposited against earth: 3 IN.
 - b. Formed surfaces exposed to weather or in contact with earth: 2 IN for reinforcing bars #6 or larger; 1-1/2 IN for reinforcing bars less than #6.
 - c. Formed surfaces exposed to or located above any liquid: 2 IN.
 - d. Interior surfaces: 1-1/2 IN for beams, girders and columns; 3/4 IN or bar diameter, whichever is greater, for slabs, walls and joists.
 - 7. Do not weld reinforcing bars.
- E. Construction, Expansion, and Contraction Joints:
 - 1. Provide at locations indicated.
 - 2. Locate wall vertical construction joints at 30 FT maximum centers and wall horizontal construction joints at 10 FT maximum centers.
 - 3. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SF.
 - 4. Install construction joints perpendicular to the planes of their surfaces.
 - 5. At least 48 HRS shall elapse between placing of adjoining concrete construction.
 - 6. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
 - 7. Before new concrete is placed, coat all construction joints with an approved bonding agent used and applied in accordance with manufacturer's instructions.
- F. Embedments:
 - 1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
 - 2. Use setting diagrams, templates and instructions for locating and setting.
 - 3. Secure waterstops in correct position using hog rings or grommets spaced along the length of the waterstop and wire tie to adjacent reinforcing steel.
- G. Preparation:
 - 1. Clean and adjust forms prior to concrete placement.
 - 2. Tighten forms to prevent mortar leakage.
 - 3. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

H. Placing Concrete:

1. Place concrete in compliance with ACI 304R and 304.2R.
2. Place in a continuous operation within planned joints or sections.
3. Begin placement when work of other trades affecting concrete is completed.
4. Place concrete by methods which prevent aggregate segregation.
5. Do not allow concrete to free fall more than 4 FT.
6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.

I. Consolidation:

1. Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.

J. Protection:

1. Protect concrete from physical damage or reduced strength due to weather extremes.
2. In cold weather comply with ACI 306R except as modified herein.
 - a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
 - b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE
AT PLACEMENT (IN SHADE)

CONCRETE TEMPERATURE
AT MIXING

=====

=====

Below 30 DegF

70 DegF

Between 30-45 DegF

60 DegF

Above 45 DegF

50 DegF

- c. Do not place heated concrete that is warmer than 80 DegF.
 - d. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DegF for 7 days or 70 DegF for 3 days.
 - e. Do not allow concrete to cool suddenly.
3. In hot weather comply with ACI 305R except as modified herein.
 - a. At air temperature of 90 DegF and above, keep concrete as cool as possible during placement and curing.
 - b. Do not allow concrete temperature to exceed 90 DegF at placement.
 - c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 - d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305R, Figure 2.1.5.

K. Curing:

1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
4. Provide curing for minimum of 7 days.
5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
6. In hot weather follow curing procedures outlined in ACI 305R.
7. In cold weather follow curing procedures outlined in ACI 306R.

8. If forms are removed before 7 days have elapsed, finish curing of formed surfaces by one of above methods for the remainder of the curing period.
 9. Curing vertical surfaces with a curing compound: Cover vertical surfaces with a minimum of two coats of the curing compound.
 - a. Allow the preceding coat to completely dry prior to applying the next coat.
 - b. Apply the first coat of curing compound immediately after form removal.
 - c. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
 - d. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.
- L. Form Removal:
1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
 2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-day compressive strength.
 3. Where reshoring is planned, supporting formwork may be removed when concrete has sufficient strength to safely support its own weight and loads placed thereon.
 - a. While reshoring is underway, no superimposed loads shall be permitted on the new construction.
 - b. Place reshores as soon as practicable after stripping operations are complete but in no case later than the end of working day on which stripping occurs.
 - c. Tighten reshores to carry their required loads.
 - d. Leave reshores in place until concrete being supported has reached its specified 28-day compressive strength.

3.2 CONCRETE FINISHES

- A. Tolerances:
1. Class A: 1/8 IN in 10 FT.
 2. Class B: 1/4 IN in 10 FT.
- B. Surfaces Exposed to View:
1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
 - a. To be covered with a coating or covering material applied directly to concrete.
 - b. Scheduled for grout cleaned finish.
 2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
 3. Fill tie holes with nonshrink grout.
- C. Surfaces Not Exposed to View:
1. Patch voids, air pockets and honeycomb areas with sand cement grout.
 2. Fill tie holes with nonshrink grout.
- D. Grout Cleaned Finish:
1. Mix a part portland cement and 1-1/2 parts fine sand with sufficient bonding agent/water mixture to produce a grout with the consistency of thick paint.
 - a. White portland cement shall be substituted for gray portland cement to produce a color that matches color of surrounding concrete as determined by trial patch for areas not to be painted.
 2. Wet surface of concrete to prevent absorption of water by grout and uniformly apply grout with brushes or spray gun.
 3. Immediately scrub the surface with a cork float or stone to coat and fill air bubbles and holes.

4. While grout is still plastic, remove all excess grout by working surface with rubber float, sack or other approved means.
 5. After the surface whitens from drying, rub vigorously with clean burlap.
 6. Keep final finish damp for a minimum of 36 HRS after final rubbing.
- E. Slab Float Finish:
1. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
 2. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation.
 3. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles.
 4. Cut down all high spots and fill all low spots during this procedure to produce a surface within Class B tolerance throughout.
 5. Refloat slab immediately to a uniform sandy texture.
- F. Troweled Finish:
1. Float finish surface.
 2. Next power trowel, and finally hand trowel.
 3. Produce a smooth surface which is relatively free of defects with first hand troweling.
 4. Perform additional trowelings by hand after surface has hardened sufficiently.
 5. Final trowel when a ringing sound is produced as trowel is moved over surface.
 6. Thoroughly consolidate surface by hand troweling.
 7. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
 8. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.
- G. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.
- H. Apply chemical floor sealer, hardener, densifier to all permanently exposed interior concrete non-vertical surfaces.
1. Apply in accordance with manufacturer's instructions.

3.3 GROUT

- A. Preparation:
1. Nonshrinking nonmetallic grout:
 - a. Clean concrete surface to receive grout.
 - b. Saturate concrete with water for 24 HRS prior to grouting.
 2. Rock anchors:
 - a. Clean rock anchors of all loose material.
 - b. Orient hook or bends in anchor bars to clear anchor bolts, reinforcements, and other embedments to be installed later.
 3. Epoxy grout: Apply only to clean, dry, sound surface.
- B. Application:
1. Nonshrink grout:
 - a. Mix in a mechanical mixer.
 - b. Use no more water than necessary to produce flowable grout.
 - c. Place in accordance with manufacturer's instructions.
 - d. Completely fill all spaces and cavities below the bottom of baseplates.

- e. Provide forms where baseplates and bedplates do not confine grout.
- f. Where exposed to view, finish grout edges smooth.
- g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
- h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
- i. Wet cure grout for 7 days, minimum.
- 2. Epoxy grout:
 - a. Mix and place in accordance with manufacturer's instructions.
 - b. Completely fill all cavities and spaces around dowels and anchors without voids.
 - c. Obtain manufacturer's field technical assistance as required to ensure proper placement.

3.4 FIELD QUALITY CONTROL

- A. Owner will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.
 - 1. Contractor to cooperate with Owner in obtaining and testing samples.
- B. Tests During Construction:
 - 1. Strength test - procedure:
 - a. Three cylinders, 6 IN DIA x 12 IN high, will be taken from each sample per ASTM C172 and C31.
 - b. Cylinders will be tested per ASTM C39:
 - 1) One at 7 days.
 - 2) Two at 28 days.
 - 2. Strength test - frequency:
 - a. Not less than one test each day concrete placed.
 - b. Not less than one test for each 50 CY or major fraction thereof placed in one day.
 - c. Not less than one test for each type of concrete poured.
 - d. Not less than one test for each concrete structure exceeding 2 CY volume.
 - 3. Slump test: Per ASTM C143.
 - a. Determined for each strength test sample.
 - b. Additional slump tests may be taken.
 - 4. Air content: Per ASTM C231, C173, and C138.
 - a. Determined for each strength test sample.
 - 5. Temperature: Determined for each strength test sample.
- C. Evaluation of Tests:
 - 1. Strength test results: Average of 28-day strength of two cylinders from each sample.
 - a. If one cylinder manifests evidence of improper sampling, molding, handling, curing or testings, strength of remaining cylinder will be test result.
 - b. If both cylinders show any of above defects, test will be discarded.
- D. Acceptance of Concrete:
 - 1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
 - a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.

- b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
- 2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
 - a. Perform additional tests and/or corrective measures at no additional cost to Owner.

3.5 SCHEDULES

A. Form Types:

- 1. Surfaces exposed to view:
 - a. Prefabricated or job-built wood forms.
 - b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
 - c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
 - d. Construct forms sufficiently tight to prevent leakage of mortar.
- 2. Surfaces normally submerged or not normally exposed to view:
 - a. Wood or steel forms sufficiently tight to prevent leakage of mortar.
- 3. Other types of forms may be used:
 - a. For surfaces not restricted to plywood or lined forms.
 - b. As backing for form lining.

B. Grout:

- 1. Nonshrink grout: General use.
- 2. Epoxy grout:
 - a. Grouting of dowels and anchor bolts into existing concrete.
 - b. Other uses indicated on Drawings.
- 3. Sand cement grout:
 - a. Repair of surfaces not exposed to view as specified in 3.02 C.

C. Concrete:

- 1. Precast concrete: Where indicated on Drawings.
- 2. Normal weight concrete: All concrete.

D. Concrete Finishes:

- 1. Grout cleaned finish: Where indicated on Drawings.
- 2. Slab finishes:
 - a. Use following finishes as applicable, unless otherwise indicated:
 - 1) Floated finish: Surfaces intended to receive roofing, concrete topping, concrete fill and waterproofing.
 - 2) Troweled finish: Interior floor slabs, exposed roof slabs and base slabs of structures, equipment bases, and column bases.
 - 3) Broom finish: Sidewalks, docks, concrete stairs, and ramps.

END OF SECTION

SECTION 05501

ANCHOR BOLTS AND EXPANSION ANCHORS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Equipment anchor bolts
 - 2. Structural anchor bolts
 - 3. Expansion anchors
 - 4. Epoxy set anchor bolts
- B. Additional Requirements Specified Elsewhere:
 - 1. Shop Drawings, Product Data and Samples: Section 01340
 - 2. Product Requirements: Section 01600

1.02 SUBMITTALS

- A. Product Data: Sufficient to verify compliance with Specifications

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver anchor bolts and templates in time to permit setting when structural concrete is placed

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bolts:
 - 1. Steel bolts and nuts: ASTM A 307 Grade B and A 563 Grade A
 - 2. Coating: Chemical cleaning, abrasive blasting, nickel priming, and multiple coats of a baked fluoropolymer coating, Tripac 2000 Blue Coating System, no approved equal. Coating shall include all fastener components, including washers.
- B. Nuts:
 - 1. Same material as bolts
 - 2. Self-locking: Prevailing torque, IFI-100, grade A
- C. Washers:
 - 1. Same material as bolts
 - 2. Flat: ANSI B27.2
 - 3. Locking: Spring type ANSI B27.1
- D. Expansion Anchors:
 - 1. In hardened concrete and grouted masonry

- a. Type "A": Wedge type, FS FF-S-325, Group II, Type 4, Class 1
 - b. Type "B": Self-drilling, FS FF-S-325, Group III, Type 1, flush type
 - c. Type "C": Non-drilling, internally threaded, FS FF-S-325, Group VIII, Type 1 Drop in
 - d. Type "D": Non-drilling, externally threaded, FS FF-S-325, Group VIII, Type 2
- 2. In hollow and solid masonry
 - a. Type "E": Lag shield, FS FF-S-325, Group II, Type 1, Class 1
 - b. Type "F": Split sleeve, FS FF-S-325, Group II, Type 3, Class 3
- 3. Coating: Chemical cleaning, abrasive blasting, nickel priming, and multiple coats of a baked fluoropolymer coating, Tripac 2000 Blue Coating System, no approved equal. Coating shall include all fastener components, including washers.

2.02 FABRICATION AND MANUFACTURE

- A. Anchor Bolts:
 - 1. 3/4 inch minimum, except as indicated on the Drawings
 - 2. Type:
 - a. General use: L-shaped hook type
 - b. Where indicated on Drawings or specified:
 - 1) Straight bolt with square head
 - 2) Straight bolt with square plate welded to bolt and nut welded to plate and bolt
 - 3) Through-bolt with sleeve and square plate assembly
 - 4) Coupled bolt with sleeve welded to square plate and bolt
 - 3. Material: Steel with fluoropolymer coating
- B. Expansion Anchors:
 - 1. 3/4-inch maximum unless otherwise indicated on Drawings
 - 2. Do not use cinch anchors
 - 3. Length: As required for proper embedment
 - 4. Material: Steel with fluoropolymer coating
- C. Epoxy Set Anchors:
 - 1. FS FF-S-325
 - 2. In hardened concrete and where specifically noted on plans:
 - a. Parabond capsule anchors
 - b. Material: Steel with fluoropolymer coating
 - c. Approved manufacturers:
 - 1) Molly Fastener Group by Emhart
 - 2) Hilti, Inc.
 - 3) Or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that holes for anchor bolts in forms and templates match applicable equipment Shop Drawings

3.02 INSTALLATION

- A. Anchor Bolts:
 - 1. Where installed in cast-in-place concrete, install a nut on the concrete side of the form or supporting template
 - 2. Provide 3 nuts for each anchor bolt for which a lock nut is indicated, 2 for others
- B. Expansion Anchors:
 - 1. Install in conformity with the manufacturer's instructions
 - 2. Minimum embedment: 4 bolt diameter or manufacturer's instructions, whichever is greater
 - 3. Minimum distance between expansion anchor centerline and any edge or exterior corner of concrete: 4 1/2 bolt hole diameter
- C. Epoxy Set Anchors:
 - 1. Install as per manufacturer's recommendation
 - 2. Minimum hole depth: As per manufacturer's recommendation but not less than 6-5/8 inches
 - 3. Diameter of drilled holes: As per ANSI B94.12

3.03 SCHEDULE

- A. Expansion Anchors:
 - 1. In hardened concrete and grouted masonry: Type "A," "B," "C," or "D," Contractor's option, unless type is indicated on Drawings
 - 2. In hollow and solid masonry: Type "E," or "F," Contractor's option, unless type is indicated on Drawings
 - 3. Epoxy set anchors were adhesion or epoxy anchor bolts specifically noted on Drawings

END OF SECTION

SECTION 05999

MISCELLANEOUS METAL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Items fabricated from metal shapes, plates, sheets, rods, bars, or castings.
 - 2. Checkered floor plate.
 - 3. Railings, galvanized.
 - 4. Grating and grating treads, galvanized.
 - 5. Edge angles.
 - 6. Stairs, galvanized.
 - 7. Nosings cast in stair steps.
 - 8. Metal specialties as specified herein.
 - 9. Ladders, galvanized.
 - 10. And all other miscellaneous metals shown on drawings.
- B. Additional Requirements Specified Elsewhere:
 - 1. Shop Drawings, Product Data and Samples: Section 01340.
 - 2. Product Requirements: Section 01600.
 - 3. Anchor Bolts and Expansion Anchors: Section 05501.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Handrail, steps, and ladders shall comply with all applicable provisions of OSHA.
- B. Reference Standards:
 - 1. AISC "Steel Construction Manual".
 - 2. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings".
 - 3. ASTM A1: Carbon Steel Tee Rails.
 - 4. ASTM A36: Structural Steel.
 - 5. ASTM A366: Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
 - 6. ASTM A569: Steel, Carbon (0.15 Max, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
 - 7. ASTM A325: High Strength Bolts for Structural Joints.
 - 8. ASTM A307: Carbon Steel Externally Threaded Standard Fasteners.
 - 9. IFI-100:
 - 10. ASTM A490: Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
 - 11. FS WW-F-461: Floor Plate, Steel, Rolled.
 - 12. ASTM A500: Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 13. ASTM A501: Hot-Formed Welded and Seamless, Carbon Steel Structural Tubing.
 - 14. FS RR-G-661: Grating, Metal, Bar Type (Floor, Except for Naval Vessels).

15. ASTM A48: Gray Iron Castings.
16. ASTM A167: Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
17. ASTM B36: Brass Plate, Strip and Rolled Bar.
18. ASTM B61: Steamer Valve Bronze Castings.
19. ASTM B140: Copper-Zinc-Lead (Leaded Red Brass or Hardware Bronze) Rod, Bar and Shape .
20. ASTM B97: Copper-Silicon-Alloy Plate, Strip and Rolled Bar for General Purposes.
21. ANSI A202.1: Metal Bar Grating Manual for Steel and Aluminum Gratings and Stair Treads.
22. ASTM A120: Pipe, Steel, Black and Hot-Dipped, Zinc Coated (Galvanized) Welded and Seamless for Ordinary Uses.

C. Tolerances:

1. Structural steel:
 - a. All members level, plumb and aligned within 1:500.
 - b. Top elevation of roof and floor members within 1/16 inch of that indicated on Drawings.
 - c. Girt faces and other supporting members in vertical planes within 1/8 inch.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data:
1. Product Data describing each manufactured metal specialty.
 2. Shop Drawings describing each fabricated item.
 3. Erection Drawings for structural steel.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Store on Blocking So That No Metal Touches the Ground and Water Cannot Collect Thereon.
- B. Protected From Bending Under Its Own Weight or Superimposed Loads.

1.05 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Guardrail, steps and ladders shall comply with all applicable provisions of OSHA.
- B. Compliance with the requirements specified herein may necessitate modification to the manufacturer's standard materials or equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel:
1. Plates and shapes: ASTM A36.
 2. Sheets: ASTM A366 or A569, zinc coated.
 3. Pipe: ASTM A120.

4. Bolts:
 - a. High strength: ASTM A325.
 - b. Unfinished: ASTM A307, fluoropolymer coated per Section 05501, coating shall apply to all nuts, washers and other components.
 - c. Self-locking nuts: Prevailing torque type; IFI-100, Grade A.
 - d. Flat washers: ANSI B27.2.
 - e. Lock washers: Spring type, ANSI B27.1.
 - f. Beveled washers: Table 1 of Specifications for Structural Joints Using ASTM A325 or A490 Bolts, AISC Steel Construction Manual.
 5. Welds:
 - a. Part 5 Specifications and Codes, AISC Steel Construction Manual.
 - b. AWS D1.1-77 American Welding Society.
 - c. Welding Electrodes: AWS 5.20 E70TX.
 6. Checkered plate: FS QQ-F-461.
 7. Structural tubing: ASTM A500 or A501.
 8. Railings, hand and guard:
 - a. Structural Steel Shapes and Plates: ASTM A36.
 - b. Steel Bars and Bar-size Shapes: ASTM A36.
 - c. Steel Tubing: ASTM A500, Grade B ($F_y = 46,000$ psi) (317MPa).
 - d. Gray Iron Castings: ASTM A48, Class 30.
 - e. Malleable Iron Castings: ASTM A47, Grade as selected.
 - f. Steel Pipe: ASTM A53, type as selected, Grade A standard weight (Schedule 40).
 - g. Paint:
 - 1) Metal Primer: VOC compliant.
 - a) Interior steel: Tnemec 10-99W (white).
 - b) Exterior steel (exposed): Tnemec-Zinc 90-97.
 - 2) Galvanizing repair paint: High zinc dust content; MIL-P-21035 (Ships).
- B. Cast Iron: ASTM A48, Class 25 or better.
- C. Stainless Steel: 18-8:
 1. Plates: ASTM A167.
 2. Bolts: IFI-104, Grade 303 or 305.
- D. Aluminum:
 1. Sheet and plate: ASTM B209, alloy 6061-T6.
 2. Rolled sections: ASTM B308, alloy 6061-T6.
 3. Rod and bar: ASTM B211, alloy 6061-T6 or 2017-T4.
 4. Extrusions: ASTM B221, alloy 6063-T5 or T6.
 5. Pipe: ASTM B429, alloy 6061-T6 or 6063-T6.
 6. Rivets: ASTM B316, alloy 6061-T6.
 7. Bolts: IFI-104, Grade 24T4.
 8. Castings: ASTM B26 or B85.
 9. Checkered plate: Alcoa C102.
- E. Specialty and Accessory Items:
 1. Chain: FS RR-C-271, Type I, Grade C, Class 5, Style 2, galvanized; welded steel, twist-link style, short link pattern.

2. Guardrail-setting cement: ASTM C595 hydraulic quick setting cement, factory prepared with accelerator.
3. Bird screen: 2 mesh, brass or copper wire cloth, minimum wire diameter 0.063 inch.
4. Body solder: Flux-core wire, ASTM B32, Alloy Grade 20B.
5. Grating saddle clips and flange block:
 - a. ANSI A202.1.
 - b. Steel grating: Galvanized steel clips.
 - c. Aluminum grating: galvanized steel clips.
 - d. Clip fasteners: Nelson stud type bolts, 1/4-inch minimum, galvanized or corrosion resistant alloy.

F. Safety Nosings:

1. Safety stair nosings, 3 inches wide, 1/4-inch thick single component type with anchor set into concrete. Aluminum base of 6063-T5 extruded aluminum with anti-slip filler containing 65 percent grain aluminum oxide (Al_2O_3)/silicon carbide (sic) abrasive. Nosings shall be designed for outdoor use, heavy pedestrian traffic. Manufactured by company specializing in fabrication of safety nosings, Manufactured by Wooster Products, Balco Inc., or equal.
2. Provide safety stair nosings at all concrete stairs and steel pain stairs.

G. Shop Coatings:

1. Rust inhibitive shop primer for steel: Tnemec "77 Chem-Prime", Carboline, or approved equal.
2. Zinc rich primer: Tnemec "92 Tnemec- Zinc", Carboline, or approved equal.
3. Coal tar paint: Tnemec "450 Heavy Tnemecol", Carboline, or approved equal.
4. Galvanizing: Hot-dip process:
 - a. ASTM A123 – Standard Spec for Zinc (Hot Dip) Coatings on Iron and Steel Products.
 - b. ASTM A385 – Standard Practice for Providing High Quality Zinc Coatings (Hot Dip).
 - c. ASTM A384 – Practice for Guarding Against Warpage and Distortion During Hot Dip Galvanizing.
5. Bolt galvanizing:
 - a. Zinc: ASTM A164, Type GS.
 - b. Cadmium: ASTM A165, Type NS.
6. Aluminum:
 - a. Standard mill finish.
 - b. Clear anodize.

H. Metal Framing Strut:

1. As shown on Pipe Support Details.
2. Non-submerged locations: Stainless steel or FRP.
3. Submerged locations: Stainless steel.
4. Provide accessory fittings, clamps, spring screws, etc. as required.
5. Tyco, AlSCO, or equal.

