GENERAL CONDITIONS

GC01. DEFINITIONS

a. Acceptable, Acceptance or words of similar import shall be understood to be the acceptance of the Engineer and/or the City.

b. Act of God an Act of God is an earthquake of magnitude 3.5 on the Richter scale and tidal waves.

c. Approval means written authorization by Engineer and/or City.

d. Contract Documents includes all documents as stated in the Contract.

e. City and Contractor are those stated in the Contract. The terms City and Owner may be used interchangeably.

f. Day shall mean calendar day unless otherwise specifically designated.

g. Engineer shall mean the General Manager, or his or her designee, of the Department of Public Works for the City of Beaumont, acting either directly or through properly authorized agents, such as agents acting within the scope of the particular duties entrusted to them. Also sometimes referred to as the "City's Representative" or "Representative" in the Contract Documents.

h. Equal, Equivalent, Satisfactory, Directed, Designated, Selected, As Required and similar words shall mean the written approval, selection, satisfaction, direction, or similar action of the Engineer and/or City.

i. Indicated, Shown, Detailed, Noted, Scheduled or words of similar meaning shall mean that reference is made to the drawings, unless otherwise noted. It shall be understood that the direction, designation, selection, or similar import of the Engineer and/or City is intended, unless stated otherwise.

j. Install means the complete installation of any item, equipment or material.

k. Material shall include machinery, equipment, manufactured articles, or construction such as form work, fasteners, etc., and any other classes of material to be furnished in connection with the Contract. All materials shall be new unless specified otherwise.

l. Perform shall mean that the Contractor, at Contractor's expense, shall take all actions necessary to complete The Work, including furnishing of necessary labor, tools, and equipment, and providing and installing Materials that are indicated, specified, or required to complete such performance.

m. Project is The Work planned by City as provided in the Contract Documents.

n. Provide shall include provide complete in place, that is furnish, install, test and make ready for use.

o. Recyclable Waste Materials shall mean materials removed from the Project site which are required to be diverted to a recycling center rather than an area landfill. Recyclable Waste Materials include asphalt, concrete, brick, concrete block, and rock.

p. Specifications means that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the work. Except for Sections 1-9 of the Standard Specifications for Public Works Construction ("Greenbook"), 2015 Edition which are specifically excluded from incorporation into these Contract Documents, the Work shall be done in accordance with the Greenbook, including all current supplements, addenda, and revisions thereof. In the case of conflict between the Greenbook and the Contract Documents, the Contract Documents shall prevail.

q. The Work means the entire improvement planned by the City pursuant to the Contract Documents.

r. Work means labor, equipment and materials incorporated in, or to be incorporated in the construction covered by the Contract Documents.

GC02. CONTRACT DOCUMENTS

a. **Contract Documents**. The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all.

b. **Interpretations**. The Contract Documents are intended to be fully cooperative and to be complementary. If Contractor observes that any documents are in conflict, the Contractor shall promptly notify the Engineer in writing. In case of conflicts between the Contract Documents, the order of precedence shall be as follows:

1. Change Orders or Work Change Directives
2. Addenda
3. Special Provisions (or Special Conditions)
4. Technical Specifications
5. Plans (Contract Drawings)
6. Contract
7. General Conditions
8. Instructions to Bidders
9. Notice Inviting Bids
10. Contractor's Bid Forms
11. Greenbook Standard Specifications (Sections 1-9 Excluded)
12. Standard Plans
13. Reference Documents

With reference to the Drawings, the order of precedence shall be as follows:

1. Figures govern over scaled dimensions
2. Detail drawings govern over general drawings
3. Addenda or Change Order drawings govern over Contract Drawings
4. Contract Drawings govern over Standard Drawings
5. Contract Drawings govern over Shop Drawings

c. **Conflicts in Contract Documents**. Notwithstanding the orders of precedence established above, in the event of conflicts, the higher standard shall always apply.

d. **Organization of Contract Documents**. Organization of the Contract Documents into divisions, sections, and articles, and arrangement of drawings shall not control the Contractor in dividing The Work among subcontractors or in establishing the extent of Work to be performed by any trade.

GC03. CONTRACTS DOCUMENTS: COPIES & MAINTENANCE

Contractor will be furnished, free of charge, **five (5)** copies of the Contract Documents. Additional copies may be obtained at cost of reproduction.

Contractor shall maintain a clean, undamaged set of Contract Documents at the Project site.