2.02 FABRICATION AND MANUFACTURE

A. General:

1. In accordance with dimensions, arrangement, sizes and weights or thicknesses indicated on the Drawings or specified.

2. All members free of winds, warps, local deformations or unauthorized bends.
 3. Holes and other provisions for field connection accurate and shop checked for proper fit. Holes shall be neatly drilled or punched. Torch cut hole are not acceptable.
 4. Mark each piece according to the erection Drawing.
 5. Provide all field connection materials.
- B. Connections:
1. General:
 - a. As indicated on the Drawings.
 - b. Where welding is permitted or required:
 - 1) Butt and miter welds continuous.
 - 2) Exposed welds ground smooth.
 - 3) Intermittent welds:
 - a) 2 inches minimum effective length.
 - b) 6 inches minimum spacing.
 2. Structural:
 - a. If not indicated on the Drawings, as defined in Part 4 "Connections" of the AISC Manual Ninth Edition.
 - b. Shop connections may be bolted, welded, or riveted.
 - c. Bolted connections for girts with slotted or oversized holes for adjustment.
 3. All others: If not indicated on the Drawings, unfinished bolts with self locking nuts or lock washers.
- C. Shop Coating:
1. Preparation:
 - a. All surfaces to be at the proper temperature, dry, and free of grease, oil, dirt, dust, grit, rust, loose mill scale, weld flux, slag, weld spatter, and other objectionable substances.
 - b. Scrape, chip and brush welds as required to remove all spatter.
 - c. Dull sharp corners of cut or sheared edges with at least one pass of a power grinder.
 2. Galvanizing: Hot dipped after fabrication.
 3. Castings: Hot dip in asphalt varnish or coat with coal tar paint, 6 mils minimum.
 4. Steel:
 - a. Unless otherwise indicated or specified, coat with rust inhibitive primer, 1 1/2 mils minimum.
 - b. Apply after fabrication.
 - c. Coat as soon after cleaning as practicable.
 - d. Apply in a heated structure if outside air temperature is below 50 Degrees F.
 - e. Do not move or handle until coating is dry and hard.
 5. Aluminum: Coat all surfaces to come in contact with concrete, cement, mortar, or dissimilar metals with coal tar paint, 6 mils minimum.
 6. Other surfaces: Do not shop coat galvanized steel, stainless steel, or bronze.
- D. Checkered Floor Plate:
1. As indicated on Drawings.
 2. If not indicated on Drawings: Aluminum.
 3. Provided with lifting hole if not bolted or welded in place.
 4. Shop straighten warped or bent plates to lie perfectly flat.
 5. Supporting steel members hot-dip galvanized after fabrication.
- E. Hand and Guard Railings:

1. Galvanized, hot dipped after fabrication.
2. All railings provided of the same type and design, except as otherwise specified or indicated on Drawings.
3. Steel:
 - a. 1-1/2-inch standard weight steel pipe.
4. Connections:
 - a. Welded railing:
 - 1) Make connection angles, offsets or other changes in alignment in pipe railings with prefabricated railing cells and welding connectors, R.B. Wagner, Julius Blum.
 - b. Prefabricated railing: As recommended by railing manufacturer.
5. Fabrication:
 - a. Smooth with all projecting joints and sharp corners ground smooth.
 - b. Make welded joints flush.
 - c. Neatly cope members and continuously weld or connect mechanically at all junctions.
 - d. Dress weld fillets to uniform radius, remove excess metal and grind smooth.
 - e. Removable guardrail sections to have two (2) posts each.
6. Sleeves:
 - a. Fixed posts:
 - 1) Standard weight steel pipe.
 - 2) 6-inch minimum, or larger as required to provide 1/4-inch minimum clearance around post.
 - b. Removable posts:
 - 1) Outer sleeve: Standard weight black steel pipe.
 - 2) Inner sleeve: Schedule 40 PVC pipe.
7. Safety chain:
 - a. Provide where indicated on Drawings.
 - b. 1/4-inch chain, length as required by opening.
 - c. Fastened to one post with cadmium plated or stainless steel eyebolt.
 - d. Fastened to other post by a 2-1/2-inch heavy duty cadmium plated harness strap engaging a similar eyebolt.
8. Toe boards:
 - a. All railings to have minimum 1/4-inch by 4-inch toe boards.
 - b. Plates to have slotted holes to allow for alignment and avoid warpage after installation.

F. Grating and Grating Treads:

1. Galvanized.
2. Depth of bearing bars as indicated on Drawings.
3. If not indicated on Drawings: Galvanized steel grating, and galvanized stair treads.
4. Laid out with openings centered on a joint between sections.
5. 3/16-inch toe plates around openings extending the full depth and 4 inches above top of grating.
6. Weld toeplates to each bearing bar.
7. 3/16-inch thick, full depth bands at ends of bearing bars in grating floor sections.
8. Weld bands to first, last and every fourth intermediate bearing bar.
9. Cut cross bars flush with outside face of side bars.
10. Cutting:
 - a. All cuts: Sawed or sheared.
 - b. Clean and smooth without fins, beads or other projections.

11. Fabricate in easily handled panels equally spaced or area covered.
12. Maximum weight of each panel: 40 lbs. Submit panel weights with panel layout drawing.
13. Align cross bars and edge bars of adjacent panels.
14. Maximum clearance between panels: 1-1/4 inches.
15. Make all bearing bars parallel.
16. Make all grating flat with no tendency to rock.
17. Tolerance:
 - a. Length: 3/16-inch.
 - b. Width: 1/8-inch.
 - c. Maximum difference on opposite diagonals: 1/4-inch.
 - d. Bearing bar spacing: 1/32-inch.
 - e. Band and toeplate vertical and horizontal alignment: 1/8-inch.
18. Grating:
 - a. Pressure locked - swaging process.
 - b. Bearing bars: 3/16-inch thick minimum at 1-3/16-inch centers maximum.
19. Hot-dip galvanize after fabrication steel frames to be cast in concrete.
20. Stair treads:
 - a. With carrier plates and abrasive nosing.
 - b. Fastened to stringers with galvanized bolts.
 - c. Galvanized similar to grating style.
21. Aluminum nosing: Non-slip nose tread.

G. Steel Stairs:

1. Erect true to line and slope.
2. Support rigidly and brace and tighten against movement.
3. Install treads level and to perfect alignment and spacing.
4. Attach handrails rigidly and to perfect alignment:
 - a. Rigid with no noticeable sway or deflection under ordinary foot traffic.
 - b. If necessary, provide additional supports and bracing to prevent noticeable movement.
5. Provide steel pans for concrete filled stairs at treatment building and maintenance/SCADA building, where shown on plans.

H. Door Frames: Not Applicable

I. Castings:

1. Manhole covers:
 - a. Cast iron frame and lid, Neenah R-1769A, Deeter Foundry, McKinley Iron Works, or approved equal.
 - b. 24-inch clear opening, or as required on Drawings.

J. Galvanized Ladders:

1. Provide in locations shown on contract plans.
2. Vertical dimensions as required and measured in field.
3. Galvanize after fabrication.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Field Measurements: Verify existing conditions by taking field measurements as required.
- B. Before Assembly, Thoroughly Clean All Parts Which Will Be In Contact With Each Other.

3.02 ERECTION AND INSTALLATION

- A. General:
 - 1. Assemble all parts accurately as indicated on the Drawings.
 - 2. Set baseplates level and grout in place.
- B. Connections:
 - 1. General:
 - a. As indicated on the Drawings.
 - b. Where welding is permitted or required:
 - 1) Butt and miter welds continuous.
 - 2) Exposed welds ground smooth.
 - 3) Intermittent welds:
 - a) Minimum effective length: 2 inches.
 - b) Max spacing: 6 inches.
 - c. No field welding to package factory water treatment plant permitted.
 - d. Light drifting is permitted to draw parts together.
 - e. No drifting to match unfair holes.
 - f. Enlarge holes, if necessary, by reaming with twist drills.
 - g. No burning to enlarge holes.
 - 2. Structural steel:
 - a. High strength bolts:
 - 1) Turn-of-nut tightening as described in "Specifications for Structural Joints Using ASTM A325 or A490 Bolts" in the AISC manual.
 - 2) Use beveled washers when the bearing faces of bolted parts have a slope of 1:20 or greater with respect to a plane perpendicular to the bolt axis.
 - b. No field welding of structural steel, except as indicated on the Drawings:
 - 1) By certified welders.
- C. Aluminum Stairs:
 - 1. Erect true to line and slope.
 - 2. Support rigidly and brace and tighten against movement.
 - 3. Install treads level and to perfect alignment and spacing.
 - 4. Attach handrails rigidly and to perfect alignment:
 - a. Rigid with no noticeable sway or deflection under ordinary foot traffic.
 - b. If necessary, provide additional supports and bracing to prevent noticeable movement.
- D. Handrails and Guard Rails:
 - 1. Install with posts plumb and longitudinal members parallel to each other and to floor or slope of stairs.
 - 2. All members in a section or in true alignment in the same vertical plane.
 - 3. Provide wall brackets where indicated or required, anchored with stainless steel bolts and expansion anchors.
 - 4. Rigidly attach fixed handrail posts to supporting structure:

- a. Attach to concrete structure by setting in sleeves, except as otherwise indicated.
 - b. Rigidly support sleeves in accurate alignment in forms.
 - c. Position vertically so sleeve is held below the finished concrete surface.
 - d. Measure the location of each sleeve before fabricating handrail.
 - e. Wedge post in accurate alignment and fill annular space with handrail set in cement.
 - f. Finish top surface of cement smooth and sloping away from post.
 - g. Where indicated, attach to structure with flanges and other special attachments or anchorages.
- 5. Set removable sections in double sleeves:
 - a. Set inner sleeve in outer sleeve as specified for fixed posts.
 - b. Take special care that inner sleeves are accurately spaced and plumb so handrail sections will stand in proper alignment and will be removable without binding.
- 6. Field connections: Locking mechanical splice fittings, R. B. Wagner, Julius Blum and Co., or equal.
- 7. Slip joints for expansion and contraction:
 - a. Provide at 30-foot maximum intervals.
 - b. Gap: Between 1/8 inch and 3/8 inch.
- 8. Post spacing:
 - a. Steel: 5 feet maximum.
- E. Grating:
 - 1. Do not damage during installation.
 - 2. General areas:
 - a. Securely anchor in place.
 - b. Fasten with saddle clips or flange blocks in accordance with ANSI A202.1.
- F. Door Frames: Anchor steel clip angles to concrete floors with 1/2-inch bolts and expansion anchors, except as otherwise indicated.
- G. Guardrail and Lattice: Tube steel of sizes indicated.

3.03 FIELD QUALITY CONTROL

- A. Structural Steel Connections:
 - 1. Provide a platform or other means of access for inspection of each field connection.
 - 2. Leave in place until inspected by Engineer.
- B. Guardrail:
 - 1. Check final alignment with a tightly drawn reference wire.
 - 2. Max misalignment allowed: 1/8 inch.
 - 3. Replace bent, damaged or deformed railings.

END OF SECTION

SECTION 06601

FIBERGLASS REINFORCED PLASTIC (FRP) GRATING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The CONTRACTOR shall properly install, and fabricate where necessary, all FRP products required to produce a complete, operable, and serviceable installation as shown on the Drawings and as specified herein in accordance with the requirements of the Contract Documents.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
1. ASTM D635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
 2. ASTM D638 Test Method for Tensile Properties of Plastic.
 3. ASTM D695 Test Method for Compressive Strength of Rigid Plastics.
 4. ASTM D732 Shear Strength of Plastics by Punch Tool.
 5. ASTM D790: Test Methods for Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 6. ASTM E84 Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. The CONTRACTOR shall furnish shop drawings of all fabricated gratings and accessories in accordance with the provisions of this Section.
- B. The CONTRACTOR shall furnish manufacturer's shop drawings clearly showing material sizes, types, styles, part or catalog numbers, complete details for the fabrication of and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes, and connection details.
- C. The CONTRACTOR shall submit the manufacturer's published literature including structural design data, structural properties data, grating load/deflection tables, corrosion resistance tables, certificates of compliance, test reports as applicable,

concrete anchor systems and their allowable load tables, and design calculations for systems not sized or designed in the contract documents.

- D. The CONTRACTOR shall submit sample pieces of each item specified herein for acceptance by the ENGINEER as to quality and color. Sample pieces shall be manufactured by the method to be used in the WORK.

1.4 QUALITY ASSURANCE

- A. All items to be provided under this Section shall be furnished only by manufacturers having a minimum of ten (10) years experience in the design and manufacture of similar products and systems. Additionally, if requested, a record of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided.
- B. The installing Contractor shall assure that all field dimensions are taken accurately and communicated to the FRP Fabricator and that all the Manufacturer's instructions and recommendations are followed.
- C. Manufacturer shall offer a 3 year limited warranty on all FRP products against defects in materials and workmanship. The warranty of all fiberglass products shall be extended for a period of 10 years against failure due to corrosion.
- D. Manufacturer shall be certified to the ISO 9001-2000 standard.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Products shall be delivered, stored and handled per the manufacturer's recommendations. Deliver products individually crated for protection from damage in cardboard containers, clearly marked with project information and shipping information. Include a copy of the installation instructions with the product delivery.
- B. All materials shall be carefully handled to prevent abrasion, cracking, chipping, twisting, other deformations, and other types of damage. Store items in an enclosed area and free from contact with soil and water. Store adhesives, resins and their catalysts and hardeners in dry indoor storage facilities between 70 and 85 degrees Fahrenheit (21 to 29 degrees Celsius) until they are required.

PART 2 PRODUCTS

2.1 GENERAL

- A. All FRP shall be corrosion resistant using resins resistant to continuous contact with the following:
 - 1. Ferric Chloride (40%).

2. Mannich Polymer.
 3. Emulsion Polymer.
 4. Municipal Wastewater.
 5. Sulfuric Acid (10%)
- B. All FRP materials shall be manufactured with vinyl ester resins.
- C. All FRP products shall also be suitable for outdoor installation and be ultraviolet (UV) resistant. Pultruded grating and structural shapes shall be constructed of strand roving, transverse mat, and a synthetic veil. Fabrication shall include UV light inhibitors.
- D. All pultruded grating and structural shapes shall be flame retardant per ASTM E-84 Class 1 Flame Spread of less than 25.
- E. After fabrication of FRP, all cuts, holes, and abrasion shall be sealed with vinyl ester resin to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the Contractor in accordance with the manufacturer's instructions.
- F. All related hardware shall be Type 316, or 316L when welded, stainless steel unless noted otherwise on the Drawings.

2.2 GRATING

- A. Grating and plate shall be suitable for outdoor installation in a wastewater plant environment, UV resistant and able to provide load requirements for walkway applications.
- B. Load/Deflection: Grating shall meet manufacturer's published safe recommended loadings with deflection not to exceed the following:
1. Uniform distributed load of 300 pounds per square foot over a 48-inch span with a maximum deflection of 0.21 inches.
- C. Depth: 2-inches deep load bars with a tolerance of plus or minus 1/32 inches.
- D. Mesh Configuration: 2-inch load bar spacing, 6-inch tie bar spacing on centers.
- E. Grating shall be assembled using a locking cross-rod design that makes a permanent connection between the cross-rod and bearing bar.
- F. Grating shall be flush construction, having no seams or cracks.
- G. Maximum weight of any single panel shall be 50 lbs.

- H. Grating shall be provided with a grit bonded and baked to the top surface of the finished grating product.
- I. The FRP color shall be gray or yellow.
- J. Engineering properties per foot of grating width:
 - 1. Cross sectional area – 3.2 in^2
 - 2. Moment of inertia – 1.68 in^4
 - 3. Section modulus of top – 1.96 in^3
 - 4. Section modulus of bottom – 1.47 in^3
- K. Manufacturer and Grating Model:
 - 1. Fibergrate Composite Structures, Inc., Safe-T-Span, T5020.
 - 2. Or approved equal.

PART 3 EXECUTION

3.1 FABRICATION

- A. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by manufacturer to complete the work. Determine correct size and locations of required holes or cutouts from field dimensions before grating fabrication.
- B. Each grating section shall be readily removable, except where indicated on the Drawings. Provide openings and holes where shown on the Drawings. Grating supports shall be provided at openings in the grating by Contractor where necessary to meet load/deflection requirements specified herein. Grating openings which fit around protrusions (pipes, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable.

3.2 INSTALLATION

- A. Install FRP products in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified.
- B. Site tolerances: Maintain plumb and level tolerance specified in manufacturer's installation instructions.
- C. Field cutting of FRP products shall not be allowed unless authorized by the Engineer. All cut or sanded surfaces shall be sealed with resin prior to installation.

3.3 PROTECTION OF INSTALLED PRODUCTS

- A. Protect products from damage by subsequent construction activities until final inspection.
- B. If FRP materials are not to be installed immediately, then store to prevent twisting, bending, breaking, or damage of any kind. Keep material covered to prevent unnecessary exposure to UV.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Flashing and sheet metal work for moisture protection
 - 2. Miscellaneous sheet metal work
- B. Additional Requirements Specified Elsewhere:
 - 1. Shop Drawings, Product Data and Samples: Section 01340
 - 2. Materials and Equipment: Section 01600

1.02 SUBMITTALS

- A. Submit Complete Specifications, Data, and Catalog Cuts on Drawings Covering All Items to be Provided

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver Flashing Members to be Built Into Masonry, or Concrete at the Proper Time for Incorporation into the Work
- B. Protect Materials from Damage During Shipment, Site Storage, and Installation
- C. Store in Clean, Dry Storage Areas

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sheet Metal:
 - 1. Galvanized steel: ASTM A366 or A569, zinc-coated
 - 2. Aluminum: ASTM B204, alloy 3003-H14, mill finish
 - 3. Stainless steel: 18-8, ASTM A167, Type 302 or 304, AISI 2D finish
 - 4. Lead-coated copper: ASTM B101, Type 1, Class A
 - 5. Lead: FS QQ-L-201, Grade B
- B. Accessories:
 - 1. Extruded aluminum: ASTM B221, alloy 6053 or 6063
 - 2. Solder, ASTM B32, alloy grade 50A (50-50)
 - 3. Solder flux:
 - a. Stainless steel: Zinc chloride type, FS O-F-506, Type II
 - b. Other metals: Acid type, FS O-F-506, Type I, Form A

4. Fasteners:
 - a. Lead-coated copper: Copper nails, other fasteners bronze
 - b. Galvanized steel: Galvanized or cadmium-plated steel
 - c. Lead: Galvanized or cadmium-plated steel
 - d. Aluminum: Aluminum
 - e. Stainless steel: Stainless steel
5. Bird screen: 2-mesh, brass or copper wire cloth, minimum wire diam 0.063 inch
6. Asphalt roof coating: FS SS-A-694, Type I
7. Plastic cement: FS SS-C-153, Type I
8. Coal tar paint: Koppers "Bitumastic Super Service Black," Porter "Tarmastic 103," Tnemec "450 Heavy Tnemecol," or equal
9. Acrylic sealant: Pecora "Unicrylic," Tnemco "Mono," or equal

2.02 FABRICATION AND MANUFACTURE

- A. Flashing:
 1. Through wall flashing: Stainless steel, 32 ga, dead soft, fully annealed, ribbed; Architectural Steel "Rib-Bond," Cheney "3-Way Sawtooth Flashing," Revere-Keystone "Interlocking Type," or equal
 2. Cap flashing: Stainless steel, 26 ga; or lead-coated copper, 16 ounce
 3. Counterflashing: Stainless steel, 26 ga; or lead-coated copper, 16 ounce; Architectural Steel, Cheney, Revere, or equal; with 4-inch wall flat and hook dam for masonry wall installation
 4. Reglets: Stainless steel, 26-gauge or lead-coated copper, 16 ounce; designed to retain counterflashing by snap action or friction fit; Architectural Steel "Friction Reglet," Cheney "Type A," Revere-Keystone "Simplex," or equal

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 1. Install sheet metal as indicated on Drawings and as specified herein and in related Work sections
 2. Avoid marring or improper bending of sheet metal
 3. Prevent contact with corrosive or staining materials
 4. Replace damaged sections
 5. Install only undamaged sections
 6. Aluminum in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint
 7. All exposed or contacting flashing shall be of the same material
- B. Joints:
 1. Closed watertight, except where slip joints are specifically required
 2. Watertight joints:
 - a. Mechanically interlock
 - b. Joints in aluminum or between aluminum and other metals: Acrylic sealant

- c. Other metal joints:
 - 1) Solder
 - 2) Wipe clean of flux
 - 3) Neutralize acid flux by washing with sodium bicarbonate solution
- C. Through Wall Flashing:
 - 1. Flashings under copings continuous
 - 2. Extend flashings over lintels and under sills 8 inches past each jamb and turn ends up 1/4 inch
 - 3. Form wall flashing with receivers for counterflashings where required
 - 4. Overlap and interlock joints in wall flashing and receivers for counterflashing
 - 5. Flashing which requires multiple bends may be single-bend sections with vertical legs overlapped to drain to the outside face of the wall
- D. Counter Flashing:
 - 1. Provide to overlap membrane base flashing, to fit into reglets or receivers, and as indicated on Drawings
 - 2. Maximum section length: 10 feet
 - 3. Overlap sections 3 inches and form a slip joint
 - 4. Do not interlock slip joints
 - 5. Offset end joints from underlying joints between reglet or receiver sections
 - 6. Make corner joints watertight
- E. Miscellaneous Metal Flashing:
 - 1. Provide for vents, sleeves and similar projections through roof
 - 2. Extend 8 inches minimum above roof, except as indicated on Drawings
- F. Conductor Heads:
 - 1. Extend downspout thimble 2 inches below conductor head soffit, sized to fit, and 1/8 inch less than downspout
 - 2. Rivet and solder thimble flanges to conductor head bottom
 - 3. Secure to scupper with single corner seams
 - 4. Nail to wall with overflow opening
- G. Gutters and Downspouts:
 - 1. Provided by metal building system supplier, reference Section 13121
- H. Cap Flashing:
 - 1. Provide at roof ventilators, skylights, and where indicated on Drawings
 - 2. Maximum section length: 10 feet
 - 3. Overlap sections 3 inches and form a slip joint
 - 4. Do not interlock slip joint
 - 5. Make corner joints watertight
 - 6. Install after membrane base flashing is completed
 - 7. Anchor as indicated on Drawings
- I. Pitch Dams: Provide at gravel stops, vents, sleeves, pans elsewhere as indicated on Drawings, and specified in related Work sections
- J. Flashing Pans: Provide for columns, equipment supports, and similar members bearing on roofs

- K. Hoods: Provide counterflashing hoods for conduits and pipes, except vents that pass through the roof; for columns equipment supports and similar members that bear on the roof; and as indicated on Drawings
- L. Miscellaneous Metal Flashing:
 - 1. Provide for vents, sleeves, and similar projections through roof
 - 2. Extend 8 inches minimum above roof, except as indicated on Drawings

END OF SECTION

SECTION 07720
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof Curbs
 - 2. Gravity ventilators.

1.3 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
 - 1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes or location of existing fixtures and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, those equal to manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated.
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.
- C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by manufacturer for type of use.
- D. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use, mill finished.
- E. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.
- F. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.
- G. Steel Tube: ASTM A 500, round tube, baked-enamel finished.
- H. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M.
- I. Galvanized Steel Pipe: ASTM A 53/A 53M.

2.3 MISCELLANEOUS MATERIALS

- A. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- C. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- D. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- E. Elastomeric Sealant: ASTM C 920, silicone or polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.
- G. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.4 ROOF CURBS

- A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
 - 1. Acceptable Manufacturers:
 - a. Colony Custom Curbs.
 - b. Commodity Products Company, Inc.
 - c. Conn-Fab Sales, Inc.
 - d. Curbs Plus Inc.
 - e. Custom Curb, Inc.
 - f. LM Curbs.
 - g. Loren Cook Company.
 - h. Metallic Products Corporation.
 - i. Pate Company (The).
 - j. Roof Products & Systems Corporation.
 - k. Roof Products, Inc.
 - l. Thaler Metal Industries Ltd.
 - m. ThyCurb; Div. of Thybar Corporation.
 - n. Uni-Curb, Inc.
 - o. Vent Products Company, Inc.
 - p. Or equal
 - 2. Load Requirements: Able to handle loads from fans and ventilators.

3. Material: Galvanized steel sheet, 0.079 inch or
4. Material: Stainless-steel sheet, 0.078 inch thick.
5. Liner: Same material as curb, of manufacturer's standard thickness and finish.
6. Factory install wood nailers at tops of curbs.
7. Factory insulate curbs with 1-1/2-inch thick, glass-fiber board insulation.
8. Fabricate units to minimum height of 12 inches, unless otherwise indicated.

2.5 GRAVITY VENTILATORS

- A. Hooded Gravity Ventilators: Manufacturer's standard unit fabricated from the following materials, with manufacturer's standard welded or sealed mechanical joints:

1. Acceptable Manufacturers:
 - a. Active Ventilation Products.
 - b. Bristolite Skylights.
 - c. Commodity Products Company, Inc.
 - d. Loren Cook Company.
 - e. Metallic Products Corporation.
 - f. Solar Group (The).
 - g. Thaler Metal Industries Ltd.
 - h. ThyCurb; Div of Thybar Corporation.
 - i. Western Canwell.
 - j. Or equal
2. Provide integral frame with base flange, and weathertight cap.
3. Dimensions: 4' x 6' plus or minus, verify in field.
4. Style: Roll-formed hood panels.
5. Bird Screens: 1/2" stainless steel mesh, mounted in hood.
6. Insect Screens: Manufacturer's standard mesh with rewirable frame.
7. Construction: minimum 18 ga aluminum bolted to aluminum support structure.
8. Schedule:

Equip No.	Throat Area	CFM	Non-Ducted SP Loss
IH-1	48 x 60	9,600	0.044 IN WC

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 2. Verify dimensions of roof openings for roof accessories.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Equipment Support Installation:
 - 1. Set equipment support so top surface of equipment support is level.
- F. Preformed Flashing Installation:
 - 1. Secure to roof membrane according to flashing manufacturer's written instructions.
- G. Seal joints with elastomeric sealant as required by manufacturer of preformed flashing.

3.3 TOUCH UP

- H. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.
- I. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.3 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 07900

SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope: Provide caulking and sealing.
- B. Additional Requirements Specified Elsewhere:
 - 1. Shop Drawings, Product Data and Samples: Section 01340.
 - 2. Product Requirements: Section 01600.
- C. Definitions: The terms "caulking" and "sealing" are used on the Drawings and in the Specifications synonymously. Either or both terms indicate the materials specified herein.

1.02 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. ANSI 116.1: Two Component Elastomeric Sealing Compounds for the Building Trade.
 - 2. FS TT-S-227: Sealing Compound, Rubber Base, Two Component for Caulking, Sealing and Glazing in Building Construction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Thiokol Sealant:
 - 1. Polysulfide rubber, 2 component, ANSI A116.1 and FS TT-S-227, bearing Thiokol Chemical "Treated and Approved Sealant" Label.
 - 2. Non-sag: Type I, Class B.
 - 3. Self-leveling: Type II, Class A.
- B. Urethane Sealant: Master Mechanics "Vulkem 116", Williams "Dynaseal," or equal.
- C. Acrylic Sealant: Pecora "Unicrylic," Tremco "Mono," or equal.
- D. Silicone Sealant: Silicone rubber, neutral color; Dow Corning "780 Building Sealant," General Electric "Silicone Sealant 1300," or equal.
- E. Oil Base Compound: Not permitted.
- F. Primer: As recommended by sealant manufacturer.
- G. Back-up Material: Polyethylene foam; Dow "Ethafom SB," Grace "Servicised 5401 Foam Filler," Haveg "Minicell Backer Rod," or equal.

2.02 MANUFACTURE

- A. Colors: Manufacturer's standard colors to best blend in with location.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Cleaning:
 - 1. Clean surfaces to receive sealant of all dust, grease, oil, or wax.
 - 2. Wipe surfaces with clean rag soaked in xylol or suitable solvent.
- B. Backup Material:
 - 1. Where required to control depth of sealant install backup material.
 - 2. When compressed 25 percent to 50 percent fills the joint space.
 - 3. Rolled or pressed into place avoiding lengthwise stretching.

3.02 INSTALLATION

- A. Install Sealants Before Painting.
- B. Install Sealants Only When the Air and Surface Temperatures are Above 50 Degrees F.
- C. Tool Each Joint to a Smooth, Even Finish, Flush with the Edges of the Sealing Recess.
- D. Keep Adjacent Surfaces Clean and Free of Overlapping Sealant.
- E. Apply to a Depth Equal to Joint Width, But Not Less Than 1/2 Inch.
- F. Remove Sealant and Reseal Joints at Which:
 - 1. Excess sealant is outside the joint and feathered onto surfaces.
 - 2. It is not possible to paint adjacent surfaces to a clean line.

3.03 SEALING SCHEDULE

- A. Non-sag Thiokol or Urethane:
 - 1. Locations where calking is shown on the Drawings or specified in other sections.
- B. Self-Leveling Thiokol:
 - 1. Horizontal joints in walks or drives.
 - 2. Horizontal joints in traffic bearing decks and slabs.
- C. Silicone:
 - 1. Where type not otherwise specified.

END OF SECTION

SECTION 09800
CONCRETE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. CONTRACTOR shall furnish all tools, equipment, materials, and supplies, shall perform all labor required to complete the application of a repair mortar and a protective lining on the non-immersed concrete surfaces. The work will be staged in two phases as indicated in the Drawings. Structures are located in the Influent Pump Station of the Wastewater Quality Control Facility located in Manteca, California.
- B. Abrasive blast the concrete surfaces to remove 2 inches of deleterious concrete and apply a concrete mortar. After the application of the repair mortar, the structure will require the application of a protective lining. The final quantity of area and the cost involved, based on the unit price listed in the Schedule of Prices, shall be based on the areas determined by the INSPECTOR's inspection. This Work shall include all precleaning, surface preparation, dehumidification, coating application on concrete surfaces, protection of surfaces not to be coated, cleanup, and appurtenant work, in accordance with the requirements of the Contract Documents.
- C. All coatings, solvents, equipment and procedures necessary to complete the Work specified shall be suitable for wastewater treatment plant and marine environments and shall comply with San Joaquin Valley Air Pollution Control CITY (SJVAPCD) Rule 4601. Materials shall be delivered unopened to the jobsite in their original containers bearing the manufacturer's label, completely identifying the contents, date of manufacture, volatile organic compounds (VOCs), and listing directions for their proper use. Products that do not conform to SJVAPCD Rule 4601 shall not be allowed on site.
- D. The coating system schedules in Part 3 EXECUTION of this Specification summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the Drawings are used to show exceptions to the schedules, to show or extend the limits of coating systems, or to clarify or show details for application of the coating systems.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The requirements of the following sections and divisions apply to the Work of this Section. Other sections and divisions of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this Work.

- 1. Section 01410 Submittals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. All Work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these Specifications. The CONTRACTOR shall comply with the applicable editions of the following codes, regulations and standards.

B. American Society for Testing and Materials International (ASTM):

- | | |
|-----------|--|
| 1. D412 | Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension |
| 2. D1653 | Standard Method for Water Vapor Transmission of Organic Coating Films |
| 3. D2240 | Standard Test Method for Rubber Property – Durometer Hardness |
| 4. D4060 | Standard Test Method for Abrasion Resistance of Organic Coatings by the Tabor Abrasor |
| 5. D4258 | Standard Practice for Surface Cleaning Concrete for Coating |
| 6. D4259 | Standard Practice for Abrading Concrete |
| 7. D4262 | Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces |
| 8. D4263 | Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method |
| 9. D4414 | Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gauges |
| 10. D4541 | Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers |
| 11. D4787 | Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates |
| 12. D5402 | Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs |
| 13. D6132 | Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage |
| 14. D7234 | Standard Test Method for Pull-Off Adhesion Strength of |

Coatings on Concrete Using Portable Pull-Off Adhesion Testers

C. California Code of Regulations (CCR), Title 8 Industrial Relations

1. Section 1637 Scaffolds – General Requirements
2. Section 1670 Personal Fall Arrest Systems, Personal Fall Restraint Systems and Positioning Devices
3. Section 1676 Job-Made Ladders
4. Section 5157 Permit Required Confined Space

D. Code of Federal Regulations (CFR), Title 29 Labor

1. Section 1910.94 Ventilation

E. International Concrete Repair Institute (ICRI)

1. 310.2 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

F. National Association of Corrosion Engineers International (NACE)

1. SP0188 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
2. RP0287 Field Measurements of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using Replica Tape

G. San Joaquin Valley Air Pollution Control District (SJVAPCD)

1. Rule 4601 Architectural Coatings – VOC Limits

H. Steel Structures Painting Council, the Society for Protective Coatings (SSPC)

1. Guide 15 Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates
2. PA 1 Shop, Field, and Maintenance Painting of Steel
3. PA 2 Measurement of Dry Film Thickness with Magnetic Gauges
4. SP1 Solvent Cleaning
5. SP2 Hand Tool Cleaning

- | | |
|-----------|-----------------------------------|
| 6. SP3 | Power Tool Cleaning |
| 7. SP11 | Power Tool Cleaning to Bare Metal |
| 8. SP13 | Surface Preparation of Concrete |
| 9. Vol. 1 | Good Painting Practice |

1.4 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall submit the following in accordance with the requirements in Section 01410 Submittals. The CONTRACTOR shall submit the following prior to mobilizing to the project site:
1. Copy of an active State of California C 33 Contractor's license as required for the application of coatings.
 2. Provide 5 references which show that the CONTRACTOR has previous successful experience with each specified or comparable coating systems. Include the name, address, and the telephone number for the owner of each installation for which the CONTRACTOR applied the protective coating.
 3. Provide a written letter from the manufacturer stating that the coating CONTRACTOR's supervisor and each applicator performing Work on the project has been trained and approved by the manufacturer to apply the selected coating system. The manufacturer shall state whether or not it has verified that the CONTRACTOR is going to use the proper mixing, coating application, heating, and environmental control equipment for the specified coating products.
 4. The CONTRACTOR shall provide SSPC QP 1 Certification or the manufacturer's certification for the specified products.
- B. Complete data on each type and kind of mortar, waterproofing sealer, primer, mastic, and liner materials shall be submitted for review. Acceptance shall be received from the CITY before the materials are delivered to the jobsite. This procedure shall be followed whether or not the products that the CONTRACTOR proposes to use is named in the Contract Documents. Submitted data shall show where and for what uses each product is proposed with cross-reference made to sections of these Specifications. Material submittals shall include the following:
1. Material safety data sheets for all products used at the jobsite including waterproofing sealers, primers, mortars, thinners, solvents and cleaners.
 2. Product Data Sheets for all primers, surface fillers, and coating products with the following information:
 - a. Surface preparation requirements for immersion service

- b. Minimum and maximum wet and dry film thickness per coat
 - c. Minimum and maximum cure, induction, and pot life times
 - d. Temperature and humidity requirements during and after application
 - e. Proper storage and shelf life at various temperatures
 - f. EPA Method 24 results to verify compliance with SJVAPCD Rule 4601 for VOC's
 - g. Tensile, elongation, moisture vapor transmission rate, and abrasion testing results.
- C. Manufacturer's product data sheet for each abrasive material to be used with the following:
- 1. Technical data sheet for each product used, including statements on the suitability of the material for the intended use.
 - 2. State and country of origin.
 - 3. Material safety data sheet for each product, if applicable.
 - 4. Size/mesh and percentage by weight of each component.
- D. Samples: During the coating application, the CONTRACTOR shall submit three coating samples, one each for each layer of the coating system, on 6-inch by 6-inch concrete samples. Each sample shall be abrasive blasted and completely coated over its entire surface with the complete coating system including primers and mortars.
- E. Coating Manufacturer's Information: For each coating system to be used the CONTRACTOR shall submit the following information at least 30 days prior to application:
- 1. Coating manufacturer's technical application instructions for application, heating materials, mixing, spray tip sizes, and hose pressures.
 - 2. Provide written certification that the coating CONTRACTOR's supervisor and each applicator performing Work on the project have been trained and approved by the manufacturer to apply the selected coating system. The manufacturer shall state whether or not it has verified that the CONTRACTOR is going to use the proper mixing, coating application, heating, and environmental control equipment for the specified coating products.

1.5 INSPECTOR AND CONTRACTOR COORDINATION

- A. The CITY's INSPECTOR will be onsite on a full time basis during the coating operations. The CONTRACTOR shall give the CITY's INSPECTOR a minimum of 5 days advance notice of the start of any field surface preparation work for coating application work.

- B. All such work shall be performed only in the presence of the INSPECTOR, unless INSPECTOR has granted prior approval in writing to perform such work in his/her absence.
- C. Inspection by INSPECTOR, or the waiver of inspection of any particular portion of the work, shall not relieve the CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.
- D. The CONTRACTOR shall hold all surface preparation and coating application operations until INSPECTOR approves the following inspection points: completion of blasting prior to coating; primer application; coating application and testing of cured coating.
- E. Scaffolding shall be erected and moved to locations where requested by INSPECTOR to facilitate inspection. Additional illumination shall be provided to cover all areas to be inspected.

1.6 MANUFACTURER'S REPRESENTATIVE

- A. The CONTRACTOR shall require the protective coating manufacturer to furnish a qualified technical representative to visit the project site for technical support for three (3) separate days to resolve field questions attributable to or associated with the manufacturer's products furnished under this Contract or the application thereof. The manufacturer's technical representative shall be onsite before the application of their specified product and during testing specified in 3.9 of this specification, at no additional cost to the CITY.

1.7 WARRANTY INSPECTION

- A. The CONTRACTOR and coating manufacturers shall warrant the coating system applications against defects and workmanship after final acceptance of the Work for a period of 5 years. The CONTRACTOR shall perform all Work and supply all equipment and materials associated with the repair of failures identified in the warranty inspection at no cost to the CITY.
- B. A warranty inspection may be conducted prior to expiration of the 5 year warranty period after final acceptance of all coating work. The CONTRACTOR and a representative of the coating material manufacturer shall attend this inspection at no cost to the CITY. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the CITY. The CITY may by written notice to the CONTRACTOR, reschedule the warranty inspection, or may cancel the warranty inspection altogether. If a warranty inspection is not held, the CONTRACTOR is not relieved of its responsibilities under the Contract Documents.
- C. A total of five (5) inspections will be required at locations chosen by the CITY and can include any or all surfaces. The CITY will be responsible for dewatering and providing access, and for performing the inspection and testing. The inspection will

include thorough visual inspection to identify pin holes, bubbles, blisters, delaminations or other product or installation defects. The CITY, at its sole discretion, may choose to perform bond strength testing per ASTM D4541. The CONTRACTOR shall conduct repairs to coated surfaces per the manufacturer's recommendations and the repaired surfaces shall be subject to inspection by the CITY.

1.8 SAFETY AND HEALTH REQUIREMENTS

- A. In accordance with the requirements CCR Title 8 Section 5157, the CONTRACTOR shall provide and require the use of personal protective and lifesaving equipment for all persons working in confined spaces.
- B. Head and face protection and respiratory devices shall include protective helmets conforming to the requirements of ANSI Z 89.1-2009 which shall be worn by all persons at all times while in the vicinity of the work when coatings are being applied. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices meeting the requirements of ANSI Z 87.1-2010 and a respirator with appropriate filter.
- C. Where ventilation is used to control potential exposures to workers, as set forth in Code of Federal Regulations Title 29 Section 1910.94 of the OSHA Regulations for Construction, ventilation shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the worker does not exist. Methods of ventilation shall meet the requirements set forth in ANSI Z9.2-2006.
- D. Temporary ladders and scaffolding shall conform to the applicable requirements of CCR Title 8 Section 1676 and Section 1637. The CONTRACTOR shall submit scaffolding plans to the CITY for review.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Definitions: The term "paint", "coatings", or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and all other protective coatings, whether used as a pretreatment, primer, intermediate coat, or finish coat. The term "DFT" means minimum dry film thickness.
- B. General: Coating materials shall be sealed in new containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.
- C. The CONTRACTOR shall use coating materials suitable for the intended use and recommended by their manufacturer for the intended service.
- D. Compatibility: In any coating system, only compatible materials from a single

manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats.

- E. Protective Coating Materials: Products shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the CONTRACTOR shall provide the CITY with the names of not less than 5 successful applications of the proposed manufacturer's products demonstrating compliance with this specification requirement.
- F. Substitute or "Or-Equal" Submittals: Unless otherwise specified, materials are from the catalogs of the companies listed herein. Materials by other manufacturers are acceptable provided that they are established as being compatible with and of equal quality to the coatings of the companies listed and accepted by the ENGINEER. The CONTRACTOR shall provide satisfactory documentation from the firm manufacturing the proposed substitute or "or-equal" material that said material meets the specified requirements and is equivalent or better than the listed materials in the following properties:
 - 1. Minimum and Maximum Cure Times
 - 2. Moisture Vapor Transmission Rate per ASTM D1653 Method B at 60 mils minimum
 - 3. Abrasion Resistance per ASTM D4060 using a CS17 Wheel
 - 4. Minimum and Maximum Recoat Times
 - 5. Solids content by volume
 - 6. Dry film thickness per coat
 - 7. Compatibility with other coatings
 - 8. Suitability for the intended service
 - 9. Resistance to chemical attack
 - 10. Temperature limitations in service and during application
- G. The cost of all testing and analysis of the proposed substitute materials that may be required by the CITY shall be paid by the CONTRACTOR. If the proposed substitution requires changes in the Contract work, the CONTRACTOR shall bear all such costs involved and the costs of allied trades affected by the substitution.

2.2 INDUSTRIAL COATING SYSTEMS MATERIALS

- A. Material Sources: Each of the following manufacturers is capable of supplying many

of the industrial coating materials specified herein. Where manufacturers and product numbers are listed, it is to show the type and quality of coatings that are required. Proposed substitute materials shall be shown to satisfy the material descriptions and to equal or exceed the properties of the listed materials as required in the paragraph entitled "Substitute or `Or-Equal' Submittals" herein.

1. Ameron Protective Linings Division
2. Linabond, Inc.

2.3 CONCRETE RESURFACER FOR VOIDS BETWEEN 1/16-INCHES AND 1/4-INCHES

A. Resurfacer for concrete walls or structures with voids between 1/16-inch inches and 1/4-inches in depth or width following the abrasive blasting shall be high early strength, epoxy-modified mortar with aggregates capable of producing a dry rough finished surface. The material shall be a two or three-component aggregate-filled mortar to be applied on vertical walls and capable of being top coated within 16 hours of surface preparation. Approved products include the following:

1. Corrobond 299 as manufactured by Sherwin Williams
2. Sikatop 123 Plus as manufactured by Sika Corporation
3. Series 218 Mortarclad as manufactured by Tnemec Company
4. or approved equal.

2.4 CONCRETE REPAIR MORTAR FOR VOIDS BETWEEN 1/4-INCHES AND 2 INCHES

A. Repair mortar with voids between 1/4-inch inches and 2-inches in depth or width shall be a pneumatically or troweled cementitious, silica fume, fiber-reinforced, high strength shrinkage-compensated portland cement mortar. Approved products include the following:

1. Emaco S88 CI as manufactured by BASF
2. Carboguard 510 as manufactured by Carboline Company
3. Five Star Structural Concrete V/O as manufactured by Five Star Products, Inc.
4. Or approved equal

2.5 CONCRETE LINERS

A. Description

1. Liner shall be Arrow-Lock Sheet Liner with a thickness of 65 mils, and ¼-inch long extensions spaced 2 inches apart, as manufactured by Ameron Protective Lining Products, Brea, California.
2. Primer for use prior to application of intermediate layer shall be Arrow-Lock Primer No. 5101 as supplied by Ameron Protective Lining Products, Brea, California.
3. Mastic for intermediate layer shall be Arrow-Lock Mastic, No. 9912 at a 2:1 epoxy gel mastic as supplied by Ameron Protective Lining Products, Brea, California.

B. Application/Installation

1. All specified materials shall be installed in strict accordance with the manufacturer's application or installation instructions.
2. NOTE: If external ground water is present, an Ameron approved waterproofing material shall be applied to the concrete prior to the installation of the primer, mastic, Arrow-Lock and welding strips.

C. Physical Properties

1. Tensile specimens shall be prepared and tested in accordance with ASTM D412 using Die B. Weight change specimens shall be 1-inch (25-mm) by 3-inch (75-mm) samples. Specimens for testing of initial physical properties may be taken from liner plate sheet and welding strip at any time prior to final acceptance of the work.
 - a. All plastic liner sheets, including ¼-inch long locking extensions, all joint, corner and welding strips shall be free of cracks, cleavages or other defects adversely affecting the protective characteristics of the material. The engineer may authorize the repair of such defects by approved methods.
 - b. All plastic liner sheets, including locking extensions, all joint, corner and welding strips shall be free of cracks, cleavages or other defects adversely affecting the protective characteristics of the material. The engineer may authorize the repair of such defects by approved methods.
 - c. The PVC lining shall have good impact resistance, shall be flexible and shall have an elongation sufficient to bridge up to 1/4 inch (6mm) settling cracks, which may occur in the concrete or in joints after installation without damage to the lining.
 - d. The lining shall be repairable at any time during the life of the rehabilitated structure.

2.6 CONCRETE WATERPROOFING SEALANT

A. The following products are approved:

1. VAP I 2000 as manufactured by Koster.
2. Xypex Concentrate as manufactured by Xypex Chemical Corporation.

PART 3 - EXECUTION

3.1 STORAGE, MIXING, AND THINNING OF MATERIALS

- A. After each component of the coating system has been thoroughly heated, the CONTRACTOR shall perform a paint/pump ratio test on the first day of spraying and at least once a day thereafter in the presence of the CITY's INSPECTOR. The CONTRACTOR shall set up two see-through containers with preprinted volumetric marks used for the paint/pump ratio test on a flat surface. The hose valve for each component shall be opened simultaneously and each component flow rate shall be allowed to stabilize by pouring the discharging materials into separate disposable containers. After the flow is stabilized, the hoses shall be transferred to the pre-printed volumetric containers and the valves shall be shut off after one of the containers has been filled to 32 or 48 fluid ounces, depending on the mixing ratio recommended by the manufacturer. If the volumetric quantity of coating in the containers does not match the manufacturer's recommendation, the CONTRACTOR shall reduce or increase the pressure and temperature until it meets the specified mixing ratio. No spraying shall be performed until the ratio test result has been accepted by the INSPECTOR.
- B. Manufacturer's Recommendations: Unless otherwise specified herein, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed. The CONTRACTOR shall supply the CITY with copies of each manufacturer's instructions.
- C. All protective coating materials shall be used within the manufacturer's recommended shelf life. Materials exceeding the storage life recommended by the manufacturer shall be removed from the jobsite.
- D. Storage and Mixing: Coating materials shall be protected from exposure to temperatures greater than or less than the manufacturer's recommendations and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together. Flammable materials shall be stored in accordance with state and local codes.

3.2 PREPARATION FOR COATING

- A. All surfaces to receive protective coatings shall be prepared as specified prior to application of said coatings. The CONTRACTOR shall examine all surfaces to be coated, and shall correct all surface defects prior to application of any coating material. All marred or abraded spots on shop-primed and on factory-finished

surfaces shall receive touch-up restoration prior to any coating application.

- B. Surface preparation shall be accepted by the INSPECTOR prior to application of the repair mortar and coating.
- C. The CONTRACTOR shall remove and dispose of all debris from abrasive blasting and other surface preparation prior to coating. Concrete and other debris shall not enter the wastewater flow leading to the bar screens.
- D. Protection of Surfaces Not to Be Coated: Surfaces which are not to receive protective coatings shall be protected, using drop clothes and other protective measures as necessary, during surface preparation, cleaning, and coating operations.
- E. All hardware, lighting fixtures, switch plates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations.
- F. Care shall be exercised not to damage adjacent piping, valves, railing, or other work during blast cleaning operations. Coating shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.
- G. Any damage incurred by the CITY or its employees due to paint, solvent or sandblasting materials shall be repaired by the CONTRACTOR to the satisfaction of the INSPECTOR.
- H. Protection of Painted Surfaces: Cleaning and coating shall be so programmed that dust and other contaminants from the cleaning process shall not fall on wet, newly-coated surfaces.

3.3 ENVIRONMENTAL REQUIREMENTS

- A. No coating work shall be performed under the following conditions:
 - 1. Surface or ambient temperatures exceed the manufacturer's recommended maximum or minimum allowable.
 - 2. Dust or smoke laden atmosphere.
 - 3. Damp or humid conditions, where the relative humidity is above the manufacturer's maximum allowable.
 - 4. Substrate and ambient temperatures are less than 5 degrees F above the dewpoint and are decreasing. Dewpoint shall be measured by use of an instrument such as

a Sling Psychrometer in conjunction with U.S. Department of Commerce, Weather Bureau psychrometric tables. Elcometer 319 Dew Point meter or equal may also be used.

5. Ambient temperature that is expected to drop below 50 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.
- B. The CONTRACTOR shall provide and use dehumidification and temperature control equipment during the course of the Work. The CONTRACTOR shall be expected to maintain the established production schedule despite these potentially adverse conditions by providing all labor, equipment and materials necessary to maintain a controlled environment in the area where Work is to be performed. The substrate and atmospheric conditions within the controlled environment, with respect to temperature and relative humidity, shall be maintained within the limits established by the manufacturer of the selected coating system to ensure proper application and curing of the coating. If the conditions are not in the specified ranges stated by the manufacturer, the CONTRACTOR shall use the following:
1. Humidity Control – Desiccant or Direct Expansion Refrigeration
dehumidification shall be used to control the environment in the space 24 hours a day during blast cleaning, coating application and coating cure. Equipment shall conform to the following requirements:
 2. Equipment – Desiccant dehumidifiers shall be a solid desiccant design having a single rotary desiccant wheel capable of fully automatic continuous operation. No liquid, granular, or loose lithium chloride drying systems will be accepted. The use of direct expansion (DX) refrigeration type dehumidifiers with reheat may be considered if the expected ambient temperature shall remain above 60 degrees F. Heating the space changes relative humidity only and does not change the dew point temperature. Heat alone, therefore, is not a substitute for dehumidification, unless substrate temperature is high enough to meet the dew point differential. The dehumidification system may consist of a combination of desiccant and refrigerant equipment.
 3. Air Changes – Equipment shall be provided that maintains an air change rate for maintaining a required spread of 17 degrees F between inside surface temperature and inside space dew point temperature with a maximum relative humidity of 45% in the space. There shall be 1 to 4 air changes per hour, depending on the air volume of the space to be controlled, to hold the desired degree of cleanliness of the surface.
 4. Temperature Control – Auxiliary cooling or insulation may be necessary to maintain the surface temperature at an acceptable level for the coating manufacturer's application parameters. This auxiliary equipment shall be approved for use by the supplier of the dehumidification equipment and shall meet the following requirements:

- a. Refrigerant type systems shall be installed in the process air supply duct between, and/or blended with, the dehumidifier as close to the work space as possible.
- b. Only electric, indirect fired combustion, or steam coil auxiliary heaters shall be used. No direct-fired space heaters shall be allowed during the blasting, coating, or curing phases.
- c. The space to be controlled shall be sealed off as well as possible, allowing air to escape the work space away from the point where the dehumidified air is being introduced. If it is necessary to filter the air escaping the space, the filtration system shall be designed so that it does not interfere with the dehumidification equipment's ability to control the dew point and relative humidity of the work space.