GC04. DETAIL DRAWINGS AND INSTRUCTIONS

a. **Examination of Contract Documents.** Before commencing any portion of The Work, Contractor shall again carefully examine all applicable Contract Documents, the Project site and other information given to Contractor as to materials and methods of construction and other Project requirements. Contractor shall immediately notify the Engineer of any potential error, inconsistency, ambiguity, conflict or lack of detail or explanation. If Contractor performs, permits, or causes the performance of any Work which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction. In no case shall the Contractor or any subcontractor proceed with Work if uncertain as to the applicable requirements.

b. **Additional Instructions.** After notification of any error, inconsistency, ambiguity, conflict or lack of detail or explanation, the Engineer will provide any required additional instructions, by means of drawings or other written direction, necessary for proper execution of Work.

c. **Quality of Parts, Construction and Finish.** All parts of The Work shall be of the best quality of their respective kinds and the Contractor must use all diligence to inform itself fully as to the required construction and finish. In no case shall Contractor proceed with The Work without obtaining first from the Engineer such Approval may be necessary for the proper performance of Work.

d. **Contractor's Variation from Contract Document Requirements.** If it is found that the Contractor has varied from the requirements of the Contract Documents including the requirement to comply with all applicable laws, ordinances, rules and regulations, the

Engineer may at any time, before or after completion of the Work, order the improper Work removed, remade or replaced by the Contractor at the Contractor's expense.

GC05. EXISTENCE OF UTILITIES AT THE WORK SITE

a. The City has endeavored to determine the existence of utilities at the Project site from the records of the owners of known utilities in the vicinity of the Project. The positions of these utilities as derived from such records are shown on the Plans.

b. No excavations were made to verify the locations shown for underground utilities. The service connections to these utilities are not shown on the plans. It shall be the responsibility of the Contractor to determine the exact location of all service connections. The Contractor shall make its own investigations, including exploratory excavations, to determine the locations and type of service connections, prior to commencing Work which could result in damage to such utilities. The Contractor shall immediately notify the City in writing of any utility discovered in a different position than shown on the Plans or which is not shown on the Plans.

c. All water meters, water valves, fire hydrants, electrical utility vaults, telephone vaults, gas utility valves, and other subsurface structures shall be relocated or adjusted to final grade by the Contractor. Locations of existing utilities shown on the Plans are approximate and may not be complete. The Contractor shall be responsible for coordinating its Work with all utility companies during the construction of The Work.

d. Notwithstanding the above, pursuant to Section 4215 of the Government Code, the City has the responsibility to identify, with reasonable accuracy, main or trunkline facilities on the plans and specifications. In the event that main or trunkline utility facilities are not identified with reasonable accuracy in the plans and specifications made a part of the invitation for bids, City shall assume the responsibility for their timely removal, relocation, or protection.

e. Contractor, except in an emergency, shall contact the appropriate regional notification center, Southern California Underground Service Alert at 1-800-227-2600 at least two working days prior to commencing any excavation if the excavation will be performed in an area which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the City, and obtain an inquiry identification number from that notification center. No excavation shall be commenced or carried out by the Contractor unless such an inquiry identification number has been assigned to the Contractor or any subcontractor of the Contractor and the City has been given the identification number by the Contractor.

GC06. SCHEDULE

a. **Estimated Schedule.** Within fourteen (14) days after the issuance of the Notice to Proceed, Contractor shall prepare a Project schedule and shall submit this to the Engineer for Approval. The receipt or Approval of any schedules by the Engineer or the City shall not in any way relieve the Contractor of its obligations under the Contract Documents. The Contractor is fully responsible to determine and provide for any and all staffing and

resources at levels which allow for good quality and timely completion of the Project. Contractor's failure to incorporate all elements of Work required for the performance of the Contract or any inaccuracy in the schedule shall not excuse the Contractor from performing all Work required for a completed Project within the specified Contract time period. If the required schedule is not received by the time the first payment under the Contract is due, Contractor shall not be paid until the schedule is received, reviewed and accepted by the Engineer.

b. **Schedule Contents.** The schedule shall allow enough time for inclement weather. The schedule shall indicate the beginning and completion dates of all phases of construction; critical path for all critical, sequential time related activities; and "float time" for all "slack" or "gaps" in the non-critical activities. The schedule shall clearly identify all staffing and other resources which in the Contractor's judgment are needed to complete the Project within the time specified for completion. Schedule duration shall match the Contract time. Schedules indicating early completion will be rejected.

c. **Schedule Updates.** Contractor shall continuously update its construction schedule. Contractor shall submit an updated and accurate construction schedule to the Engineer whenever requested to do so by Engineer and with each progress payment request. The Engineer may withhold progress payments or other amounts due under the Contract Documents if Contractor fails to submit an updated and accurate construction schedule.