C. Overspray and Dust Control Protection.

1. All spray application of coatings or blast cleaning at the project site which is performed outside of a totally enclosed booth shall be kept to a minimum. Alternative application methods (brushing, rolling, etc) or off-hour work shall be considered and may be required to minimize potential overspray damage.
2. When spray painting and/or blast cleaning are required, the CONTRACTOR shall submit a work plan for review by the ENGINEER in advance outlining specific areas where the work will take place including a schedule and preventative measures being utilized to eliminate the possibility of overspray damage to facilities and vehicles and dust control.
3. Under no circumstances shall fugitive dusts or coating particulates be permitted to leave the immediate work area.
4. For work within the site, the CONTRACTOR shall provide and install signs at Plant entrances, work areas, and roadways to direct traffic as needed to alternate parking areas to prevent overspray damage to vehicles. Parking areas immediately downwind or otherwise in high-risk areas shall be delineated to prevent vehicles from parking in these areas.
5. Any damage incurred by the CITY or its employees due to paint, solvent or sandblasting materials from blasting or coating operations shall be promptly repaired by the CONTRACTOR to the satisfaction of the CITY and its employees at no additional contract cost to the CITY.

3.4 SURFACE PREPARATION OF DAMAGED CONCRETE

A. Surface preparation shall be as follows:

1. All loose, brown carbonated, deteriorated, or unsound concrete shall be removed in the immediate vicinity of the damaged documented areas to provide a substrate that is tightly adhered to the surfaces of the structure.

2. The depth of concrete to be removed shall be measured by pre-drilling holes 2 inches deep, 10 feet by 10 feet apart, before any surface preparation occurs. The removal of sufficient concrete shall be measured by comparing the surrounding concrete to the predrilled holes. Concrete surfaces shall be prepared per SSPC SP13 abrasive blasting to remove the top 2 inches of existing concrete and to produce a surface roughness equivalent to that of ICRI 310.2 Concrete Surface Profile 5. If grease or other visible contaminants remain on the surface, the CONTRACTOR shall scrub the surfaces with a mixture of trisodium phosphate detergent and water until the surfaces are acceptable to the INSPECTOR.
 - a. During the Phase I work, the surface preparation shall terminate 6 inches above the existing grating. During the Phase II work, the surface preparation shall extend down to the existing PVC liner.
3. The CONTRACTOR shall cut and remove any existing delaminated PVC liner and the remaining edge of the liner shall be at an embedded locking (T-Lock) anchor that is tightly adhered to the wall.
4. Install a 1/8-inch wide by 3/8-inch deep groove in the concrete near all coating termination points as shown in the Drawings. Dust, debris, and other contaminants shall be removed prior to primer application.
5. At the discretion of the INSPECTOR, the CONTRACTOR shall test the concrete surfaces for soluble salts with the use of Chlor*Test CSN as manufactured by Chlor*Rid International or approved equivalent. The surfaces shall be tested and shall have a concentration less than 5 micrograms per square centimeter ($\mu\text{g}/\text{cm}^2$) of chlorides, sulfates, or nitrates. A test shall be conducted for every 200 square feet (ft^2) of surface area to be coated at locations determined by the INSPECTOR.
6. If the soluble salt test indicates chloride, sulfate, or nitrate concentrations greater than those outlined in these Specifications, the CONTRACTOR shall use Chlor*Rid, as manufactured by Chlor*Rid International, in the water source during Low Pressure Water Cleaning at 1,500 psi to remove the salts from the substrate and allow it to dry for a minimum of 8 hours. The treated areas shall be reblasted and tested after the surfaces have been cleaned. A substrate's surface preparation will be accepted once the soluble salt concentration is below the amounts outlined in these Specifications.
7. In accordance with ASTM D4262, test to determine the pH of the concrete surface after the surface has been thoroughly blasted and cleaned. If the pH is outside the range recommended by the coating manufacturer, then the surface must be neutralized by removing concrete until a surface pH of 7 or greater is obtained prior to any coating application. One pH test shall be performed every 200 square feet, or less, and at locations determined by the INSPECTOR.
8. The CONTRACTOR shall test for capillary moisture in accordance with ASTM D4263. Moisture tests shall be taken every 200 square feet or less and at locations

determined by the INSPECTOR. If capillary moisture is present, the coating manufacturer shall be consulted to determine primer requirements and special coating application criteria.

9. Resurfacing of Concrete: The CONTRACTOR shall use a concrete mortar to rebuild the existing concrete to 2 inches in depth following abrasive blasting. Concrete mortar must be scrubbed into substrate filling all pores and voids. While the scrub coat is still plastic, force material against the edge of repair, working toward center. The CONTRACTOR shall use a trowel to repair the existing concrete with a high early strength mortar, as specified, prior to the installation of the epoxy primer. Hand application is not acceptable. The repaired concrete shall be finished with a masonry brush with 4-inch long Tampico fibers, completely cured, and dried according to the manufacturer's recommendations.
10. The existing PVC liner shall be abraded with rough sandpaper and be solvent cleaned per SSPC SP1 if the new PVC liner will overlap it.
11. As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, and a fine mist of water. Moist curing should commence immediately after finishing.
12. After curing, and prior to coating, the repaired concrete shall be lightly abrasive blast cleaned to produce a surface roughness equivalent to that of ICRI 310.2 Concrete Surface Profile 3.

3.5 REINFORCING STEEL REPAIR

- A. If reinforcing steel is exposed and determined to be in adequate condition by the Engineer, the CONTRACTOR shall coat reinforcing steel with Sika Aramatec 110, or equal, prior to rebuilding the concrete.
- B. If the reinforcing steel has more than 50% of the cross sectional area lost along its exposed length, the reinforcing steel shall be replaced and spliced to sound, adjacent reinforcing steel. The CONTRACTOR shall remove enough of the concrete around the circumference of the reinforcing bar to accommodate the splices and/or coupler installation and to allow for bonding between the reinforcing steel and the new cementitious mortar material. Removals shall allow for a ½-inch gap around the circumference of the reinforcing steel or coupler.

3.6 WORKMANSHIP

- A. Each coat of material shall be subject to the inspection and acceptance of the INSPECTOR before the next successive coating is applied. Defective work of any kind shall be deemed sufficient cause for completely stripping, preparing, and recoating the entire surface involved. Sufficient time shall be allowed between coats to assure proper drying for optimum bonding of the subsequent coats as recommended by the manufacturer for the existing ambient conditions. Excessive

time beyond the manufacturer's recommended recoat window shall be avoided. When maximum recommended drying times are exceeded, surfaces shall be abraded for subsequent coats as recommended by the manufacturer.

- B. All work shall be done in a professional manner with high quality workmanship leaving the finished surfaces free from runs, drops, ridges, waves, holidays, laps, brush marks, variations in color, texture and finish. No visual holes, bubbles, or blisters shall be allowed to be exposed to wastewater.
- C. Upon completion of the painting, the CONTRACTOR shall remove all rubbish and shall remove spattered paint from hardware, floors, equipment and any other surfaces upon which it is not intended.
- D. Skilled craftsmen and experienced supervision shall be used on all work.
- E. Clean drop cloths shall be used. All damage to surfaces resulting from the work hereunder shall be cleaned, repaired, and refinished to their original condition.
- F. All coatings shall be applied under dry and dust-free conditions as indicated in the Environmental Requirements Section 3.3 of this Specification. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to ensure that they have been thoroughly cleaned and that they receive an adequate thickness of coating material. Particular care shall be used to ensure that the specified coverage is secured on the edges and corners of all surfaces.

3.7 SURFACES NOT TO BE COATED

- A. The following surfaces shall not be protective coated hereunder unless shown or specified herein, or elsewhere in the Contract Documents. The following surfaces shall be masked off by the CONTRACTOR prior to coating work being performed on adjacent surfaces requiring coating:
 - 1. Maintenance hole frames and covers
 - 2. Sliding and gear surfaces of telescoping valves
 - 3. Threaded portions of gate stems
 - 4. Machined surfaces of gate slides, frames and guides
 - 5. Any roller-type chains not completely enclosed in drive housings
 - 6. Pump inlets and outlets
 - 7. Internal pipe seals, joints, and gaskets
 - 8. Butterfly valves, check valves, gaskets and slide gates

- B. Drop cloths and other coverings shall be so placed at all times to protect asphalt, concrete, exterior steel and other surfaces from spatter and drippings.
- C. Valve gaskets or seals, flanges, drains, or manhole seats, which are not to be painted, shall be masked off prior to lining work.

3.8 APPLICATION OF PRIMER AND MASTICS

- A. If the interior walls of the structure can not be kept dry due to groundwater infiltration, a waterproofing sealant shall be used prior to the application of the liquid coatings.
- B. Materials and supplies provided shall be the standard products of the manufacturer. Materials within a coating system shall be the products of a single manufacturer.
- C. Before the start of the coating application each day, the CONTRACTOR shall set up a 10-foot by 10-foot polyethylene sheet or cardboard on the ground for the purpose of performing a test patch. The CONTRACTOR, in the presence of the INSPECTOR, shall spray on the polyethylene sheet or cardboard and shall not have any discoloration, bubbles, or pinholes in the coating and the spray gun shall not clog. The spray gun shall produce an even fan spray and the coating shall be of a consistent color. Once these performance characteristics are achieved, the coating application may proceed.
- D. No lining shall be applied under conditions which, in the opinion of the INSPECTOR, could jeopardize the appearance or quality of the finish in any way. It is necessary for the CONTRACTOR to provide a working area which meets the manufacturer's recommended and specified environmental conditions.
- E. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The CONTRACTOR shall schedule such inspection with the INSPECTOR in advance.
- F. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and procedures included in this Section, whichever has the most stringent requirements.
- G. The CONTRACTOR shall verify the wet film thickness with a notched gauge in conformance with ASTM D4414. Wet film thickness readings shall be recorded a minimum of every 100 square feet.
- H. Special attention shall be given to edges, angles, corners, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.
- I. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.

- J. Finish coats, including touch-up and damage repair coats shall be overlapped 6 inches onto existing coatings and shall be applied in a manner which will present a uniform texture and color matched appearance.
- K. The CONTRACTOR shall employ backrolling, troweling, or coating at night to minimize holidays, blisters, and bubbles.

3.9 ARROW-LOCK LINING INSTALLATION

A. General

- 1. Installation of the lining, including preheating of sheets in cold weather and the welding of all joints, shall be done in accordance with the recommendations of the liner manufacturer.
- 2. Coverage of the lining shall not be less than the minimum shown on the plans.
- 3. The lining is normally installed with the locking extensions running vertically in the structure.
- 4. All cut, torn and seriously abraded areas in the lining shall be patched according to manufacturer's instructions.
- 5. Hot joint compounds, such as coal tar, shall not be poured or applied to the lining until all welding has been completed.
- 6. The CONTRACTOR shall take all necessary measures to prevent damage to installed lining from equipment and materials used in or taken through the work.

B. Priming

- 1. Mix Arrow-Lock Mastic Primer No. 5101 according to directions on the label.
- 2. Brush, roller, or spray system (optional) to apply good wet coat to exposed concrete, achieving thorough coverage.
- 3. Let primer cure until it becomes tacky (approximately 30 minutes) before applying mastic. Drying times may vary due to humidity or cooler temperatures.
- 4. Apply primer to repaired concrete and backside of PVC liner at a coverage of 200 square feet per gallon.

C. Mastic Application

- 1. Arrow-Lock Mastic No. 9912 is a 2:1 epoxy gel for filling voids and bonding to properly prepared concrete substrates.
- 2. DO NOT apply mastic at ambient temperatures below 45°F (7°C) or above 100°F

(38°C).

3. Mixing

- a. Mix Mastic Component A and Component B in a 5 gallon pail using an air or electric powered mixer until the components are a uniform color. Pot life is approximately 15 minutes if mastic is left in the container.
- b. DO NOT over mix, as this will shorten the pot life.
- c. In cool climates, store mastic and primer at approximately 77°F (25°C) to facilitate mixing and application.

4. Application

- a. Abrade the leading edge of the existing PVC Liner with 60 grit sandpaper and solvent clean per SSPC SP1 the tightly adhered and embedded PVC liner and allow surface to dry.
- b. Use small un-notched trowel or other suitable tool to apply mastic to concrete substrate in a uniform minimum thickness of 3/8-inch.
- c. Small voids may be filled with mastic; larger voids require filling with an appropriate concrete repair material.
- d. Carefully watch mastic setting time (approximately 15 minutes) to avoid hardening before the liner is applied to the mastic-coated surface.
- e. Mastic coverage is approximately 4 sq. ft. per gallon at a 3/8-inch applied thickness.
- f. If there is evidence of external groundwater infiltration, de-watering procedures are required for a minimum 24 hours after the final installation of the mastic, Arrow-Lock, and weld strips.

D. Arrow-Lock Sheet Lining Application

1. Install Arrow-Lock with sheet on non-horizontal surfaces with the ribs oriented vertically to allow run off of any moisture that may accumulate behind the lining.
2. Measure and cut sheets to size before mixing and applying mastic to the concrete surface.
3. Place one edge of Arrow-Lock sheet into position and roll the Arrow ribs into the mastic.
4. Properly align sheets with respect to each other as required by the type of joint to be produced.
5. NOTE: It may be necessary to heat the lining to allow the sheet to turn corners.

6. Use a hard rubber roller to embed the ¼-inch long ribs full depth into the mastic layer.
7. Clean the surface of an installed sheet with a soft cloth.
8. Do not contaminate a weld area with mastic.
9. Continue process until all surfaces have been covered.
10. During Phase I, terminate the new PVC liner above the existing grating as required in the Drawings.
11. During Phase II, overlap the new PVC liner onto the properly prepared existing PVC liner and seal the joint as required in the Drawings.

E. Hot Air Welding of Liner Joints

1. Three joint types are recommended (refer to Ameron Protective Lining Division Drawing No. PLD-AL-010)
 - a. Type AL-1 (1-inch maximum joint gap)
 - b. Type AL-2 (1/2-inch maximum joint gap)
 - c. Type AL-3 (1/4-inch maximum joint gap)
2. Solvent clean areas to be covered with a weld strip per SSPC SP1. Remove cured mastic with a scraper.
3. Use a hot air gun to fuse the weld strip over the gap between adjacent sheets.
4. Follow the manufacturer's recommendations for setting the heat gun exit air temperature, and the instructions for fusing and applying the weld strip seal over the joint gap.

F. Inspection and Repair

1. Visually inspect all areas of the lining and joints for cracks, tears, punctures, and delamination. Repair punctures and holes in the lining by fuse-welding on weld strips directly over the damaged area.
2. All welds shall be physically tested by a non-destructive probing method using a blunt instrument such as a putty knife.
3. All repairs shall use methods approved by the manufacturer.

3.10 INSPECTION AND TESTING DURING AND AFTER APPLICATION

- A. All inspection and testing shall be subject to confirmation by the CITY's

INSPECTOR.

- B. The CONTRACTOR shall provide anchor profile measurements, blast hose pressures, type/percent mixture of the abrasive, and shall check the compressor air cleanliness.
- C. The CONTRACTOR shall provide a written record of the quantity of coating material applied and the quantity of surface area covered, a description of the location of the area coated, each coating product batch number, dew point temperature, surface temperature, ambient temperature, relative humidity, and names of applicators on a daily basis. The CONTRACTOR shall record the pressures and temperatures at which the coating material is being heated and delivered to the spray gun.
- D. The CONTRACTOR shall provide wet film and dry film thickness readings, and results of the holiday testing, and shall note any discrepancies with the coating specifications. All test results shall be documented in daily inspection reports. These reports shall be submitted to the ENGINEER not less than one business day following the completion of testing.
- E. Inspection Devices: The CONTRACTOR shall furnish, until final acceptance of such coatings, inspection devices in good working condition and calibrated by the manufacturer prior to testing until the final acceptance of such coatings.
- F. Holiday Testing: The CONTRACTOR shall holiday test all spray applied-coated ferrous and non-ferrous surfaces, and surfaces exposed to submerged and severe service environments in the presence of the INSPECTOR. After the specified coating has set hard to the touch, the CONTRACTOR shall test the coated steel surfaces for pinholes and holidays using a high voltage spark tester according to NACE SP0188. The CONTRACTOR shall test the coated concrete surfaces for pinholes and holidays using a high voltage spark tester according to ASTM D4787. Areas which contain visual pinholes and sparking holidays shall be marked, repaired or recoated, and retested in accordance with the coating manufacturer's printed instructions. The electrode movement over the coating surface shall be continuous and shall proceed in a systematic manner, which ensures 100% coverage of the coated surfaces.
 - 1. Coatings with Thickness Exceeding 20 Mils: For surfaces having a total dry film coating thickness exceeding 20 mils, a pulse-type holiday detector shall be used. Holiday testing shall be conducted with a new 12-inch or 18-inch wide wire brush electrode attached to the unit. A silicon rubber electrode shall not be allowed. The unit shall be adjusted to operate between 18,000 and 22,000 Volts. Approved products include the following:
 - a. Tinker & Rasor Model AP-W,
 - b. D.E. Stearns Co. Model 14/20,
 - c. Elcometer D236-30KV

d. or equal

G. Film Thickness Testing: The dry film coating thickness shall be measured in accordance with the SSPC PA 2 with a Level 2 Thickness Restriction using a magnetic-type dry film thickness gage conforming to ASTM D6132. The instruments shall have the capability of measuring 50% over the specified coating thickness and shall produce an actual reading and shall not be estimated. It shall also be measured on the coating material that is attached to the adhesion pull dollies. A theoretical thickness shall also be calculated from the quantities of materials applied. No measurements shall be made until at least 8 hours after application of the coating. The following instruments are acceptable:

1. Concrete

- a. Wet – Notched gauge per ASTM D4414, or approved equal
- b. Dry – PosiTector 200 or equal.

H. Adhesion Testing – Adhesion testing on the concrete shall be performed every 400 square feet of coated concrete surfaces. The coating adhesion to the concrete substrates shall be tested using a Type II or Type V instrument per ASTM D4541 on each coupon and shall be witnessed by the INSPECTOR. Elcometer 106, Defelsko Positector AT, or equal, shall be used to perform the test. The procedure is as follows:

- 1. The new lining material shall be abraded and wiped with solvent per SSPC SP1 prior to applying the adhesive on the dolly.
- 2. A minimum of one new 20 mm diameter dolly shall be affixed to the coated surface for every 400 square feet. Each testing location shall be identified and recorded by the INSPECTOR.
- 3. Before the dolly is affixed to the new lining and prior to conducting the pull-off test, the INSPECTOR shall score around the dolly without disturbing the concrete or bond within the test area. The scoring shall penetrate through the newly applied coating, and abrade the original substrate. Glue the dolly to the scored concrete.
- 4. The adhesive used to attach the dollies to the liner shall be rapid setting with a tensile strength in excess of the coating material and permitted to cure in accordance with the manufacturer's recommendations. Failure of the dolly adhesive shall require re-testing.
- 5. The concrete adhesion pulls shall exceed 200 psi with failure at the concrete. Adhesion pulls between 150 psi and 200 psi shall be acceptable if the dolly contains 50% concrete. An additional pull test will be required for results less than 150 psi for concrete as stated below.
- 6. The INSPECTOR shall record the type of adhesive used, the length of time the adhesive was allowed to cure, and the type of failure observed on the dolly.

7. If more than 50% of the adhesion tests on the concrete do not meet the adhesion requirements, an additional test shall be conducted within 12 inches of the lowest measurement. If the additional dolly does not meet the adhesion requirements, an additional location shall be tested on a different surface. The adhesion values of the retests and passing results shall be recorded and shall average a minimum of 175 psi for concrete, or as otherwise approved by CITY. If the adhesion tests fail to meet the adhesion requirements, the coating shall be removed and replaced at the CONTRACTOR's expense.
8. The CONTRACTOR shall repair the coating and damaged concrete at the locations of the adhesion tests per the manufacturer's recommendations. The testing dollies shall be retained by the INSPECTOR at the conclusion of the testing.
9. If hollow areas are observed by tapping the finished surface with a hammer, the liner plate shall withstand a test pull of at least 20 pounds per linear inch (3.58 kg/cm), applied perpendicularly to the concrete surface for a period of one minute, without rupture of the locking extensions or withdrawal from the intermediate mastic layer or delamination of the mastic from the concrete substrate. This test shall be made at a temperature of 70° - 80°F (21° - 27°C) inclusive and not before mastic has cured at least 7 days.

3.11 CURING OF COATINGS

- A. The coating shall not exhibit bubbling, tackiness, or softness after the coating has exceeded the manufacturer's recommended cure time.
- B. If delaminations, blisters or tackiness is observed after the manufacturer's recommended cure time, the INSPECTOR shall conduct a Solvent Rub Test in accordance with ASTM D5402 after 24 hours of curing. The test area shall be evaluated for appearance, hardness, or any color transfer to the cloth. If there is no change to the coating after the test, it shall be considered cured.
- C. If delaminations, blisters or tackiness is observed after the manufacturer's recommended cure time, the INSPECTOR shall conduct Shore D Durometer Hardness Testing per ASTM D2240. In order to consider the coating cured and properly mixed, it shall meet the manufacturer's recommended Shore D Durometer requirement for the specified product.
- D. The CONTRACTOR shall provide curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the highest requirement, prior to placing the completed coating system into service.
- E. In the case of enclosed areas, forced air ventilation, using heated air if necessary, shall be required until the coatings have fully cured.

3.12 COATING SYSTEM A – PVC LINING SYSTEM

- A. The following PVC lining product, or equal, shall line concrete as indicated in the Drawings:

Product Name	Arrow Lock
Minimum Surface Profile	ICRI 310.2 CSP 5
Prime Coat DFT	Arrow Lock 5101 at 200 sq. ft. per gallon
Mastic DFT	Arrow Lock 9912 at 3/8-inch thick (4 sq. ft. per gallon)
PVC Liner	Arrow Lock Sheet Liner at 65 mils
Total System DFT	440 to 445 mils

3.13 COATING SYSTEM B – CONCRETE REPAIR MORTAR

- A. The following epoxy modified cement mortar, or equal, shall be used to build up the existing concrete surfaces to 2 inches thick on the Influent Pump Station from Elevation -0.5 ft. up to Elevation +23.0 ft., including the ceiling. It shall be applied after it has been abrasive blasted, after any reinforcing steel is repaired, and tested for surface contaminants.

Product Name	Five Star Structural Concrete V/O, Emaco S88 CI, Carboguard 510, or approved equal
Surface Preparation	SSPC SP13 Abrasive Blast to remove top 2 inches of original surface and achieve a ICRI 310.2 CSP 5
Application Method	Per Manufacturer's Recommendations
Total Thickness Minimum	2 inches

3.14 COATING SYSTEM D – SOUND, EXPOSED REBAR REPAIR

- A. One of the following concrete repair mortars shall also be used to repair reinforcing steel with less than 50% corrosion loss in cross sectional area:

Product Name	Sika Armatec 110 and SikaRepair 224 or Five Star Structural Concrete V/O
Surface Preparation	SSPC SP13 Abrasive Blast to remove top 2 inches of original surface and achieve a ICRI 310.2 CSP 5. SSP3 on exposed reinforcing steel
Corrosion Inhibitor	2 coats at 20 mils
Repair Mortar	As needed to restore to original surface.
Application Method	Per Manufacturer's Recommendations

END OF SECTION

SECTION 10400

IDENTIFYING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Signs and Tags:
 - a. Safety, caution, danger and hazard signs.
 - b. Stamped metal tags for field equipment and instruments.
 - c. Tagging of valves, pumps, motors, conduit, instrumentation and process equipment.
 - 2. Pipeline marking tape to identify buried pipe:
 - a. All pressure lines.
 - b. All drain lines 4 inches or larger.
 - 3. Locating wire:
 - a. All non-metallic buried pipe.
 - 4. Color coding, labeling, stenciling, and tagging of all exposed process, water and air piping.
 - 5. Identification and tagging of electrical and instrumentation equipment.
 - 6. Wire numbering standards: See Division 16 specifications.
- B. Additional Requirements Specified Elsewhere:
 - 1. Shop Drawings, Product Data, and Samples: Section 01340.
 - 2. Quality Control: Section 01400.
 - 3. Product Requirements: Section 01600.
 - 4. Painting: Section 09900.
 - 5. Piping: Section 15060 – Piping Schedules

1.02 SUBMITTALS

- A. See Section 01340.
- B. Product Technical Data Including:
 - 1. Acknowledgment that products submitted meet requirements of standards referenced.
 - 2. Identification register listing all items to be identified, type of identification system to be used, lettering, location and color.
 - 3. Catalog information for all tagging systems.
 - 4. Updated, complete, identification register with non-conflicting numerical assignments submitted prior to project acceptance.
- C. Drawings and Data:
 - 1. Signs: Submit schedule of all signs, including data describing size, colors, materials, letter sizes, mounting and schedule of signage.
 - 2. Tape: Material, size, color, detectability.

1.03 JOB CONDITIONS

- A. Signs:
 - 1. Indoor installation; wall, bracket or pipe mount as directed by Engineer.
 - 2. Outdoor installation; wall mount, direct sunlight, locate as directed by Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Paint: As specified in Painting Section 09900.
- B. Metal Tags and Attachment Wire:
 - 1. Tags: Aluminum or stainless steel.
 - 2. Stamped-in identifying letters.
 - 3. Colors: Two colors, lettering on separate background color. Colors as selected by District.
 - 4. Size: 3 inch diameter, minimum, or larger as required.
 - 5. Wire: 32 mil, nylon coated, stainless steel, no substitution.
 - 6. Tag numbers in accordance with valve and equipment schedules in respective sections and numbering shown on P&ID's.
 - 7. WH Brady Company, Carlton Industries, or equal.
- C. Snap-on Markers: Plastic sleeves, Seton Name Plate "Setmark," WH Brady Company, Carlton Industries, or equal.
- D. Fiberglass Reinforced Plastic Signs:
 - 1. Approved manufacturers and catalog numbers:
 - a. W H Brady Co., Catalog S-10, #B-120, Carlton Industries, or equal.
 - 2. Material: Fiberglass reinforced plastic.
 - 3. Size:
 - a. Surface: As scheduled.
 - b. Thickness: 0.10 inch.
 - 4. Fabrication:
 - a. Rounded corners.
 - b. Drilled holes in corners with grommets.
 - 5. Legend: Preprinted and permanently embedded.
- E. Phenolic Nameplates:
 - 1. Approved manufacturers and catalog numbers:
 - a. W H Brady Co., Catalog S-10, #B-1, Carlton Industries, or equal.
 - 2. Materials: Phenolic.
 - 3. Size:
 - a. Surface: As required for text.
 - b. Thickness: 1/16 inch.
 - 4. Fabrication:
 - a. Three layers laminated.
 - b. Legend engraved through top lamination into center lamination.
 - c. Drilled holes with grommets for mounting.

2.02 SAFETY SIGNS

- A. General:
 - 1. Material: Fiberglass reinforced resin/glass.
 - 2. Construction:
 - a. Graphics laminated between resin glass shields.
 - b. Thickness: 1/16 inch.
 - c. Grommets corner holes.
 - 3. Abrasion and impact resistant.

2.03 PIPELINE AND ELECTRICAL CONDUIT MARKING TAPE

- A. Material: Mylar Encased Aluminum.
- B. Width: 2 inches.
- C. Color: Orange or Yellow.
- D. Printed Identification:
 - 1. Pressure lines: "Caution: Buried Water Line Below".
 - 2. Drain lines: "Caution: Buried Drain Line Below".
 - 3. Electrical: "Caution: Electrical Below".
- E. Capable of Being Located From Above Ground With Metal Locator.

2.04 LOCATING WIRE

- A. No. 10 AWG, Continuous, Solid Copper, with UF Coating.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Location of Identification:
 - 1. Lettering and flow direction arrows:
 - a. Near equipment served.
 - b. Adjacent to valves.
 - c. At each branch or tee.
 - d. At intervals of not more than 50 feet on straight runs, unless otherwise indicated by the Engineer.
 - 2. "Caution," "Danger," and identification signs located at direction of Engineer.
- B. Metal Tags:
 - 1. Provide tags in lieu of stenciling/lettering on pipe 5/8 inch or smaller outside diameter (including covering).
 - 2. Color code as specified.
 - 3. Attach with stainless wire and stainless crimps.
- C. Lettering:
 - 1. Self adhesive or snap-on style markers.
 - 2. Letter size as follows:

Outside Diameter of Pipe or Covering

5/8 inch or smaller

3/4 inch through 4 inches

5 inches or larger

Minimum Height of Letters

Metal tags – 1/4 inch

3/4 inch

2 inches

D. Scheduled Color Coding:

1. All 12 inch pipe and smaller.
2. Bands where scheduled: 6 inches wide, at 5 foot intervals.
3. Provide only bands of color on uninsulated stainless steel, CPVC, and PVC, elsewhere natural finish.

E. Piping Not Scheduled:

1. Paint to match wall or ceiling, unless otherwise directed by Engineer.
2. Appropriately identify and place flow arrows
3. Uninsulated stainless steel and PVC:
 - a. Natural finish.

F. Pipeline Marking Tape:

1. Install continuously above all buried pipe.
2. Depth: 4 inches, 6 inches.

G. Pipeline Locating Wire:

1. Install continuously, tape to all non-metallic buried pipe.
2. See details on plans for continuation at valve boxes.

H. Piping Not Scheduled:

1. Paint to match wall or ceiling, unless otherwise directed by Engineer.
2. Appropriately identify and place flow arrows.
3. Uninsulated stainless steel, CPVC and PVC:
 - a. Natural finish.

3.02 SCHEDULES

A. Piping Color Schedule:

<u>Pipe</u>	<u>Color of Pipe</u>	<u>Lettering</u>
Odor Control	To match existing	Black

D. Specially Paint the Following Items:

<u>Item</u>	<u>Color</u>
Factory Primed Equipment	to match existing
Exposed Galvanized Flashing	Light Gray
Anywhere steel comes into contact with aluminum	Factory color

E. Danger Signs:

1. Size: 10 inches wide by 7 inches high.

2. Standard OSHA header, "Danger," white letters on red background in upper half of sign.
3. Baked enamel on 0.063 inch aluminum.
4. Custom lettering, "Equipment Starts Automatically", black letters on white background, Quantity: 1.
5. Custom lettering, "No Smoking", quantity 3.
6. At exhaust fan

F. Pipeline Labeling Markers:

1. Label all process piping as listed below.
2. Peel and press self adhesive style labels.
3. White lettering on green background.
4. Size markers for pipe size per label manufacturer=s recommendations.
5. Secure each pipeline label marker with self adhesive flow arrow tape, one full wrap minimum at each end of label. White arrows on colored background, same color as pipeline label.
6. Legend:

<u>Label</u>	<u>Quantity</u>
Odor Control	1

G. Metal Tags:

1. Schedule:
 - a. Exhaust fan and motor

END OF SECTION

SECTION 15605
HVAC: EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Heating, ventilating, and cooling equipment.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. Air Movement and Control Association (AMCA):
 - a. 210, Laboratory Methods of Testing Fans for Rating Purposes.
 - b. AS401, Fans, Standard Classifications for Spark-Resistant Construction.
 2. Air Conditioning and Refrigeration Institute (ARI):
 - a. 410, Force-Circulation Air-Cooling and Air-Heating Coils.
 - b. 430, Central Station Air-Handling Units.
 3. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
 - a. Applications Handbook, Chapter on Sound and Vibration Control.
 4. National Electrical Manufacturers Association (NEMA).
 5. National Fire Protection Association (NFPA):
 - a. 90A, Installation of Air Conditioning and Ventilating Systems.
 6. National Roofing Contractor Association (NRCA).
 7. Underwriters Laboratories, Inc.(UL).
- B. Miscellaneous:
1. Gage thickness specified herein shall be manufacturer's standard gage for steel and Brown and Sharpe gage for non-ferrous metals.
 2. Corrosion protection of equipment to be as specified herein.

1.3 SUBMITTALS

- A. Shop Drawings:
1. See Division 1.
 2. Fabrication and/or layout drawings.
 3. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Wiring diagrams.
 - d. Control diagrams.
 - e. Manufacturer's catalog cuts and technical data.
 - f. Corrosion-protection information.
 - g. Fan curves.
 - h. Sound data.
 - i. Vibration isolation.
 - j. Control description.
 - k. Performance data on all equipment.
 4. Certifications:
 - a. Provide certification of thickness of corrosion-protection coating.

- B. Operation and Maintenance Manuals:
 - 1. See Division 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Vibration isolation assemblies:
 - a. Mason.
 - b. Vibration Mounting and Controls Co.
 - 2. Corrosion-protective coatings:
 - a. Heresite and Chemical Co.; "Heresite."
 - b. Technical Coating Division of Southern Anodizing Co., Inc.; "Technicoat."
 - 3. Roof-mounted centrifugal exhaust fans:
 - a. Loren Cook.
 - b. Greenheck.
 - c. Penn Ventilator Co., Inc.
 - d. Or equal.

2.2 GENERAL

- A. All manufactured units shall be factory wired and assembled.
 - 1. Use fasteners made of same material as unit.
 - 2. Fabricate motor assemblies and unit housings with vibration isolation assemblies:
 - a. Type: As per Table 42, Chapter 43, ASHRAE Applications Handbook.
- B. All manufactured units shall be constructed with corrosion-resistant materials or have corrosion-resistant coating.
 - 1. Type:
 - a. Corrosion-resistant materials:
 - 1) Aluminum.
 - 2) Stainless steel.
 - 3) FRP.
 - b. Corrosion-resistant coating:
 - 1) Phenolic-based coating:
 - 2) 3 mil minimum dry thickness, air-dried coating, for surfaces exposed to temperatures less than 150 DegF.
 - 3) 5 mil baked-on coating for heat transfer surfaces and surfaces exposed to temperatures greater than 150 DegF.
 - 4) Factory applied.

2.3 MANUFACTURED UNITS

- A. Roof-Mounted, Upblast Centrifugal Exhaust Fans:
 - 1. AMCA certified.
 - 2. Non-overloading horsepower capability.
 - 3. Materials:
 - a. Top cap: Spun aluminum.
 - b. Wheel and inlet shroud: Aluminum.
 - c. Baffle: Aluminum.
 - d. Base: One-piece aluminum.
 - e. Drive assembly supports: Steel.

- f. Drive shaft: Solid stainless steel.
- 4. Backward inclined blades.
- 5. Tapered inlet shroud.
- 6. Statically and dynamically balanced wheel.
- 7. Bearings:
 - a. Permanently sealed, flange type, ball-bearings.
 - b. Five-to-one load capability to actual load ratio.
 - c. 200,000 HR average life.
- 8. Weathertight compartment for motor and drives.
 - a. Separated from airstream.
- 9. Motor: See Section 11005.
 - a. Driver and driven sheaves:
 - 1) Keyed hub type.
 - 2) Drive sheaves: Fixed pitch diameter.
 - 3) Driver:
 - a) Shipped with variable pitch diameter sheave.
 - b) Fixed pitch diameter size based on approved test and balance reports.
 - 4) V-belt drives sized for 150-percent motor horsepower.
- 10. Vibration isolated drive assembly.
- 11. Accessories:
 - a. Prefabricated insulated aluminum roof curb.
 - b. Bird screen.
- 12. Size and capacity as scheduled.

Equip No.	Cook Model	CFM	ESP	HP	RPM
EF-1	ACRUB 330 R11B	10,560	1.0 IN WC	5	640

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with Section 11005.
- B. Install fixed pitched drive sheave after sheave has been sized based on accepted test and balance report.

3.2 FIELD QUALITY CONTROL

- A. Comply with Section 15990.

END OF SECTION

SECTION 15990
HVAC SYSTEMS: AIR BALANCING AND TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Adjusting, balancing, and testing of ventilating including the following systems:
 - a. EF-1
 - b. Odor control duct from the Dewatering Building, and the discharge duct from existing odor control fan EF 16-1.
 - c. And as specified.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. Associated Air Balance Council (AABC):
 - a. National Standard for Total System Balance, Fourth Edition, 1982.
 2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
 - a. ASHRAE Handbook, Systems, chapter entitled "Testing, Adjusting, and Balancing."
 - b. ASHRAE Handbook, Applications, chapter entitled "Laboratories."
 3. National Environmental Balancing Bureau (NEBB):
 - a. Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 4. Sheet Metal and Air Conditioning Contractors National Association, Inc (SMACNA):
 - a. HVAC Systems, Testing, Adjusting and Balancing.
- B. Qualifications:
1. Work of this Section to be accomplished by an independent testing and balancing firm certified by one of the following:
 - a. Associated Air Balance Council (AABC).
 - b. National Environmental Balancing Bureau (NEBB).
 - c. Other certification entity approved by Engineer.
 2. The independent firm shall not be the same firm as the firm installing the HVAC equipment, nor under contract to the firm installing the equipment.

1.3 SUBMITTALS

- A. Shop Drawings:
1. See Section 01340.
 2. Certifications:
 - a. Letter stating the name and qualifications of the firm proposed.
 - b. Evidence that relevant subcontractors have been notified of the requirement to coordinate balance and test elements in the work with the testing and balancing firm.
 3. Test reports:
 - a. Procedures and forms to be used in calibrating of test instruments, balancing systems, and recording and reporting test data.
 - b. Completed test reports and data forms upon completion of installation, balance and testing of HVAC systems.
 - 1) Insert recorded information on report forms required by specifications and approved for use on project.

- 2) Additional written verification and other related information clearly identifying project, date and specifics of verification.
- 3) Utilize report forms similar to those shown in Section V of AABC Standard.
- 4) Provide forms typed and signed by the testing and balancing firm.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Secure approved shop drawings of specified systems equipment.
- B. Procedures and Forms:
 1. Submit procedures and forms to be used in calibration of test instruments, balancing systems, and recording and reporting test data.
 2. Obtain approval before beginning balancing and testing.
- C. Do not begin balancing and testing until systems are complete and in full working order.
 1. Place systems into full operation and continue their operation during each working day of balancing and testing.
- D. Provide qualified heating and ventilating Engineer(s) to supervise and perform balancing and testing.
- E. Review design Drawings, Specifications, approved shop drawings and other related items to become thoroughly acquainted with the design of HVAC systems.
- F. Check all installed systems against Contract Drawings, Specifications and shop drawings to see that system is installed as required.
 1. Report deficiencies to the Engineer.
 2. Report deficiencies to Contractor for remedial action including providing corrective measures required in the function of any part of system to complete balancing.
- G. Make necessary adjustments as required to balance the systems.
- H. Provide two weeks notice to Engineer to schedule witnessing of the test and balancing.
- I. Balance all new HVAC systems.

3.2 FIELD QUALITY CONTROL

- A. Balance and Test Air Systems:
 1. Engineer will be present at testing and balancing.
 2. Measure duct air flows using pitot tube traverse.
 3. Open all exhaust duct dampers in wet well/screen room to 100% open.
 4. Adjust dampers in FRP intake grilles in the Dewatering building to achieve 10,000 cfm from dewatering building, as measured in the 32" FRP header from the Dewatering building. Measure static pressure in 32" FRP header just outside of the Dewatering building.
 5. Measure air flow from discharge of existing odor control fan EF 16-1.
 6. Measure amps, fan speed, and suction and discharge pressure of EF 16-1.
 7. Measure static pressure loss across the grease filter with clean filter.
 8. Measure CFM into each exhaust grille in wet well/screen room.
 9. Report findings to Engineer on site. Engineer may direct testing and balance firm to adjust EF 16-1 fan speed and/or exhaust grille damper positions in wet well/screen room, and re-balance system.

10. Obtain design CFM for EF-1. Adjust fan speed as required. Measure EF-1 amps and suction pressure at 32" FRP duct inside the dry well.
11. Prepare and submit reports.

END OF SECTION

SECTION 16010

ELECTRICAL GENERAL

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The following list of components and areas of work is a summary of the work required in the drawings and specifications. The list is not comprehensive of the total work required nor is it in any specific order. It is merely being provided as an aid to the bidder. Work not listed herein, but described in the plans or specifications, is also part of the overall scope of work.
1. Motor Control Center (MCC) Modifications
 - a. Furnish and Install new cubicle into existing MCC
 2. Control panel(s).
 - a. Connect new exhaust fan I/O to existing PLC spare I/O as required per drawing E3 and E4.
 - b. Add programming to existing Modicon Quantum PLC and SCADA system to control blower per drawing E3 and E4
 - c. Obtain existing program from Construction Manager by request through the RFI process. Expect that this process will take 4 weeks.
 - d. Test operation in presence of Engineer or Construction Manager.
 3. Conduit – support systems, wire, and grounding system, for equipment interconnection, and operation.
 4. Trenching, backfilling, compaction and resurfacing for all new underground conduit routes, concrete pads, and pull boxes.
- B. Electro-mechanical equipment to be installed in this project may be specified in other divisions but will interface to equipment provided under Electrical Specifications. Obtain submittals for those devices, review, coordinate and provide all interfacing equipment, software, communications, I/O, and testing to integrate the equipment to the extent possible and as intended.
- C. Install electrical and control portion of electro-mechanical equipment specified in other sections. Reference those specifications, pertinent details, and follow all manufacturer instructions to erect, install and commission equipment. Furnish all

electrical equipment, interconnecting wire, and make connections to place equipment in operation.

- D. All electrical equipment and materials, and methods - including installation, calibration, and testing - shall conform to the applicable codes and standards listed in this and other Sections. All electrical materials and work shall conform to published standards of the National Electric Code (NEC) latest issue, Institute of Electrical and Electronic Engineers (IEEE), and Underwriters Laboratories Inc (UL).

1.02 RELATED SPECIFICATIONS

- A. The following specification sections are part of Division 16 [Electrical Specifications].
 - 1. Section 16110 – Conduit, Boxes and Grounding
 - 2. Section 16120 – Wire, Fuses and Terminal Blocks
- B. Owner, Engineer, Construction Manager, Application Programmer, and City are used within Electrical Specifications and are interchangeable. They are all representatives of the Owner, in this case, the City of Manteca.

1.03 QUALIFICATIONS

- A. Electrical Contractor
 - 1. Management and installation of the entire electrical and control system) required for this project shall be by an Electrical Contractor meeting qualifications as defined herein.
 - 2. Electrical Contractor must be competent in performance, supervision and coordination of work required and performed by equipment suppliers and Systems Integrator (Subcontractors).
 - 3. The Electrical Contractor (EC) shall meet the following minimum qualifications:
 - a. Has a current C10 Electrical Contractor's License issued by the State of California Department of Consumer Affairs.
 - b. EC shall have sufficient qualified personnel to staff the project. State law requires that all personnel installing electrical components are certified by the State of California as "Electrician" or "Electrician Trainee." Apprentices may install electrical components only under direct supervision of a certified Electrician.
 - c. EC shall be familiar with and understand codes and requirements from NFPA70, NFPA110, and all other local codes as required for work scope as described in the drawings and specifications.
 - d. EC shall be regularly engaged in similar electrical contracting for

the Municipal Water and Wastewater Industry.

- e. EC shall know and understand common terms and abbreviations used in this Industry. Not all terms and abbreviations will be defined in the drawings and specifications.
- f. EC shall be competent with the methods and materials associated in the type of electrical and instrumentation work specified in this Division.
- g. EC shall carry all insurances as defined and required by the special provisions and as required by law.

B. System Integrator

- 1. Systems Integrator must be competent in performance, supervision and coordination of work required in this contract.
- 2. This includes, but is not limited to, all work necessary to select, furnish, construct, supervise installation, configure, calibrate, test, and place into operation all transmitters, instruments, programmable controllers, control panels, motor controls, alarm equipment, communications, monitoring equipment, and accessories.
- 3. The System Integrator shall have on staff a Project Engineer with three years prior experience on similar sized projects. This Project Engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. The Project Engineer shall attend all coordination meetings when specifically requested by the Engineer.
- 4. The System Integrator (SI) shall meet the following minimum qualifications:
 - a. SI shall be regularly engaged providing electrical and control systems for the Municipal Water and Wastewater Industry.
 - b. SI shall have an Electrical Engineer on staff registered in the State of California as a Professional Engineer.
 - c. SI shall be capable of labeling all electrical panels as manufactured or customized by the System Integrator with appropriate UL label prior to factory testing or shipment to project site.
 - d. SI shall have successfully completed work of similar or greater complexity and on similar facilities on at least ten previous projects under the present company name.
 - e. SI shall be actively engaged in the following disciplines for the last 5 consecutive years.
 - 1) Design and manufacturing of custom Control Panels, Motor Controls Centers, and associated devices and equipment as specified in this division.
 - 2) Programming and commissioning of SCADA, PLC and Operator Interface hardware.

- 3) Instrumentation - selection, purchase, calibration, start-up and commissioning.
- 4) Testing, calibration, start-up, and commissioning of control systems as applied to the Water and Wastewater industry.
- f. SI shall employ personnel on this project who have successfully completed ISA or equal training courses on general purpose instrumentation.
- g. SI shall have a permanent, fully staffed and equipped service facility within 200 miles of the project site for a minimum of 1 year prior to bid date with personnel and equipment required to maintain, repair and calibrate the instrumentation system.
- h. SI shall be a certified member of the Control System Integrators Association and a Wonderware certified system integrator.

1.04 CONTRACT DOCUMENTS

- A. The resolution of conflicting information within the contract electrical documents shall put precedence on electrical drawings over that of electrical specifications.
- B. The Contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided with sufficient detail to construct. Minor omission of detail shall not relieve a qualified contractor from the obligation to provide a complete operational system if it can be determined that the particular detail is usual and customary for similar systems.
- C. The following specifications may incorporate specific equipment or materials that do not have equal equipment listed. These items are standards because of their familiarity, serviceability, and/or spare parts inventory. However, equal alternate equipment or materials (noted in the submittal cover letter) will be considered for use on this project if submitted. The Engineer may reject said equipment for the purpose of adherence to standards.
- D. Contract drawings are diagrammatic and indicate general arrangement of systems and equipment, except when specifically dimensioned or detailed. Exact locations of electrical products shall be verified in the field. Field measurements take precedence over dimensioned drawings. Drawing intent is to show size, capacity, approximate location, direction and general relationship of equipment in area shown but not exact detail or arrangement. The requirements or descriptions in the drawings shall take precedence in the event of conflict.
- E. The Contractor is encouraged to visit site and shall thoroughly examine existing conditions before submitting his bid proposal to perform any work. He shall compare site conditions with data given on the plans or in these Specifications. No allowance shall be made for any additional costs incurred by the Contractor due to his failure to examine each site or report any discrepancies to the Engineer.
- F. The Contractor shall examine the architectural, mechanical, structural, and

electrical and instrumentation submittals and equipment furnished under other specifications divisions in order to determine conduit routing, stub-up locations, and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment electrical terminals. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment. If the Contractor installs equipment conflicting with the architectural, mechanical, structural, instrumentation or electrical equipment provided under this and other specifications sections, the Contractor shall replace without additional cost.

- G. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. If accessibility appears to be compromised, the location of equipment or stub ups shall be modified to the extent possible.
- H. Where conduits are shown on the Contract drawings, or stated to be furnished but not explicitly shown, as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc. as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this Section.
- I. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for review.
- J. The Contractor shall maintain a neatly and accurately marked full size set of Contract Drawings recording the as built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or drawing changes. Drawings shall be kept current weekly, with all "change orders", submittal modifications, and construction changes shown. Drawings shall be subject to the inspection by the Engineer at all times, progress payments or portions thereof may be withheld if drawings are not accurate or current.
- K. When documents are changed, they shall be marked with erasable colored pencils using the following coloring scheme:
 - Additions - red
 - Deletions - green
 - Comments - blue
 - Dimensions - black
- L. Prior to acceptance of the work, the Contractor shall deliver to the Engineer one set of record full size drawings neatly marked accurately showing the information required above.