GC07. SUBSTITUTIONS

a. Pursuant to Public Contract Code Section 3400(b) the City may make a finding that is described in the invitation for bids that designates certain products, things, or services by specific brand or trade name.

b. Unless specifically designated in the Contract Documents, whenever any material, process, or article is indicated or specified by grade, patent, or proprietary name or by name of manufacturer, such Specifications shall be deemed to be used for the purpose of facilitating the description of the material, process or article desired and shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer for substitution any material, process or article which shall be substantially equal or better in every respect to that so indicated or specified in the Contract Documents. However, the City may have adopted certain uniform standards for certain materials, processes and articles.

c. Contractor shall submit requests, together with substantiating data, for substitution of any "or equal" material, process or article no later than thirty-five (35) days after award of the Contract. To facilitate the construction schedule and sequencing, some requests may need to be submitted before thirty-five (35) days after award of Contract. Provisions regarding submission of "or equal" requests shall not in any way authorize an extension of time for performance of this Contract. If a proposed "or equal" substitution request is rejected, Contractor shall be responsible for providing the specified material, process or article. The burden of proof as to the equality of any material, process or article shall rest with the Contractor. The City has the complete and sole discretion to determine if a material, process or article is an "or equal" material, process or article that may be substituted.

d. Data required to substantiate requests for substitutions of an "or equal" material, process or article data shall include a signed affidavit from the Contractor stating that, and describing how, the substituted "or equal" material, process or article is equivalent to that specified in every way except as listed on the affidavit. Substantiating data shall include any and all illustrations, specifications, and other relevant data including catalog information which describes the requested substituted "or equal" material, process or article, and substantiates that it is an "or equal" to the material, process or article. The substantiating data must also include information regarding the durability and lifecycle cost of the requested substituted "or equal" material, process or article. Failure to submit all the required substantiating data, including the signed affidavit, to the City in a timely fashion will result in the rejection of the proposed substitution.

e. The Contractor shall bear all of the City's costs associated with the review of substitution requests.

f. The Contractor shall be responsible for all costs related to a substituted "or equal" material, process or article.

g. Contractor is directed to the Special Conditions (if any) to review any findings made pursuant to Public Contract Code section 3400.

GC08. SHOP DRAWINGS

a. Contractor shall check and verify all field measurements and shall submit with such promptness as to provide adequate time for review and cause no delay in his own Work or in that of any other contractor, subcontractor, or worker on the Project, six (6) copies of all shop or setting drawings, calculations, schedules, and materials list, and all other provisions required by the Contract. Contractor shall sign all submittals affirming that submittals have been reviewed and approved by Contractor prior to submission to Engineer. Each signed submittal shall affirm that the submittal meets all the requirements of the Contract Documents except as specifically and clearly noted and listed on the cover sheet of the submittal.

b. Contractor shall make any corrections required by the Engineer, and file with the Engineer six (6) corrected copies each, and furnish such other copies as may be needed for completion of the Work. Engineer's approval of shop drawings shall not relieve Contractor from responsibility for deviations from the Contract Documents unless Contractor has, in writing, called Engineer's attention to such deviations at time of submission and has secured the Engineer's written Approval. Engineer's Approval of shop drawings shall not relieve Contractor from responsibility for errors in shop drawings.

GC09. SUBMITTALS

a. Contractor shall furnish to the Engineer for approval, prior to purchasing or commencing any Work, a log of all samples, material lists and certifications, mix designs, schedules, and other submittals, as required in the specifications. The log shall indicate whether samples will be provided in accordance with other provisions of this Contract.

b. Contractor will provide samples and submittals, together with catalogs and supporting data required by the Engineer, to the Engineer within a reasonable time period to provide for adequate review and avoid delays in the Work.

c. These requirements shall not authorize any extension of time for performance of this Contract. Engineer will check and approve such samples, but only for conformance with design concept of work and for compliance with information given in the Contract Documents. Work shall be in accordance with approved samples and submittals.