1.05 PROJECT COORDINATION

- A. Upon submittal approval, the Electrical Contractor shall coordinate with

equipment suppliers and/or the System Integrator to verify types, sizes, locations, installation requirements, controls and diagrams of all equipment furnished. If there are any issues or coordination requiring Engineer attention, they shall be identified within the letter at this time.

1.06 SUPERVISION

- A. The Contractor shall schedule all activities, manage all technical aspects of the project, coordinate submittals and drawings, and attend all project meetings associated with this Section. The Contractor shall coordinate and confirm that the project schedule is being adhered to and all work is being completed within the scheduled time frames.
- B. The Contractor shall supervise all work in this Section, including the electrical system general construction work, from the beginning to completion and final acceptance.
- C. The Contractor shall coordinate, obtain, prepare, and/or complete the documentation required within this division. All documentation shall be complete and delivered prior to final acceptance.

1.07 INSPECTIONS

- A. General
 - 1. Contract work or materials shall be subject to inspection at any time by the Engineer. If equipment, material, or installation method does not conform to the Contract documents, or does not have a favorably reviewed submittal status and has been determined to be unsatisfactory by the Engineer, then the Contractor shall remove said material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.
 - 2. Work shall not be closed in or covered over before inspection and approval by the Engineer. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.
 - 3. The Contractor shall cooperate with the Engineer and provide assistance at all times for the inspection of the electrical system under this Contract. The Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality of the work.
- B. Milestones requiring inspection and signoff.
 - 1. Underground conduit complete. Do not cover any portion of conduit prior

to inspection. Conduits must be labeled with temporary tags per Electrical Specifications [Conduit, Boxes and Grounding].

2. Installation of electrical equipment. Equipment is anchored in place, conduit connections are complete, no wire is yet pulled into conduit. Permanent conduit tags must be in place per Electrical Specifications [Conduit, Boxes and Grounding].
3. Wire termination complete. Do not energize equipment. All wire tags must be installed and wires terminated per Electrical Specifications [Wire, Fuses and Terminal Blocks]. Pre-energization testing to commence after inspection.
4. Testing per Electrical Specifications, All testing per Electrical Specifications shall be witnessed unless specifically declined by the Engineer. Schedule tests with Engineer 2 weeks prior to test date.
5. Punch list – final inspection. Schedule final walkthrough with Engineer one week prior to intended project completion date. All items on punchlist must be complete prior to scheduling walk-through.

1.08 JOB CONDITIONS

A. Construction Power and Telephone Service

1. The Contractor shall coordinate, furnish and install, temporary utility services required during construction of the project, such as temporary electrical power and telephone service. Temporary services shall be installed in accordance with the applicable codes and regulations of the serving utilities.
2. Upon completion of the project, remove temporary services. All equipment and material shall be the property of the Contractor.

B. Equipment Storage

1. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction.
2. Equipment and materials shall be completely and sufficiently sealed and covered and set on a pallet above grade so that they are protected from weather, wind, dust, water, or construction operations.
3. Equipment shall not be stored outdoors. Where equipment is stored or installed in an area with susceptibility to moisture, such as unheated buildings, untested piping, etc., provide an acceptable means to prevent moisture damage, such as plastic cover and a uniformly distributed heat source to prevent condensation.

- C. The project site is located where outside temperatures vary between 10 deg F. to 110 deg F. Humidity in this area will range from 10% to 100%.

1.09 AREA CLASSIFICATIONS

- A. Area classifications are shown on the site electrical plans. The area enclosed by walls or the entire drawing area shall be as classified unless otherwise described or shown. All electrical equipment, enclosures, conduit, and supports shall be formally rated for or, at minimum, meet the intent of the rating. If no area classification rating is shown, classification shall default to a NEMA 12 rating for indoors, and NEMA 4 rating for outdoors (non corrosive) and NEMA 4X for corrosive areas both indoors and outdoors.

1.10 SUBMITTAL REQUIREMENTS

- A. General
 - 1. Requirements described herein are specific to electrical submittals and are secondary to those described in other general specifications sections. Any additional requirements described here that are beyond those described in those sections shall be provided as described. Conflicts shall be resolved by giving priority to general specifications.
 - 2. The Contractor shall ensure that the System Integrator and/or equipment suppliers provide the submittal documentation required in this section. Submittals shall be neat, orderly, complete (without un-needed parsing), and indexed.
 - 3. The Contractor shall coordinate submittals with the work so that project will not be delayed. This coordination shall include scheduling the different categories of submittals, so that one will not be delayed for lack of coordination with another. Time extensions will not be allowed due to failure to properly schedule submittals.
 - 4. No material or equipment shall be delivered to the job site until the submittal for such items has been reviewed by the Engineer and marked "no exceptions noted" or "make corrections noted".
 - 5. The equipment specifications have been prepared on the basis of the equipment first named in the Specifications. The Contractor shall note that the second named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required to meet Specifications or functional installation.
 - 6. Exceptions to the Specifications or Drawings or equipment or procedures submitted as "equal" to specified equipment shall be clearly identified in a letter at the front of the submittal. Submittal data for "equal" equipment or procedures shall contain sufficient details so a proper evaluation may be

made by the Engineer. The Contractor is responsible for verifying proper application/operation of substituted equipment.

7. Deviations from the Contract documents shall **not** be incorporated into the work without prior written approval of the Engineer. A "Change Order" directive from the Engineer is required prior to incorporating any deviation from the Contract documents that has costs associated. The cost differential associated with this change order must be negotiated with the Engineer to amend the Contract to reflect the costs or savings.

B. Submittal Procedures

1. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: "XXX-0"; where "XXX" is the sequential number assigned by the Contractor. Resubmittals shall have the following format: "XXX-Y"; where "XXX" is the originally assigned submittal number and "Y" is a sequential number assigned for resubmittals, i.e., 1, 2, or 3 being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25-0, for example, is the first submittal of Submittal 25, and Submittal 25-2 is the second resubmittal of Submittal 25.
2. Identify all submittals by submittal number on letter of transmittal. Submittals shall be numbered consecutively and resubmittals shall have a letter suffix. For example:
 - a. 1st submittal: 1
 - b. 1st resubmittal: 1A
 - c. 2nd resubmittal: 1B, etc.
3. Within 30 calendar days after contract award, the Contractor shall furnish to the Engineer six (6) sets of all submittals (4 paper, 2 electronic on CD) required for this Division. Interconnection drawings, training documents test procedures, and O&M Manuals as applicable shall be submitted timely as to not delay the project.
 - a. Submittals may be delivered entirely electronically via email (no hard copy required) if total submittal documents do not exceed 30 pages. However, General Contractor supervision must not be circumvented by sending submittals direct to Engineer.
 - b. Electronic Submittals shall be transmitted with the hard copy submittals and be viewable using a PDF reader.
 - c. Electronic (PDF) submittals must follow all applicable requirements for hard copy submittals including indexing, bookmarks, highlighting, selection indicators (box, highlight) etc. Use of native PDF files (not scans) are required if one exists on the

World Wide Web (WWW).

4. Submittal Preparation

- a. Submittals shall be published 1st electronically and 2nd on hard copy paper stock.
- b. Electronic submittals shall be assembled in accordance with the specifications for hard copy submittals with table of contents, bookmarks, tabs, subtabs, etc. utilizing the electronic bookmarks feature available in the PDF assembler. Only one PDF file is allowed for each submittal. Multiple (.PDF) files will not be acceptable.
- c. Electronic (PDF) submittals must follow all applicable requirements for hard copy submittals including indexing, item selection indication, bookmarks, etc.
- d. Use of native PDF files (not scans) are required if one exists on the www. Ignoring this requirement is cause for submittal rejection.

5. Each submittal over 25 pages shall be bound in a three ring binder, which is sized such that when all material is inserted the binder is not over 3/4 full. Binder construction shall allow easy removal of any page without complete manual disassembly; spiral ring type binders are not acceptable. Submittals 25 pages or less may be stapled without binder or indexing.

- a. Each binder shall be appropriately labeled on the outside spine & front cover with the project name, contract number, equipment supplier's name, specification section(s), and major material contained therein.
- b. An index shall be provided at the inside of the front cover. This index shall itemize the contents of each tab and subtab section.
- c. Data summary sheets shall be provided for each individual piece of instrumentation. The data summary sheets shall have the following information preceding their corresponding catalog data:
 - 1) Instrumentation type and tag name.
 - 2) Location/description.
 - 3) The manufacturer's model and part number with all options.
 - 4) Range, span, units, input and output signals.
 - 5) Description of component.
 - 6) Contract specification subsection number reference.
- d. Drawings may be bound in separate 11 x 17 binder or included with the 8.5 x 11 binder if folded such that the title block is visible

with drawing folded. Drawings that are "C" or "D" size are not allowed.

6. The reviewed submittals will be annotated "Make Corrections Noted", "No Exceptions Noted", "Revise and Resubmit Noted Items", or "Rejected without Review." The following actions shall then be taken by the Contractor:
 - a. "No Exceptions Noted" - The Contractor may proceed with the work covered in this submittal. No resubmission is necessary.
 - b. "Make Corrections Noted" - The Contractor may proceed with the work covered in this submittal incorporating the changes noted. However, the Contractor shall revise the submittal in accord with the changes noted and resubmit six (6) copies of drawings, bill of materials, and catalog data denoting changes within 14 calendar days when requested by the Engineer for record keeping purposes.
 - c. "Revise and Resubmit Noted Items" - The Contractor shall not proceed with the work covered in this submittal. The Contractor shall revise and correct the submittal in accordance with the comments and resubmit six (6) copies within 14 calendar days for approval.
 - d. "Rejected without Review" submittal - The Contractor shall not proceed with the work covered in this submittal. The submittal did not address the work scope as defined by the submittal's title or the previous submittal comments have not been addressed in full. The Contractor shall revise and correct the submittal in accordance with the specifications, and resubmit six (6) copies within calendar 14 days for approval.
 7. Resubmittals shall address all comments by the Engineer. A submittal response letter shall be submitted that addresses each comment by the Engineer with a standardized response of "revised" or with a written explanation. Partial re-submittals (that do not address all comments) may be returned without review at the discretion of the Engineer.
 8. The Contractor shall be responsible for the Engineer's review cost for each resubmittal in excess of the second resubmittal. These costs will be back-charged to the Contractor and will be deducted from his progress payments.
- C. Electrical Equipment -- Submittal data shall be grouped by equipment type or location. Each submittal shall be as complete as possible covering the entire project and scope of supply. Drawings or equipment submitted individually that are not on the critical path will not be accepted for individual review. The electrical submittals shall include (as a minimum):

1. Table of Contents
2. Comment Letter: The Project Engineer of the System Integrator shall note all deviations from Contract Documents and the reason(s) for the deviation. He may use this forum to inform the Engineer or installing Contractor of important information related to the project. RFIs must be submitted separately. Re-submittals shall include written responses to every comment provided by the engineer during the previous review.
3. Bill of Materials: The Contractor and System Integrator each shall provide Bill of Material for electrical components formatted as shown below. Generic names or part numbers as defined by a distributor or Integrator are not acceptable. Only the originating manufacturer's name and part number shall be listed. Provide separate bill of materials for each panel, MCC, instrument list, etc.

Bill of Material

Item #	Qty	Tag#	Description	Manufacturer	Part #

4. Shop Drawings:
 - a. Equipment elevations with enclosure details drawn to scale or dimensioned with relative scale.
 - b. Electrical One-line, Elementary, and wiring diagrams
 - c. PLC I/O wiring diagrams
5. Catalog Data shall include the following: (features and options shall be highlighted, circled, or "arrowed.")
 - a. Instrumentation data summary sheets (by Contractor)
 - b. Manufacturer's technical information brochure
 - c. Physical size and mounting details and illustrations
 - d. Calibration Range
 - e. Input/output signals
 - f. Electric power, air, and/or water supply requirements.
 - g. Options selected and available (Cross out items not included)
 - h. Materials of construction of components
6. Program Software Documentation
 - a. Programming hardcopy
 - b. Programming disk copy

- D. Shop Drawings - Shop drawings shall be furnished for each electrical panel even if one was not shown explicitly on the Contract drawings. Shop drawings shall be numbered in sequence. Blank drawings or drawings that contain no specific

project data will not be accepted for review.

All drawings shall be generated with a computer utilizing AutoCAD 2000 or newer drafting package. Drawings shall be prepared in a professional manner and shall have borders and a title block identifying the project, manufacturer with address and phone number, system, drawing number, drawing title, AutoCAD file name, project engineer, date, revisions, and type of drawing. Drawings shall be no smaller than 11" x 17" and printed with a laser jet printer or plotted in ink on vellum. The lettering shall be legible and no smaller than 0.075 inch in height. Diagrams shall carry a uniform and coordinated set of wire colors, wire numbers, and terminal block numbers. The shop drawings shall include the following as a minimum:

1. Electrical one-line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the one- or three- line diagram: location, size and amperage rating of bus; size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; power fail and other protective devices; fuse size and type.
2. Detailed analog and digital I/O diagrams showing the wiring requirements for each instrument or device connection. Reference the Contract Drawings for an example of each I/O card drawing requirements. If one is not included in the Contract Drawings, then one may be obtained from the Engineer upon request.
3. Elementary (wiring) diagrams shall be provided for all relay logic, programmable logic controls, motor controls, power supplies, and other wiring. All elementary (wiring) diagrams shall be drawn in JIC EMP/EGP format and standards showing ladder rung numbers and coil and contact cross referencing numbers.
4. Enclosure and Elevation scaled drawings of deadfront, front panel and backpan devices. Show fabrication methods and details; including material of construction, paint color, door latch and lock, and ventilation system. Submit base plan showing allowed conduit entrance areas and bolt hole locations.
5. Submit full size drawing of all nameplates and tags, as specified herein, to be used on project. Submittal to include the following:
 - a. Dimensions of nameplate.
 - b. Exact lettering and font for each nameplate.
 - c. Color of nameplate.
 - d. Color of lettering.
 - e. Materials of construction.
 - f. Method and materials for attachment.
 - g. Drawing showing location of nameplates on each, panel and

enclosure.

1.11 OPERATING AND MAINTENANCE INFORMATION

A. Operational Training

1. At time of completion, the Contractor shall provide a period of not less than 6 hours training for instruction of operation and maintenance personnel in the use of systems. Instruct all personnel at one time in one session. Make necessary arrangements with manufacturer's representative. Provide product literature and application guides for user's reference during instruction.

B. Operations and Maintenance Manuals

1. Provide Operation and Maintenance manuals per specifications as described in "Submittal Requirements" in this section with the following additional requirements:
 - a. A comprehensive index.
 - b. A complete "Record" set of favorably reviewed electrical submittals as provided under subsection "Submittal Requirements" illustrating all components, piping, and electrical connections.
 - c. A complete list of the equipment supplied, including serial numbers, ranges, catalog cuts, and pertinent data.
 - d. Full specifications on each item.
 - e. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts list with stock numbers shall be provided for the components that make up the assembly. All of these shall be originals, no copies.
 - f. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
 - g. PLC & OI applications programming and configurations (as applicable)
2. Submit electronic readable PDF file format (CD disk copies (2) or email attachments) of the proposed O&M manuals for review by the Engineer. Submittals shall be delivered timely to the Engineer to allow for review period, corrections, and re-submissions as necessary.
 - a. General Contractor supervision must not be circumvented by sending submittals direct to Engineer.
 - b. O&M Submittals shall be published 1st electronically and 2nd on

hard copy paper stock.

- c. Electronic Submittals shall be transmitted with the hard copy submittals and be viewable using a PDF reader.
 - d. Electronic submittals shall be assembled in accordance with the specifications for hard copy submittals with table of contents, bookmarks, tabs, subtabs, etc. utilizing the electronic bookmarks feature available in the PDF assembler.
 - e. Electronic (PDF) submittals must follow all applicable requirements for hard copy submittals including indexing, item selection indication, bookmarks, etc.
- 3. Provide four (4) hard copy O&M manuals per specifications as described in SUBMITTALS REQUIREMENTS in this section.
 - a. Deliver approved hard-copy O&M manuals to the project site and Owner prior to pre-operational testing or equipment start-up.
- C. At the end of the project hard copy and soft copy electronic PDF files, shall be updated to "as-built" conditions.
- D. Provide two (2) sets of compact disk (CD) containing all shop drawings, application programs, configurations, calculations, documents or other computer electronic files prepared for this project in native file format and updated to reflect as-built conditions.

PART 2: PRODUCTS

2.01 QUALITY

- A. All equipment and materials shall be new, in current production, and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.
- B. Products specified that have become obsolete (out of current manufacturing, or have been superseded by another product) shall be cross-referenced to a replacement product(s) and provided in lieu of the specified product(s) for no additional cost. Under no conditions, shall products be submitted or furnished that are known (on manufacturer's list of obsolescence) and expected to be removed from current production within 12 months after of project submittal. Products found to have been furnished this way will be removed and replaced at Contractor's expense.
- C. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses which may occur during

fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble free service. Light duty, fragile and competitive grade devices of questionable durability shall not be used.

- D. Products that are specified and include a manufacturer, trade name or catalog number are intended to establish a standard of quality, performance, warranty and service. Products that are specified “or equal” or “or approved equal,” do not prohibit the use of equal products of other manufacturers provided they are submitted, identified and promoted as equal, and favorably reviewed by the Engineer prior to procurement and installation.
- E. Products submitted as “equal” to the named products will be reviewed for conformance with the specifications and in comparison with the first named product. If the equal product meets specifications, but does not have a feature or performance characteristic that is available with the first named product, and that feature or performance is required for this project, then the submitted equal product may be rejected on those grounds.
- F. In the event that some claims of the manufacturer of submitted “equal” product are called into question by the Engineer, the Contractor, may be required to prove those claims either prior to installation or during startup of product. If the product does not meet the claims made or specifications, the product may be rejected by the Engineer and a replacement product must be submitted by the Contractor in its place. All cost for the rejected product, installation, testing, and removal will be the responsibility of the Contractor.
- G. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment. Extra parts, labor, panel space, power supplies, GFIC devices shall be provided as necessary for incorporation of specified non-UL components.
- H. When required by the Contract Specifications or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.

2.02 NAMEPLATES & TAGS

- A. Equipment exterior nameplates - Nameplate material shall be rigid laminated

black plastic with beveled edges and white lettering; except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the nameplate shall be as shown on the drawings. No letters are allowed smaller than 3/16". All nameplates located outdoors shall be UV resistant. Securely fasten nameplates in place using two stainless steel screws type, 316L, if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable. Engrave the nameplates with the inscriptions as approved by the Engineer in the submittal.

1. For each major piece of electrical equipment provide a manufacturer's nameplate showing the Contract specified name and number designation, and pertinent ratings such as voltage, # of phases, ratings, etc.
2. For each device with a specific identity (pushbutton, indicator, instrument, etc.) mounted on the exterior or deadfront of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents.
3. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device.
4. Install Safety Signs in accordance with the latest OSHA requirements.
 - a. Entrances to electrical rooms and stations: Danger Sign requirements, ELECTRICAL ROOM, HIGH VOLTAGE (define voltage, example 480 VAC) KEEP OUT, AUTHORIZED PERSONNEL ONLY.
 - b. Equipment enclosures, cable tray and wireway where 120 VAC or higher and 50 V DC and higher exist: Danger Sign requirements, HIGH VOLTAGE (define voltage, example 480 VAC) AUTHORIZED PERSONNEL ONLY.
 - c. Equipment such as motor control centers, control panels, etc., where more than one source may be present in an enclosure or cubicle: Danger Sign requirements, VOLTAGE (define voltage, example 120 VAC control voltage or 480 VAC power) FROM MULTIPLE SOURCES IN THIS ENCLOSURE.
 - d. Equipment such as switchboards, switchgear, panelboards and motor control centers: Warning Sign requirements, WARNING, SERVICE ENTRANCE DISCONNECT FOR 1 OF ____ (define quantity) SERVICES TO THIS BUILDING. OTHER SERVICE ENTRANCE DISCONNECTS ARE LOCATED AT (define locations).
5. Caution, warning and danger nameplates shall be red with white lettering

- B. Equipment Interior Nameplates - Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering. The size of the nameplate tape shall be no smaller than 1/2" in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device used on the submittal drawings. Stamp the nameplates with the inscriptions as approved by the Engineer in the submittal.
- C. Equipment Tags - When there is no space or it is impractical to attach an engraved plastic nameplate with screws, as is the case with most field devices and instruments, the Contractor shall attach a tag to the equipment with the same inscriptions as specified above in paragraph A. The tag shall be made from stainless steel material and the size of the nameplate shall be no smaller than 3/8"h x 2"w with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. The tag shall be attached to the equipment with stainless steel wire of the type normally used for this purpose.

2.03 FASTENERS

- A. Fasteners for securing equipment to walls, floors, or ceilings, shall be stainless steel. The minimum size fastener shall be 3/8 inch diameter.

2.04 COMPONENTS

A. SWITCHES AND PUSHBUTTONS

1. Switches (HS) and pushbuttons (HC) for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, standard 30 mm diameter, with plastic holding nut.
2. Switches and pushbuttons shall have contacts rated NEMA A600 or 10 amperes continuous and 600 VAC. Provide NO and NC contacts as required.
3. Engraved black legend plates shall be provided to define each switch and pushbutton function.
4. Selector switch handles and pushbutton caps shall be black unless otherwise noted on drawing. Lock-out stop caps shall be red.
5. Selector switches for hand-off-auto (HOA) applications shall have the hand position to the left, off in center, and auto in the right position.

6. Pushbuttons and selector switches in hazardous locations shall have hermetically sealed contacts or explosion proof enclosures.
7. Lockout stop pushbuttons shall include padlocking attachment. Pushbutton type shall be coordinated with padlock attachment type.
8. Switches and pushbuttons shall be Allen-Bradley 800H, or equal.

B. INDICATING LIGHTS

1. Indicating Lights for general purpose applications shall be NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, 30 mm diameter, with plastic lens, plastic holding nut, and miniature bayonet lamp base.
2. Lamp shall be full voltage 120 VAC with 28 chip (min) High Intensity LED.
3. Indicating lights shall have contacts rated NEMA A600 or 10 amperes continuous and 600 VAC. Provide NO and NC contacts as required.
4. Engraved black legend plates shall be provided to define each lights function.
5. Indicating light type and color of lens shall as follows or as otherwise shown on the Contract Drawings:

a.	Open/On	Green
b.	Closed/Off	Red
c.	Alarm	Amber or Blue
d.	Power On	White
6. Indicating lights designated "PTT" on wiring diagram or shown with push-to-test wiring shall be provided with a push-to-test switch and wiring.
7. Indication lights shall be Allen-Bradley 800H, or equal.

C. RELAYS AND TIMERS

1. General: Relays and timers shall be provided with N.O. or N.C. contacts as shown on the Contract drawings. All spare contacts shown shall be provided. Contacts shall be rated 10 amps minimum at 120 VAC, 60 Hz unless otherwise shown on the Contract drawings. Coil voltage shall be 120 VAC unless otherwise described or shown on the Contract drawings. Relays and timers shall be designed for continuous duty. All relays shall be U.L. listed. All relays and sockets shall be the product of a single manufacturer. The following is a summary of abbreviations associated with relays and timers:

CR	– Control relay
TR	– Timing relay
TDOE	– Time delay on energization
TDOD	– Time delay on de-energization
PR	– Power Relay
PFR	– Phase Fail Relay

2. Sockets for plug-in relays and timers shall be standard industrial type din rail mount with barrier type pressure plate screw terminals. Sockets shall be rated 300 VAC, 10 amps minimum.
 - a. Blade 8 or 11 pin for coil voltage above 90 volts AC or DC.
 - b. Octal 8 or 11 pin for coil voltage below 90 volts AC or DC.
3. Control relays (CR) shall be plug-in type with neon indicating lights and clear see-through sealed housing to exclude dust. Provide IDEC Type RR, or approved equal. Two form-C contacts (minimum) shall be provided on each relay.
4. Time delay relays on energization (TR-TDOE) shall be solid state plug-in relays with adjustable timer ranges from 1 second to 10 hours selectable unless other ranges are shown. Provide LED timer energized indicator lamp. Time delay relays shall be IDEC RTE, or equal.
5. Time Delay Relays (TR-TDOD)
 - a. Time delay relays on de-energization (TR-TDOD) (continuous power control input) shall be solid state plug-in relays with a timer adjustable range from 1 second to 10 hours selectable unless other ranges are shown. Provide LED timer energized indicator lamp. Time delay relays shall be IDEC RTE, or equal.
 - b. Time delay relays on de-energization (TR-TDOD) (true off) shall be solid state plug-in relays with a timer adjustable range from 1 second to 10 minutes unless other ranges are shown. True off time delay relays shall be IDEC GT3F-2, or equal.
6. Power relays (PR) shall be plug-in type with test buttons and clear see-through sealed housing to exclude dust. Provide Magnecraft Type 389F, or approved equal. Two form-C contacts rated 25A or 1.5 HP at 240 VAC (minimum) shall be provided on each relay. Furnish compatible blade type relay socket.
7. Phase fail relay (PFR) shall continuously monitor the three phases for power loss, low voltage, phase loss, and phase reversal. The PFR shall interface to the control circuit with SPDT contacts rated for 4 Amps at 120

VAC. The phase fail relay shall have a drop-out voltage adjustment, and status indicating LEDs. Phase fail relay shall be Time Mark 258 with 8 pin octal smart socket and hold down clamp, no equal.