GC10. MATERIALS

a. Except as otherwise specifically stated in the Contract Documents, Contractor shall provide and pay for all materials, labor, tools, equipment, water, lights, power, transportation, superintendence, temporary constructions of every nature, and all other services and facilities of every nature whatsoever necessary to execute and complete this Contract within specified time.

b. Unless otherwise specified, all materials shall be new and the best of their respective kinds and grades as noted and/or specified, and workmanship shall be of good quality.

c. Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of The Work and shall be stored properly and protected as required by the Contract Documents. Contractor shall be entirely responsible for damage or loss by weather or other causes to materials or Work.

d. No materials, supplies, or equipment for Work under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in the work and agrees upon completion of all work to deliver the Project, to the City free from any claims, liens, or charges.

e. Materials shall be stored on the Project site in such manner so as not to interfere with any operations of the City or any independent contractor.

GC11. CONTRACTOR'S SUPERVISION

Contractor shall continuously keep at the Project site, a competent and experienced full-time Project superintendent approved by the City. Superintendent must be able to proficiently speak, read and write in English. Contractor shall continuously provide efficient supervision of the Project.

GC12. WORKERS

a. Contractor shall at all times enforce strict discipline and good order among its employees. Contractor shall not employ on the Project any unfit person or any one not skilled in the Work assigned to him or her.

b. Any person in the employ of the Contractor whom the City may deem incompetent or unfit shall be dismissed from The Work and shall not be employed on this Project except with the written Approval of the City.

GC13. SUBCONTRACTORS

a. Contractor agrees to bind every subcontractor to the terms of the Contract Documents as far as such terms are applicable to subcontractor's portion of The Work. Contractor shall be as fully responsible to the City for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by its subcontractors, as Contractor is for acts and omissions of persons directly employed by Contractor. Nothing contained in these Contract Documents shall create any contractual relationship between any subcontractor and the City.

b. The City reserves the right to Approve all subcontractors. The City's Approval of any subcontractor under this Contract shall not in any way relieve Contractor of its obligations in the Contract Documents.

c. Prior to substituting any subcontractor listed in the Bid Forms, Contractor must comply with the requirements of the Subletting and Subcontracting Fair Practices Act pursuant to California Public Contract Code section 4100 et seq.

GC14. PERMITS AND LICENSES

Permits and licenses necessary for prosecution of The Work shall be secured and paid for by Contractor, unless otherwise specified in the Contract Documents.

a. Contractor shall obtain and pay for all other permits and licenses required for The Work, including excavation permit and for plumbing, mechanical and electrical work and for operations in or over public streets or right of way under jurisdiction of public agencies other than the City.

b. The Contractor shall arrange and pay for all off-site inspection of the Work related to permits and licenses, including certification, required by the specifications, drawings, or by governing authorities, except for such off-site inspections delineated as the City's responsibility pursuant to the Contract Documents.

c. Before Acceptance of the Project, the Contractor shall submit all licenses, permits, certificates of inspection and required approvals to the City.

GC15. UTILITY USAGE

a. All temporary utilities, including but not limited to electricity, water, gas, and telephone, used on the Work shall be furnished and paid for by Contractor. Contractor shall Provide necessary temporary distribution systems, including meters, if necessary, from distribution points to points on The Work where the utility is needed. Upon completion of The Work, Contractor shall remove all temporary distribution systems.

b. Contractor shall provide necessary and adequate utilities and pay all costs for water, electricity, gas, oil, and sewer charges required for completion of the Project.

c. All permanent meters Installed shall be listed in the Contractor's name until Project Acceptance.

d. If the Contract is for construction in existing facilities, Contractor may, with prior written Approval of the City, use the City's existing utilities by compensating the City for utilities used by Contractor.

GC16. INSPECTION FEES FOR PERMANENT UTILITIES

All inspection fees and other municipal charges for permanent utilities including, but not limited to, sewer, electrical, phone, gas, water, and irrigation shall be paid for by the City. Contractor shall be responsible for arranging the payment of such fees, but inspection fees and other municipal fees relating to permanent utilities shall be paid by the City. Contractor may either request reimbursement from the City for such fees, or shall be responsible for arranging and coordination with City for the payment of such fees.

GC17. TRENCHES

a. Trenches Five Feet or More in Depth. The Contractor shall submit to the City, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches five feet or more in depth. If the plan varies from shoring system standards, the plan shall be prepared by a registered civil or structural engineer. The plan shall not be less effective than the shoring, bracing, sloping, or other provisions of the Construction Safety Orders, as defined in the California Code of Regulations.

b. Excavations Deeper than Four Feet. If work under this Contract involves digging trenches or other excavation that extends deeper than four feet below the surface, Contractor shall promptly, and before the following conditions are disturbed, notify the City, in writing, of any:

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

2) Subsurface or latent physical conditions at the site differing from those indicated.