D. CIRCUIT BREAKERS

1. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic (TM) action, except when protecting motor feeders where motor circuit protector (MCP) breakers with adjustable magnetic trip shall be used. Where indicated, provide breakers with ground fault (GFI), Long (L), Short (S) and Instantaneous (I) adjustable trip functions.
2. Circuit breakers shall be the bolt-on type. The use of tandem or dual circuit breakers in a normal single-pole space to provide the number of poles or spaces specified are not acceptable. All multiple-pole circuit breakers shall be designed so that an overload on one pole automatically causes all poles to open.
3. Each 480 volt circuit breaker shall have a minimum interrupting capacity of 42,000 amperes or as otherwise shown in the drawings. Each 120 or 208 or 240 volt breaker shall be rated for a minimum 10,000 amperes interrupting capacity. Breakers shall be sized as shown on Drawings and as necessary for the supplied equipment.
4. Circuit breakers and motor circuit protectors shall be manufactured by Cutler-Hammer, Square D, G.E., ITE, or equal.

E. CONTROL POWER TRANSFORMER

1. Control power transformer shall be epoxy encapsulated for dust and moisture protection. The internal wiring shall be copper and have 105 deg. C insulation rating. The unit shall feature barriered screw terminals for connection to electrical circuits. Provide with time-delay, slow-blow secondary fuse rated to protect the transformer and interrupt 10,000 amperes at 120VAC. Two primary fuses rated for 480 VAC and AIC as shown in the drawings shall be provided. Transformer minimum size and voltage ratings shall be as shown on Contract drawings. Control power transformer shall be Micron Impervitran, Cutler Hammer MTE or equal.

F. MOTOR STARTER

1. Motor starters shall be NEMA rated of size shown on the Drawings. Coil voltage shall be 120 volts AC or as shown otherwise in elementary drawings. Provide auxiliary contacts as required per the elementary diagrams and/or as shown in the P&IDs. Motor starters shall include contactor and overload relay as a package unit or as separate pieces to

accommodate for special switching requirements. Motor starters shall be Cutler Hammer Freedom, Square D, GE or equal.

G. MOTOR OVERLOAD

1. External motor overload protection shall be required per drawings. External overload shall use bimetallic heating strips and provide +/-15% adjustment for full load amperage. Provide Cutler Hammer Freedom or equal.

2.05 DEVICES

A. DISCONNECT SWITCH

1. Disconnect Switch shall be heavy duty, horsepower rated, three pole, single throw, fusible/non-fusible with quick make/break operating mechanism. The enclosure shall be 316 stainless steel and rated NEMA 4X. The enclosed switch shall be rated for 480 Volt, and 10HP (minimum) unless otherwise shown on the drawings. Provide fuses, auxiliary contacts, or indicators as required by the motor control or one-line diagram. The operator shall actuate the switch side mounted handle and have provisions for up to 3 padlocks. Disconnect switch shall be Cutler Hammer DH series, Square D or equal.

PART 3: EXECUTION

3.01 CONSTRUCTION METHODS

- A. Equipment shall be assembled and wired by the manufacturer prior to shipment. Field modifications or changes are not allowed without a written "change order" to the Contract. Field changes, however large or small, shall be executed using the components, materials, wiring, labeling, and assembly methods identical to that of the original supplied equipment.
- B. Electrical plugs, receptacles, cords, and connectors required to power or interface the equipment and panels shall be furnished and installed by the Contractor.
- C. Factory as-built drawings for each custom manufactured control panel or MCC shall be shipped with the equipment and placed inside in waterproof envelopes.

3.02 EQUIPMENT FABRICATION

- A. All electrical equipment, including custom manufactured equipment, shall meet the requirements of Underwriters Laboratories (UL) and bear the appropriate label. Panels shall be affixed with UL label prior to shipment and be built in accordance with the UL guidelines and procedure that corresponds to the UL label. Custom control equipment shall bear a UL-508 label, minimum, with additional UL labels as required per intended service.

- B. Panel cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device.
- C. Equipment doors shall swing freely and close and latch with proper alignment.
- D. Component within the electrical equipment shall be securely mounted on an interior subpanel or backpan and arranged for easy servicing. Mounting bolts and screws shall be front mounted for device removal without special tools or removal of entire mounting panel.
- E. A ground bus shall be provided in each enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250-95, whichever is larger.
- F. Bolts and screws for mounting devices on doors shall have a flush head which blends into the device or door surface. No fastening devices shall project through the outer surfaces of equipment.

3.03 WORKMANSHIP

- A. All work in this division shall conform to the codes and standards outlined herein.
- B. Installation shall be performed by qualified personnel providing first class workmanship per Electrical Specifications [Electrical General, Qualifications].
- C. Maintain equipment installed (or to be installed) in new condition. Protect equipment from damage while in Contractor care from dust, water, or mishaps that are typical to construction sites
- D. Confirm that equipment and materials are correct for their intended duty and will be installed per manufacturer guidelines. Equipment and components found to be installed inconsistent with manufacturer guidelines and/or these specifications will not be acceptable and subject to removal and replacement.
- E. Upon completion of daily work, remove excess materials, scraps, and debris from the work area and from the inside of equipment.
- F. Upon notification, stop work on any portion of the installation that is determined to be non-compliant with contract or being installed by unqualified personnel.
- G. Perform all work to correct improper installations at Contractor expense.
- H. Equipment furnished under this contract or provided to Contractor for installation shall be installed in accordance with manufacturer's instructions, installation

calculations, and contract documents.

3.04 EQUIPMENT SHIPMENT AND STORAGE

- A. Shipment -- Any equipment whose destination (jobsite) is more than 25 miles from the factory shall be carefully protected for shipping. All openings shall be protected by plywood securely fastened to the framework of the equipment. Equipment shall be adequately covered during local delivery.
- B. Storage -- From the time of receipt until the equipment is installed and energized, the equipment shall be considered in storage. While in storage, a 120V, 1 phase source of power shall be made available and connected to space heaters in all items of equipment so equipped. Equipment not provided with space heaters shall be provided with a light bulb or electric heater while in storage to prevent moisture condensation. Unless stored indoors, it shall be at least 1 foot above grade covered with at least 2 layers of heavy polyethylene plastic sheets and anchored to prevent damage by high winds. All equipment shall be protected from dust and moisture prior to and during construction.

3.05 DAMAGED PRODUCTS

- A. Damaged products that cannot be repaired to new condition shall be replaced with new products. All equipment and materials shall be in like-new condition at start-up and commissioning.
- B. Minor cosmetic damage shall be repaired by spray painting, after properly preparing the surface, all scratches or defects in the finish of the equipment. Only identical paint furnished by the equipment manufacturer shall be used for such purposes.

3.06 INSTALLATION

- A. General
 - 1. Install all products per manufacturer's recommendations and the Drawings.
 - 2. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections.
 - 3. Protect wiring insulation from wear by installing rubber cushions, bushings, or strip insulation, or by fastening the wiring to a rigid surface with zip ties and anchors.
 - 4. Provide additional devices, wiring, conduits, relays, signal converters, isolators to complete interfaces of the electrical and instrumentation system.

5. Changing normally open contacts to normally closed contacts or vice versa
6. Adding additional relays to provide more contacts as necessary.
7. All programmable devices (not specifically excluded herein) shall be programmed, set-up and tested by the Contractor prior to startup. Programming and set-up parameters shall be adjusted or changed as directed by the Engineer during start-up and throughout the warranty period.
8. Coordinate with the Engineer and setup all alarm, process, and operation setpoints.
9. Keep a copy of the manufacturer's installation instructions on the jobsite available for review at all times prior to and during the installation of the associated equipment.

B. Panels and enclosures:

1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.
2. Install level and plumb.
3. Seal all enclosure openings to prevent entrance of insects and rodents.
4. Clearance about electrical equipment shall meet the minimum requirements of NEC 110.26

C. Conduits and Ducts:

1. Install all conduits and ducts per Electrical Specifications [Conduit, Boxes & Grounding].
2. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC tables 312-6 (a) & (b).

D. Wiring, Grounding, and Shielding:

1. Observe proper grounding and shielding practices as this application environment is generally noisy. The shield of shielded cables shall be terminated to ground at one end only, the origination end. The shield at the other end shall be encased in an insulated material to isolate it from ground.

E. Cutting and Patching:

1. The Contractor shall do all cutting and patching required for installing his

work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching.

F. Cleaning and Touch up:

1. At the completion of the work, all parts of the installation, including all equipment, exposed conduit, and fittings, shall be thoroughly cleaned of grease and metal cuttings. Any discoloration or other damage to parts of the building, the finish, or the furnishings, due to the Contractor's failure to properly clean the system, shall be repaired by the Contractor.
2. The Contractor shall thoroughly clean any of his exposed work requiring same.
3. Vacuum and clean the inside of all electrical and instrumentation enclosures prior to applying power.
4. The Contractor shall paint scratched or blemished surfaces with the necessary coats of quick drying paint to match existing color, texture and thickness. This shall include all prime painted electrical equipment including but not limited to enclosures, poles, boxes, devices etc.

3.07 INITIAL APPLICATION OF POWER

- A. The Engineer will direct the energization and de-energization of all existing and new equipment. The Contractor is not authorized to energize or de-energize any equipment unless he has been given written permission to do so or while in the presence of the Engineer.
1. Any equipment that is under repair, demolition or installation shall be locked off and tagged out of service with Contractor supplied padlocks and tags.
- B. The Contractor is responsible for grounding of high and medium voltage cabling and/or bus during installation and removal of equipment. The contractor is responsible for complying with all California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA) safety requirements and procedures while working in or near medium voltage equipment.

3.08 TESTING

- A. The Contractor shall test the panel in the presence of the Engineer. The Engineer will expect to see all functions possible on the day(s) of the test. Functions that are not capable of actual testing, will be required to be simulated.
- B. Test equipment required to perform testing shall be provided by Contractor.

- C. Coordinate testing days with Construction manager to allow for scheduling with Electrical Engineer representatives. Minimum 1 week advance notice.

3.09 WARRANTY

- A. The Contractor shall warrant all electrical and instrumentation equipment & software for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

3.10 FINAL ACCEPTANCE

- A. Final acceptance will be given by the Engineer after the equipment has passed the "final acceptance trial period", each deficiency has been corrected, final documentation has been provided, and all the requirements of design documents have been fulfilled.
- B. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Contractor shall provide the following:
 - 1. Each "operation and maintenance" manual shall be modified or supplemented to reflect all field changes and as-built conditions.
 - 2. Two (2) disk copies of all final documentation to reflect as-built conditions.
- C. Keys: Submit two sets of all keys for locks supplied on this project. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.

END OF SECTION

SECTION 16110

CONDUIT, BOXES AND GROUNDING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Labor, materials, equipment, tools, safety gear, test equipment, incidentals, services, and transportation for a complete electro-mechanical installation as shown on the Drawings, included in these Specifications, or as can be reasonably implied from project descriptions.
- B. The scope of work includes:
 - 1. Furnish and install conduits, junction boxes, pull boxes, and associated hardware. Provide hardware, conduit, fittings, and other parts for a complete raceway installation.
 - 2. Furnish and install grounding system required by drawings, or if not shown or defined, as required by Article 250 of the NEC.
 - 3. Installations shall be designed and installed with components meeting the NEMA area designation.
- C. Work includes that specified in Electrical Specifications [Electrical General].

1.02 REFERENCES

- A. Electrical Specifications [Electrical General]
- B. Electrical Specifications [Wire, Fuses, and Terminal Blocks]
- C. Project Drawings

1.03 QUALIFICATIONS

- A. Material furnished under this specification shall be installed by qualified installers meeting requirements specified in Electrical Specifications [Electrical General, Qualifications].

1.04 SUBMITTAL REQUIREMENTS

- A. Provide submittals and drawings as specified in Electrical Specifications [Electrical General, Submittal Requirements].

PART 2: PRODUCTS

2.01 CONDUIT, RACEWAYS AND WIREWAYS

A. GENERAL - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications.

1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this Section.
 - a. Exposed conduit material (not underground and beyond transition) shall be per the following table unless otherwise noted in the drawings. Condulets, elbows, fittings, device boxes, and hardware shall be of the same material and finish.

<u>Location</u>	<u>Material</u>
Indoors NEMA 12	Galvanized rigid steel (GRS)
Outdoors NEMA 3R	Galvanized rigid steel (GRS)
Outdoors NEMA 4	PVC-Coated Steel (GRS-PVC)
Indoor or outdoor corrosive (chemical or gas) areas NEMA4X	PVC-Coated Steel (GRS-PVC)
Indoor or outdoor hazardous areas Class 1 Div 1 or 2	PVC-Coated Steel (GRS-PVC)

- b. Conduit transitions shall be GRS-PVC for 6" on either side of the transition point (minimum) or as shown in drawing details. Conduit transition is defined as conduit sections through concrete or earth in the area from below to above grade or through walls or vaults.
3. The minimum size conduit shall be 3/4-inch unless indicated otherwise on the Drawings or for special connections to equipment.
4. Conduit stubs for future use shall be capped with coupling and plug. Identify each end with conduit labels.
5. Existing conduits to be abandoned that protrude above graded shall be cut flush and filled with grout.

6. Conduit Tags

- a. All conduits listed in the "Conduit and Wire Routing Schedule" shall have conduit tags at both ends of each conduit run with tag number from schedule identified. This shall include ends within underground pull boxes.
- b. All conduits shall have temporary tags during construction. Temporary tags may be made from duct tape with hand written ink marking or suitable equivalent. Temporary tags shall be removed by Contractor at time of installation of permanent tags.
- c. Tag material shall be rigid laminated red plastic with white lettering. The size of the tag shall be ¼" thick by ¾" round or ¾" x 1" rectangle minimum.
- d. Letter height shall be ¼" minimum. Engrave the tags with the conduit number or acronym. Labeling shall be neatly installed for visibility and shall be clearly legible. Securely fasten tags in place using 20ga stainless steel tie wire through a pilot hole on the tag.
- e. Conduit tags shall be Custom manufactured per specification.

7. Supports

- a. Cross section of a single channel shall be 1-5/8" x 1-5/8" and cross-section of a double channel shall be 1-5/8" x 3-1/4". The channel wall thickness shall be 12 gauge as applicable.
- b. One-Hole clamps shall be intended for pipe mounting on support channels and equipped with clamp-backs. The clamps shall be Efcor, Thomas and Betts, Appleton or equal
- c. Spacers, provided to support underground conduits in concrete encasements, shall be plastic. The spacers shall be Carlon, Johns-Manville, Underground Products or equal
- d. Anchors shall be expansion type for securing equipment to concrete foundations, floors and walls. Anchors shall have length identification mark on the exposed end of the bolt. Provide Hilti Kwik Bolt 3, or equal.
- e. Stanchions shall be as shown on the drawings. If a detail is not provided, then the stanchions shall be shop fabricated and welded 4" c-channel, 12" x 12" x ¼" steel base plate, coated with a rust inhibiting primer and top coat of gray polyurethane gloss paint. Attach equipment to the stanchion direct or on a ¼" aluminum sheet sized for the equipment supported.

- f. Conduit Hangers shall be trapeze construction, with double channel, 3/8-inch rods and nuts. Suspend from suitable structural support.
- g. Support material and finish shall be per the following table unless otherwise noted in the drawings. Brackets, fittings and hardware shall be of the same material and finish.

<u>Location</u>	<u>Material</u>
Indoors NEMA 12	Galvanized steel
Outdoors NEMA 3R	Galvanized steel
Corrosive areas NEMA4X	PVC bonded, 40 mil, factory applied

- h. Channels shall be used for mounting equipment to walls and for supporting conduit runs. Double channel type shall be used for fabricating equipment mounting racks as required and as detailed on the drawings. All field cut surfaces of the channels shall be covered with matching zinc paint or PVC to match adjacent surface.

B. GALVANIZED RIGID STEEL CONDUIT - (GRS)

1. Manufactured from high-strength steel and hot dipped zinc galvanized inside and out. Conduit and fittings shall meet UL 514B, UL 6, and conform to NEMA RN 2. Conduit shall be capable of being used as an equipment grounding conductor per NEC 250.
2. Provide galvanized rigid steel factory sweeps and elbows for 90 degree transitions.
3. Cast fittings and device boxes shall be malleable iron or aluminum. Appleton type FS/FD or equal.
4. In hazardous locations, fittings shall meet and be listed UL 886.
5. All fittings, hubs, couplings, pulling elbows and connectors shall be threaded-type. Set-screw type and compression-type are not acceptable. All thread conduit is not allowed over 1/2" exposed length. Cover plates shall be cast iron with sealing gasket in NEMA 3R locations.
6. Pipe threads shall be treated with T & B "Kopr-Shield".
7. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

C. GALVANIZED RIGID STEEL CONDUIT - PVC COATED (GRS-PVC)

1. Galvanized Rigid Steel conduit with a 40-mil thick polyvinylchloride exterior coating and a 2-mil urethane interior coating meeting NEMA RN-1, UL-6 and ETL PVC-001. The bond of the PVC to the zinc coated pipe must be stronger than the tensile strength of the PVC.
2. Provide PVC coated galvanized rigid steel factory sweeps and elbows for 90 degree transitions.
3. Cast fittings and device boxes shall be malleable iron or aluminum with a 40 mils thick PVC coating. Calbond, Robroy type FS/FD or equal.
4. In hazardous locations, fittings shall meet and be listed UL 886.
5. Provide PVC coated threaded-type fittings, hubs, pulling elbows, couplings, and connectors; set-screw type and compression-type are not acceptable. Form 8 conduit fittings, ½" through 4", must have a tongue-in-groove gasket to effectively seal out the corrosive elements. Covers shall be supplied with plastic encapsulated stainless steel cover screws.
6. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit. Pipe threads shall be treated with conduit interior urethane touch up compound.
7. All junction and metal pull boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness.
8. Unistrut, strut clamps, pipe straps, and clamp back spacers, shall have 40 mil thick PVC coating. All mounting anchors shall be stainless steel.
9. Conduits entering enclosures shall be fitted with insulated grounding bushing; OZ/Gedney "HBLG " or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
10. GRS-PVC conduit to be Calbond, Robroy Plasti-bond, or equal.

D. PVC CONDUIT, SCHEDULE 40 or 80 (PVC-40, PVC-80)

1. Shall be high impact schedule 40 or 80 polyvinylchloride suitable for use underground, direct burial and for use with 90 C wires, and shall conform to UL 651. Shall be UL listed and labeled for "direct" burial.
2. A copper bonding conductor shall be pulled in each raceway and bonded to equipment at each end with approved lugs.

3. Each underground run shall be placed in a trench with a five (5) inch sand bed evenly compacted on all sides, top and bottom unless otherwise noted.
4. Elbows, and risers shall be per exposed conduit transition detail. PVC conduit is not allowed above ground except where specifically called out on the drawings.
5. PVC fittings shall have solvent-weld-type conduit connections. Fittings and device boxes shall be PVC with factory fabricated conduit connections. Provide Carlon or equal.
6. Conduits entering enclosures shall be fitted with a glued male adapter, lock ring and bushing to prevent wire chafing. Conduits entering panels through concrete to an open bottom or entering a pull box shall have a glued end bell fitting.
7. PVC conduit shall be stored on a flat surface and shielded from the sun.

E. LIQUID TIGHT FLEXIBLE NON-METALLIC CONDUIT (up to 2") - (FLEX)

1. Liquid tight flexible Nonmetallic Conduit shall be constructed of flexible PVC and have a smooth inner surface with integral crush resistant reinforcement within the conduit and be designated as a Type LFNC-B (for FNMC-B).
2. Liquid tight Flexible Nonmetallic Conduit shall be sunlight, oil, and flame resistant and approved for the installation of electrical conductors in indoor and outdoor applications.
3. Liquid tight Flexible Nonmetallic Conduit shall be listed to UL standard UL1660.
4. Liquid tight flexible non-metallic conduit shall be installed in accordance with Article 351, Part B of the National Electrical Code (NEC) and other applicable sections of the NEC and/or local electrical codes.
5. Liquid tight Fittings shall be listed for the use with Liquid tight Flexible Nonmetallic Conduit and shall be marked LFNC-B (FNMC-B).
6. Flexible Non-Metallic Conduit shall be Carlon Carflex or equal.

F. LIQUID TIGHT FLEXIBLE METAL CONDUIT (above 2-1/2") - (FLEX)

1. Liquid Tight Flexible Metal conduit shall be moisture and oil-proof with PVC jacket extruded over a galvanized flexible steel conduit.
2. Liquid tight Flexible Metallic Conduit shall be sunlight, oil, and flame resistant and approved for the installation of electrical conductors in

indoor and outdoor applications.

3. Liquid tight Flexible Nonmetallic Conduit shall be listed to UL standard UL 360.
4. Liquid tight flexible metallic conduit shall be installed in accordance with Article 351, Part B of the National Electrical Code (NEC) and other applicable sections of the NEC and/or local electrical codes.
5. Liquid tight Fittings shall be listed for the use with Liquid tight Flexible Metallic Conduit and conform to UL514B.
 - a. Outdoors when extension of GRS-PVC: PVC coated galvanized steel with insulated bushings.
 - b. Outdoors when extension of GRS: Galvanized steel with insulated bushings.
 - c. Indoors or outdoors when extension of stainless steel: 316 stainless steel with sealing ring and insulated bushing.
 - d. Indoors: Galvanized steel with insulated bushings.
6. Flexible Metallic Conduit shall be Amer-Tite type GP or equal.

2.02 DEVICE BOXES

A. BOXES

1. Device boxes shall be of zinc-galvanized malleable iron or cast aluminum with shape and size best suited for the particular application, rated for the location installed, and shall be supported directly to structure by means of screws, anchors, or bolts.
2. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC articles 314 requirements.
3. Boxes exposed to the weather or in moist locations shall be weatherproof (WP) by means of gasketing under a weatherproof cover.
4. Boxes connected to GRS-PVC conduit runs shall be PVC coated with 40 mil coating.

2.03 PULL BOXES

A. JUNCTION BOXES

1. Where required for best installation or where specifically called out in the drawings, junction boxes shall have JIC type construction with hinged

door, NEMA 4X rating, manufactured of type 304 stainless steel or as otherwise shown. Door shall be fastened with clamps and stainless steel screws. No devices, screws, rivets, or bolts shall protrude through the exterior surface unless specifically shown on the drawings. Boxes shall be Hoffman, Circle AW, or equal.

B. UNDERGROUND BOXES

1. Underground pull boxes shall be prefabricated concrete with “Christy Box” size and type or equivalent or dimensioned on the Drawings. Provide larger boxes as determined in field to allow for adequate pull area at Contractor discretion. Extension sections shall be provided as necessary to reach the depth of underground conduits with maximum depth of 48”. All boxes shall have galvanized steel hold down bolts and hardware. Boxes located in paved areas or other areas which vehicles may travel shall be H/20 loading rated and have traffic covers. Steel covers or lids shall be galvanized and grounded with bonding jumper to the local grounding circuit per NEC. Pull box covers shall be labeled electrical, signal, utility, and telephone, whichever applies. Pull boxes shall be Christy Concrete Products, Brooks or equal.

PART 3: EXECUTION

3.01 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in specified in Electrical Specifications [Electrical General, Workmanship].