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

The City shall promptly investigate the conditions, and if it finds that the conditions do so materially differ, or do involve hazardous waste, and cause a decrease or increase in

Contractor's cost of, or the time required for, performance of any part of The Work, shall issue a change order under the procedures described in the Contract Documents.

In the event that a dispute arises between the City and the Contractor as to whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of The Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the parties.

GC18. DIVERSION OF RECYCLABLE WASTE MATERIALS

In compliance with the applicable City's waste reduction and recycling efforts, Contractor shall divert all Recyclable Waste Materials to appropriate recycling centers. Contractor will be required to submit weight tickets and written proof of diversion with its monthly progress payment requests. Contractor shall complete and execute any certification forms required by City or other applicable agencies to document Contractor's compliance with these diversion requirements. All costs incurred for these waste diversion efforts shall be the responsibility of the Contractor.

GC19. REMOVAL OF HAZARDOUS MATERIALS

Should Contractor encounter material reasonably believed to be polychlorinated biphenyl (PCB) or other toxic wastes and hazardous materials which have not been rendered harmless at the Project site, the Contractor shall immediately stop work at the affected Project site and shall report the condition to the City in writing. The City shall contract for any services required to directly remove and/or abate PCBs and other toxic wastes and hazardous materials, if required by the Project site(s), and shall not require the Contractor to subcontract for such services. The Work in the affected area shall not thereafter be resumed except by written agreement of the City and Contractor.

GC20. SANITARY FACILITIES

Contractor shall provide sanitary temporary toilet buildings for the use of all workers. All toilets shall comply with local codes and ordinances. Toilets shall be kept supplied with toilet paper and shall have workable door fasteners. Toilets shall be serviced no less than once weekly and shall be present in a quantity of not less than 1 per 20 workers as required by CAL-OSHA regulation. The toilets shall be maintained in a sanitary condition at all times. Use of toilet facilities in The Work under construction shall not be permitted. Any other Sanitary Facilities required by CAL-OSHA shall be the responsibility of the Contractor.

GC21. AIR POLLUTION CONTROL

Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes. All containers of paint, thinner, curing compound, solvent or liquid asphalt shall be labeled to indicate that the contents fully comply with the applicable material requirements.

GC22. COMPLIANCE WITH STATE STORM WATER PERMIT

a. Contractor shall be required to comply with all conditions of the State Water Resources Control Board ("State Water Board") National Pollutant Discharge Elimination System General Permit for Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activity ("Permit") for all construction activity which results in the disturbance of in excess of one acre of total land area or which is part of a larger common area of development or sale. Contractor shall be responsible for filing the Notice of Intent and for obtaining the Permit. Contractor shall be solely responsible for preparing and implementing a Storm Water Pollution Prevention Plan ("SWPPP") prior to initiating Work. In bidding on this Contract, it shall be Contractor's responsibility to evaluate the cost of procuring the Permit and preparing the SWPPP as well as complying with the SWPPP and any necessary revision to the SWPPP. Contractor shall comply with all requirements of the State Water Resources Control Board. Contractor shall include all costs of compliance with specified requirements in the Contract amount.

b. Contractor shall be responsible for procuring, implementing and complying with the provisions of the Permit and the SWPPP, including the standard provisions, monitoring and reporting requirements as required by the Permit. Contractor shall provide copies of all reports and monitoring information to the Engineer.

c. Contractor shall comply with the lawful requirements of any applicable municipality, the City, drainage district, and other local agencies regarding discharges of storm water to separate storm drain system or other watercourses under their jurisdiction, including applicable requirements in municipal storm water management programs.

d. Storm, surface, nuisance, or other waters may be encountered at various times during construction of The Work. Therefore, the Contractor, by submitting a Bid, hereby acknowledges that it has investigated the risk arising from such waters, has prepared its Bid accordingly, and assumes any and all risks and liabilities arising therefrom.

e. Failure to comply with the Permit is in violation of federal and state law. Contractor hereby agrees to indemnify and hold harmless City, its officials, officers, agents, employees and authorized volunteers from and against any and all claims, demands, losses or liabilities of any kind or nature which City, its officials, officers, agents, employees and authorized volunteers may sustain or incur for noncompliance with the Permit arising out of or in connection with the Project, except for liability resulting from the sole established negligence, willful misconduct or active negligence of the City, its officials, officers, agents, employees or authorized volunteers. City may seek damages from Contractor for delay in completing the Contract in accordance with the Contract Documents, caused by Contractor's failure to comply with the Permit.