3.02 INSTALLATION

A. System:

1. Install all products per Electrical Specifications [Electrical General, Installation].

B. Rigid Conduits and Ducts:

1. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.
2. Except as expressly indicated or approved, all conduits shall be surface mount on block walls, concealed behind gypsum walls, and buried to required depth below floor slabs.
3. Installation of the GRS-PVC conduits must be in accordance with the manufacturer’s installation procedures using recommended tools. To ensure compliance, the installer(s) must be “manufacturer certified” before installation can proceed. Certification available by contacting

manufacturer's representative and attending a brief instructional course. Certification shall be available for review.

4. Repair GRS-PVC utilizing a patching compound or system as provided by the manufacturer of the conduit of the same material as the coating. The entire conduit shall be replaced if the repair exceeds 3" combined length.
5. A maximum of three equivalent 90 degree elbows are allowed in any continuous run. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.
6. Route all above grade conduits parallel or perpendicular to structure lines and/or piping. Conduits installed above grade shall be braced in place with stanchions. Expansion joints shall be installed every 100 feet. Bends shall be concentric.
7. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Process Pipe, mechanical and HVAC shall have precedence over conduits for routing and space requirements.
8. Seal each bottom entrance conduit into the MCC and other electrical enclosures with plugging compound sealant to prevent the entrance of gasses, insects and rodents. Plugging compound sealant shall be Gardner Bender Duct Seal or equal.
9. Exposed conduit stubs for future use shall be capped with coupling and plugged. Drill hole in plug for pull rope as necessary.
10. Explosion proof seal-off fittings shall be provided on all conduits that enter or leave hazardous areas per requirements of the National Electrical Code, Chapter 5 and UL 886. The seal-off fitting shall prevent hazardous gases and/or flames from passing from one type area to another through the conduit system. Ceramic or other non-asbestos fiber material and sealing compound shall be placed in the fitting to complete the seal.
11. Hazardous location conduit outlet boxes shall be used in hazardous locations for change in direction, access to conductors and as pull and splice boxes.
12. All spare conduits shall have 1/8" nylon pull ropes installed.

C. Flexible Conduit and Cords

1. Final connections to vibrating equipment such as motors, heaters and fans shall be made with liquid tight flexible conduit.

2. Flexible conduit lengths shall not be greater than 36 inches for sizes up to 2 ½” and 48 inches for 3” and larger conduit.
3. Flexible conduit shall include a ground conductor for equipment bonding in circuits over 30 VDC or as shown in the conduit schedule.
4. Flexible conduit shall only be installed in exposed or accessible locations.
5. Where equipment is cord connected, submersible rated, and conduit connections are not possible without modification, devices and equipment may be free-air cord connected in lieu of flexible conduit. Connection to adjacent rigid conduit shall be through liquid-tight cord connector fitting specifically designed for the purpose and sized appropriately for the cord. Cord connectors shall be rated similar to the adjacent conduit they are connected to: Stainless steel, galvanized or plastic.

D. Excavation and Back Filling:

1. Trenches for conduit below floor slabs and other underground electrical conduit shall be excavated to the required depths per utility requirements or specific detail. Conduits under floor slabs shall have minimum trench depth to contain bends without any portion of the radius visible at finished grade.
2. Underground conduits outside of structures, excluding utility conduits, shall have a minimum cover of 24 inches except under roadways where minimum cover shall be 30 inches or as otherwise shown in the Contract Drawings. Back filling shall be done only after conduits have been inspected. Excavation and back fill of conduits shall conform to the requirements of other applicable Specifications sections unless modified on plans, and to other entities (Utilities, etc.) as required.
3. Install spacers to support underground conduits. Horizontal and vertical separation shall be maintained by plastic spacers set every four feet. Spacers shall be Carlon Snap-Loc or equal.
4. At all times during the installation of the electrical system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.

E. Underground pullboxes:

1. Pullboxes shall be located in areas that will experience the least traffic loading and in the general vicinity as shown in the contract drawings. Boxes in pavement shall be set at final grade and boxes in planter areas shall be set 1” above final grade. Boxes shall not be buried by landscape material.

2. Steel pull box lids shall be grounded per NEC 250.4(A)(5) and 314.4.
3. Boxes shall be set on compacted base and base rock to minimize settling of the box over time. If the box is located in a paved traffic area, a 6" x 6" concrete ring shall be poured around the box below the pavement.

F. Cutting and Patching:

1. The Contractor shall do all cutting and patching required to install his work. Any cutting which may impair the structure will require prior approval. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching.

3.03 WARRANTY

- A. Provide warranty as specified in Electrical Specifications [Electrical General, Warranty].

END OF SECTION

SECTION 16110

CONDUIT, BOXES AND GROUNDING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Labor, materials, equipment, tools, safety gear, test equipment, incidentals, services, and transportation for a complete electro-mechanical installation as shown on the Drawings, included in these Specifications, or as can be reasonably implied from project descriptions.
- B. The scope of work includes:
 - 1. Furnish and install conduits, junction boxes, pull boxes, and associated hardware. Provide hardware, conduit, fittings, and other parts for a complete raceway installation.
 - 2. Furnish and install grounding system required by drawings, or if not shown or defined, as required by Article 250 of the NEC.
 - 3. Installations shall be designed and installed with components meeting the NEMA area designation.
- C. Work includes that specified in Electrical Specifications [Electrical General].

1.02 REFERENCES

- A. Electrical Specifications [Electrical General]
- B. Electrical Specifications [Wire, Fuses, and Terminal Blocks]
- C. Project Drawings

1.03 QUALIFICATIONS

- A. Material furnished under this specification shall be installed by qualified installers meeting requirements specified in Electrical Specifications [Electrical General, Qualifications].

1.04 SUBMITTAL REQUIREMENTS

- A. Provide submittals and drawings as specified in Electrical Specifications [Electrical General, Submittal Requirements].

PART 2: PRODUCTS

2.01 CONDUIT, RACEWAYS AND WIREWAYS

A. GENERAL - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications.

1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this Section.
 - a. Exposed conduit material (not underground and beyond transition) shall be per the following table unless otherwise noted in the drawings. Condulets, elbows, fittings, device boxes, and hardware shall be of the same material and finish.

<u>Location</u>	<u>Material</u>
Indoors NEMA 12	Galvanized rigid steel (GRS)
Outdoors NEMA 3R	Galvanized rigid steel (GRS)
Outdoors NEMA 4	PVC-Coated Steel (GRS-PVC)
Indoor or outdoor corrosive (chemical or gas) areas NEMA4X	PVC-Coated Steel (GRS-PVC)
Indoor or outdoor hazardous areas Class 1 Div 1 or 2	PVC-Coated Steel (GRS-PVC)

- b. Conduit transitions shall be GRS-PVC for 6" on either side of the transition point (minimum) or as shown in drawing details. Conduit transition is defined as conduit sections through concrete or earth in the area from below to above grade or through walls or vaults.
3. The minimum size conduit shall be 3/4-inch unless indicated otherwise on the Drawings or for special connections to equipment.
4. Conduit stubs for future use shall be capped with coupling and plug. Identify each end with conduit labels.
5. Existing conduits to be abandoned that protrude above graded shall be cut flush and filled with grout.

6. Conduit Tags

- a. All conduits listed in the "Conduit and Wire Routing Schedule" shall have conduit tags at both ends of each conduit run with tag number from schedule identified. This shall include ends within underground pull boxes.
- b. All conduits shall have temporary tags during construction. Temporary tags may be made from duct tape with hand written ink marking or suitable equivalent. Temporary tags shall be removed by Contractor at time of installation of permanent tags.
- c. Tag material shall be rigid laminated red plastic with white lettering. The size of the tag shall be ¼" thick by ¾" round or ¾" x 1" rectangle minimum.
- d. Letter height shall be ¼" minimum. Engrave the tags with the conduit number or acronym. Labeling shall be neatly installed for visibility and shall be clearly legible. Securely fasten tags in place using 20ga stainless steel tie wire through a pilot hole on the tag.
- e. Conduit tags shall be Custom manufactured per specification.

7. Supports

- a. Cross section of a single channel shall be 1-5/8" x 1-5/8" and cross-section of a double channel shall be 1-5/8" x 3-1/4". The channel wall thickness shall be 12 gauge as applicable.
- b. One-Hole clamps shall be intended for pipe mounting on support channels and equipped with clamp-backs. The clamps shall be Efcor, Thomas and Betts, Appleton or equal
- c. Spacers, provided to support underground conduits in concrete encasements, shall be plastic. The spacers shall be Carlon, Johns-Manville, Underground Products or equal
- d. Anchors shall be expansion type for securing equipment to concrete foundations, floors and walls. Anchors shall have length identification mark on the exposed end of the bolt. Provide Hilti Kwik Bolt 3, or equal.
- e. Stanchions shall be as shown on the drawings. If a detail is not provided, then the stanchions shall be shop fabricated and welded 4" c-channel, 12" x 12" x ¼" steel base plate, coated with a rust inhibiting primer and top coat of gray polyurethane gloss paint. Attach equipment to the stanchion direct or on a ¼" aluminum sheet sized for the equipment supported.

- f. Conduit Hangers shall be trapeze construction, with double channel, 3/8-inch rods and nuts. Suspend from suitable structural support.
- g. Support material and finish shall be per the following table unless otherwise noted in the drawings. Brackets, fittings and hardware shall be of the same material and finish.

<u>Location</u>	<u>Material</u>
Indoors NEMA 12	Galvanized steel
Outdoors NEMA 3R	Galvanized steel
Corrosive areas NEMA4X	PVC bonded, 40 mil, factory applied

- h. Channels shall be used for mounting equipment to walls and for supporting conduit runs. Double channel type shall be used for fabricating equipment mounting racks as required and as detailed on the drawings. All field cut surfaces of the channels shall be covered with matching zinc paint or PVC to match adjacent surface.

B. GALVANIZED RIGID STEEL CONDUIT - (GRS)

1. Manufactured from high-strength steel and hot dipped zinc galvanized inside and out. Conduit and fittings shall meet UL 514B, UL 6, and conform to NEMA RN 2. Conduit shall be capable of being used as an equipment grounding conductor per NEC 250.
2. Provide galvanized rigid steel factory sweeps and elbows for 90 degree transitions.
3. Cast fittings and device boxes shall be malleable iron or aluminum. Appleton type FS/FD or equal.
4. In hazardous locations, fittings shall meet and be listed UL 886.
5. All fittings, hubs, couplings, pulling elbows and connectors shall be threaded-type. Set-screw type and compression-type are not acceptable. All thread conduit is not allowed over 1/2" exposed length. Cover plates shall be cast iron with sealing gasket in NEMA 3R locations.
6. Pipe threads shall be treated with T & B "Kopr-Shield".
7. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

twisted pair #18 conductors with drain wire. Multiple twisted shielded pair (T.S.PR.) cables shall be Belden 9773 thru 9777, or equal.

- d. Multi-pair cable is not allowed (unless specifically called out in conduit schedule or on plans) for use in field or non-field applications. One T.S.PR cable is required for each signal.

6. Manufacturer Supplied Cables

- a. Cables and wiring for special systems provided by the manufacturer with the equipment shall be installed per the manufacturer's recommendations.

C. COLOR CODE

1. All wires #8 and below shall have wire insulation the color specified. Wires #6 and larger may be black with color electrical tape at termination points.
2. No other colors shall be used without prior approval.
3. Color code - color code of all wire shall conform with the following table:

WIRES COLOR CODE TABLE

Description	Phase/Code Letter	Field wire or tape color	Non-Field Wire Color
480V, 3 Ph	A	Brown	Brown
	B	Orange	Orange
	C	Yellow	Yellow
	Neutral	Gray	Gray
240V or 208V, 3 Ph	A	Black	-
	B	Red (Orange if high leg)	-
	C	Blue	-
240 / 120 V, 1 Ph	L1	Black	Black
	L2	Red	-
24V Positive	24+	Pink	Pink
24V Negative	24-	Black	Black
12V Positive	12+	Pink	Pink/white
12V Negative	12-	Black	Black/white
AC Control		Violet	Red (Yellow for foreign circuits)
DC Control		Blue	Blue
Neutral	N	White	White

Ground	G	Green	Green
Shielded Pair	+	Clear (White)	Red
	-	Black	Black

2.02 WIRE MARKING

A. All panel, enclosure and field wiring shall have wire labels on both ends of each wire. Labeling shall be neatly installed for visibility and shall be clearly legible. Each conductor of instrument shielded signal wiring shall be labeled. Wire labels shall be machine printed with on white heat shrinkable tubing. Each label shall fit a minimum 23 characters, 3/16" in height before shrink. Tubing shall be oversized for the wire and shrunk into place using an electric heat gun. The "shrunk" label shall have just enough give to allow the label to be rotated. Hand lettered wire labels are not acceptable and shall be replaced at the Contractor's expense. Provide Brady "PermaSleeve" or equal.

1. **Node Style Wire Identification** - All wires that are electrically the same (connected to common termination points) and do not pass through a contact or other switching device shall have the same wire identification. The wire labeling code for each end of the same wire shall be identical.
 - a. The wire identification code for **internal panel** wiring shall be the number/letter as designated on the Contract elementary and/or approved shop drawings.
 - b. Wire labeling for **field** wiring shall contain the panel/equipment name as a prefix and the termination point name. (I.E. PLC50-A103 or P10-124). The hierarchy of label names is 1) PLC panel name, 2) MCC equipment name, and 3) Equipment name. Therefore, wires from PLC50 to the MCC50 P10 cubicle will be labeled PLC50-XXX. Wires from MCC50 P10 to field pressure switch PSH10 will be labeled P10-XXX.
 - c. Wire labels shall be exactly per interconnection submittal -- abbreviations determined in the field are not allowed. Abbreviations may be used in the wire label as submitted and approved in the interconnection drawings submittal.
 - d. Wire labels for lighting and receptacle circuits shall consist of the panel board and circuit number and a unique node number. (I.E. LP#3-A, LP#3-B, LP#3-N)
 - e. Wire labels may be omitted on "neutral jumpers" less than 8" in length.

2.03 FUSES AND FUSE HOLDER

- A. Fuses shall not be used in branch or control circuits unless specifically shown in the drawings. Circuit breakers shall be furnished and utilized where possible.
- B. Fuses used in circuits 200 VAC and above shall be time- delay, 13/32" x 1-1/2", and have an interrupting rating of 10,000 AIC at 500 VAC. Fuses shall be Bussman type FNQ or approved equal. Fuse holders shall be of the barrier type with fuse puller and rated 30A at 600 VAC. Fuse holders shall be Connectron NDNF1 with PF1 fuse puller or equal.
- C. Fuses used in 120 VAC shall be time-delay, 1/4" x 1-1/4", and have a rating of 250 VAC. Fuses shall be Bussman type MDA or approved equal. Fuse-holders shall be of the same manufacturer, series and color as the adjacent terminal blocks and have blown fuse neon indicators. Fuse holders shall be Entrelec ML 10/13.SFL, Allen Bradley 1492-H4 or equal.
- D. Fuses used in signal and 24 VDC circuits shall be fast acting, 5mm x 20mm and have a rating of 250 VAC. Fuses shall be Bussman type GMA or approved equal. Fuse-holders shall be of the same manufacturer, series and color as the adjacent terminal blocks and have blown fuse LED indicators. Fuse holders shall be Entrelec M 4/8.SFDT, Allen Bradley- 1492-H5 or equal
- E. Fuses shall be sized in conformance with the NEC.

2.04 TERMINAL BLOCKS AND ACCESSORIES

- A. General
 - 1. Terminal blocks to be clamp type, 5 to 6mm spacing, 300 volt, minimum rating of 30 amps, and mounted on DIN rail. DIN rail shall be same type as used for the relays. Install extra DIN rail on each type of terminal strip with 10% spare terminals for future additions.
 - a. Provide larger terminal as necessary based on gauge of connected wiring. Those terminals with 10 gauge larger gauge wiring or more than one 12 gauge wire should be evaluated and changed.
 - 2. Provide terminal blocks with "follower" plates that compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks that compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.
 - 3. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end (i.e.: TB1, TB2, etc.) or as shown in drawings.

4. Plastic marking tabs shall be provided to label each terminal block. These marking tabs shall have a unique number/letter for each terminal which is identical to the "elementary" and "loop" diagram wire designation. Numbers on these marking strip shall be machine printed and 1/8" high letters minimum.
5. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.
6. Provide a ground terminal or connection point for each grounding conductor.
7. Provide a separate common or neutral terminal for every two (maximum) inputs and/or outputs.

B. General Purpose

1. Terminal blocks shall be Allen Bradley 1492-W4, Entrelec M4/6, or approved equal.
2. Provide quantity of general purpose terminal blocks as required per drawings, specifications, and field terminations.

C. Grounding

1. Grounding blocks shall be Allen Bradley 1492-WG4, Entrelec, or approved equal.

D. Sensor Blocks

1. Sensor blocks shall be Allen Bradley 1492-WTS3, Entrelec, or approved equal.
2. Furnish 2 sensor blocks for each analog input.

E. Control Relays

1. Control isolation relays used in terminal block locations shall be Allen Bradley 700-HLT1U1, Entrelec, or approved equal.
2. Furnish one control relay for each digital output.

F. MCC – Motor Starter Cubicle Terminal Blocks

1. MCC cubicle terminal blocks shall be pull apart as supplied standard by MCC manufacturer.

G. Power – Power terminal Blocks

1. Backpan mounted termination blocks shall be rated for 600V (min). The power termination blocks shall be rated to accept Copper or Aluminum cable and rated as shown on Contract one-line diagrams. Each termination block shall be provided with quantity of primary and secondary cable connections as required per installation. The power termination blocks shall be Connectron Square D or equal.
2. Unmounted termination blocks shall be constructed of aluminum and suitable for use with Aluminum and copper wire. Size and quantity of cable connections shall be as required for installation. Termination blocks shall be insulated with molded high-dielectric strength plastic covering and eliminate the need for tape insulation of electric connection. The termination block shall have removable access plugs over the wire entry and hex screw ports. Provide NSI Polaris IPL or IPLD Series terminal blocks or equal.

H. PANEL GROUND

1. Each electrical, control and instrumentation panel shall be provided with a 1 inch x 0.25 inch x 8 inch (minimum size) solid copper grounding bus bar, mounted on the inside of the enclosure. The grounding bar shall be mounted on insulated standoffs so that no electrical connection is made between the ground bar and the cabinet through the mounting. The ground bar shall be drilled and tapped for a 0.25-20 screws at 0.5 inch interval along its entire length.
2. An un-insulated solid copper #8 AWG ground wire shall be attached between the ground bar and the panel enclosure, and between the ground bar and the mounting panels. The ground connection to the enclosure and panel shall be made by sanding the paint finish off a small area, drilling a hole for a 0.25 inch bolt and mounting a 0.25-20 bolt to the panel to serve as grounding stud. The grounding stud shall be attached with a nut and flat washers on both sides of the enclosure/panel, and with an inside tooth star lock washer next to the panel surface. The star lock washer shall be on the inside surface of the enclosure, and the front surface of the mounting panel. The grounding wire shall be secured to the stud with a nut and inside tooth star lock washer. These grounding points shall be located within 12 inches of the bottom to the grounding bar. Each terminal strip rail shall be individually grounded by means of a #12 AWG wire to the ground bus. The PLC rack, power supply, lightning arrestor shall be similarly grounded according to the manufacturer's recommendations.

2.05 ELECTRICAL TAPE / SHRINKABLE INSULATORS

- A. Vinyl tape shall be 7 mil, 600 volt rated, flame retardant, hot and cold weather resistant conforming to UL510. Provide 3M Scotch Super 33+ vinyl tape or equal
 - 1. Vinyl tape for color coding shall be 7 mil, ¾" width, vinyl tape conforming to UL 510. Provide 3M Scotch 35 vinyl tape or equal.
- B. Rubber Tape: EPR rubber, 90 deg C continuous rated. Provide 3M 130C rubber tape or equal.
- C. Varnished Cambric Tape: Adhesive backed, 7 mil, bias cut cotton tape, coated with yellow insulating varnish. Provide 3M Scotch 2510 or equal.
- D. Shrinkable insulators shall be heat shrinkable, polyolefin thick wall sleeves, end caps and cable repair sleeves are designed for use in splicing, sealing and re-jacketing of direct bury secondary cables. The insulators shall comply with UL 486D and be rated up to 1000 Volts. They shall provide long-term reliable performance overhead, underground or submerged with mechanical and environmental protection. Shrinkable insulators shall be 3M ITCSN or 3M IMCSN per manufacturer instructions for the application or equal.

PART 3: EXECUTION

3.01 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in Electrical Specifications [Electrical General, Workmanship].
- B. Perform work to remedy non-compliant installations after inspection.
- C. Upon notification, stop work on any portion of the installation that is determined to be substandard or being installed by unqualified personnel.

3.02 FABRICATION AND INSTALLATION

- A. System:
 - 1. Install all products specified in Electrical Specifications [Electrical General, Installation].
 - 2. Panels shall be completely factory wired and tested before shipment.
 - 3. All spare PLC input / output points shall be wired to terminal blocks.
 - 4. A minimum of 20% spare unwired terminals shall be provided in each panel.
- B. Wiring Methods:
 - 1. Wiring Separation: Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wire

ways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles.

2. Harness: All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by screw attached retainer. Where space is available, wiring shall be run in slotted plastic wireways with dust covers. Wireways shall be sized such that the wire fill does not exceed 60%. Tie-wraps shall be T&B TY-RAP or equal.
3. Retainers: Wireways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be T&B TC series or equal.
4. Hinge Loops: Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N or equal.
5. Routing: Wires and cable shall be routed such as to maintain separation between 100 Volt or higher from 100 volt or lower wiring being run in the same duct or bundle. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable.
 - a. Wires shall be routed in slotted plastic wireways with snap covers. Wires carrying 120 VAC shall be separated as much as possible from other wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible. Wireways for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined wireways shall be minimized. Wires and cables shall be placed in the wireways in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.
 - b. Provide 2" minimum separation between wireway and terminal blocks.
 - c. Wiring not routed in wireways shall be neatly bundled, treed, and laced with plastic ties.

C. Wire Terminations

1. Single wire and cable conductors shall be terminated according to the

requirements of the terminal device as follows:

- a. Crimp-on terminals: shall be UL listed, self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.
 - b. Terminal Blocks: Remove the last +/- 0.25 inches insulation from of the conductor and insert it under the pressure plate to full length of the bare portion of the conductor. Tighten the screw to close the pressure plate onto the conductor. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.
 - c. Screw-less terminals: wire shall be stripped back and inserted per the terminal manufacturer's instructions.
 - d. Motors with pigtail leads: Install terminal connectors on the motor pigtails and the cable to be connected. Terminals shall be non-insulated crimp-on type applied with a ratchet-type crimping tool. The terminals shall be bolted together with a nut, bolt and lock washer combination. The connection shall be wrapped with four (4) layers varnished cambric tape, six (6) layers of rubber tape and six (6) layers of vinyl electrical tape, each half lapped.
2. When stripping insulation from conductors, do not score or damage conductor.
 3. The drain wire of shielded cables shall be covered with insulating tubing along its full bare length between the cable jacket and the terminal lug or terminal pressure plate.
 4. Heat shrink shall be placed on ends of shielded cable to cover foil.
 5. Condulets with wire nut connections shall be supplied for wire termination to devices with leads instead of terminals (i.e. solenoid valves, level probe, etc.).

D. Wire Splicing

1. No wires shall be spliced without prior approval.
2. Where splices are allowed or approved they shall conform to the following:
 - a. Wire splicing devices shall be sized according to manufacturer's recommendations.

- b. Splices of #10 and smaller, including fixture taps, shall be made with nylon self-insulated twist on wire nuts; T & B "Piggys", Ideal "Wing-Nut" or equal.
- c. Splices of #8 and larger shall be hex key screw, two way connectors, insulated with molded high-dielectric strength plastic; NSI Polaris IPL or IPLD Series terminal blocks or equal.

E. Wire Installation

- 1. Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, stressing the cables, or damaging the insulation. Use a UL listed pulling compound for lubrication within conduits as necessary. The raceway construction shall be complete and protected from weather before cable is pulled in. Swab conduits before installing cables and exercise care in pulling, to avoid damage to the insulation or conductors.
- 2. All wire and cables (with the exception of coaxial antenna cable) shall be installed within UL listed raceways or enclosures. Install all wires and cables in one continuous length unless splices are per contract drawings, required to connect equipment or submitted and favorably reviewed.
- 3. Bundle incoming wire and cables in panels. Zip-tie at intervals of 2" and neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Do not bundle, tape or tie wires within conduits.

3.03 WARRANTY

- A. Provide warranty as specified in Electrical Specifications [Electrical General, Warranty].

END OF SECTION