GC23. CLEANING UP

a. Contractor at all times shall keep premises free from debris such as waste, rubbish, and excess materials and equipment. Contractor shall not store debris under, in, or about the premises. Upon completion of Work, Contractor shall clean the interior and exterior of the

building or improvement including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected so surfaces are free from foreign material or discoloration. Contractor shall clean and polish all glass, plumbing fixtures, and finish hardware and similar finish surfaces and equipment and contractor shall also remove temporary fencing, barricades, planking and construction toilet and similar temporary facilities from site. Contractor shall also clean all buildings, asphalt and concrete areas to the degree necessary to remove oil, grease, fuel, or other stains caused by Contractor operations or equipment.

b. Contractor shall fully clean up the site at the completion of The Work. If the Contractor fails to immediately clean up at the completion of The Work, the City may do so and the cost of such clean up shall be charged back to the Contractor.

GC24. LAYOUT AND FIELD ENGINEERING

All field engineering required for laying out The Work and establishing grades for earthwork operations shall be furnished by the Contractor at its expense. Layout shall be done by a registered civil engineer Approved by the Engineer. Any required "as-built" drawings of the Work shall be prepared by the registered civil engineer.

GC25. EXCESSIVE NOISE

a. The Contractor shall use only such equipment on the work and in such state of repair so that the emission of sound therefrom is within the noise tolerance level of that equipment as established by CAL-OSHA.

b. The Contractor shall comply with the most restrictive of the following: (1) local sound control and noise level rules, regulations and ordinances and (2) the requirements contained in these Contract Documents, including hours of operation requirements. No internal combustion engine shall be operated on the Project without a muffler of the type recommended by the manufacturer. Should any muffler or other control device sustain damage or be determined to be ineffective or defective, the Contractor shall promptly remove the equipment and shall not return said equipment to the job until the device is repaired or replaced. Said noise and vibration level requirements shall apply to all equipment on the job or related to the job, including but not limited to, trucks, transit mixers or transit equipment that may or may not be owned by the Contractor.

GC26. TESTS AND INSPECTIONS

a. If the Contract Documents, the Engineer, or any instructions, laws, ordinances, or public authority require any part of The Work to be tested or Approved, Contractor shall provide the Engineer at least two (2) working days notice of its readiness for observation or inspection. If inspection is by a public authority other than the City, Contractor shall promptly inform the City of the date fixed for such inspection. Required certificates of inspection (or similar) shall be secured by Contractor. Costs for City testing and City

inspection shall be paid by the City. Costs of tests for Work found not to be in compliance shall be paid by the Contractor.

b. If any Work is done or covered up without the required testing or approval, the Contractor shall uncover or deconstruct the Work, and the Work shall be redone after completion of the testing at the Contractor's cost in compliance with the Contract Documents.

c. Where inspection and testing are to be conducted by an independent laboratory or agency, materials or samples of materials to be inspected or tested shall be selected by such laboratory or agency, or by the City, and not by Contractor. All tests or inspections of materials shall be made in accordance with the commonly recognized standards of national organizations.

d. In advance of manufacture of materials to be supplied by Contractor which must be tested or inspected, Contractor shall notify the City so that the City may arrange for testing at the source of supply. Any materials which have not satisfactorily passed such testing and inspection shall not be incorporated into The Work.

e. If the manufacture of materials to be inspected or tested will occur in a plant or location outside the geographic limits of City, the Contractor shall pay for any excessive or unusual costs associated with such testing or inspection, including but not limited to excessive travel time, standby time and required lodging.

f. Reexamination of Work may be ordered by the City. If so ordered, Work must be uncovered or deconstructed by Contractor. If Work is found to be in accordance with the Contract Documents, the City shall pay the costs of reexamination and reconstruction. If such work is found not to be in accordance with the Contract Documents, Contractor shall pay all costs.

GC27. PROTECTION OF WORK AND PROPERTY

a. The Contractor shall be responsible for all damages to persons or property that occur as a result of The Work. Contractor shall be responsible for the proper care and protection of all materials delivered and Work performed until completion and final Acceptance by the City. All Work shall be solely at the Contractor's risk. Contractor shall adequately protect adjacent property from settlement or loss of lateral support as necessary. Contractor shall comply with all applicable safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the Project site where Work is being performed. Contractor shall erect and properly maintain at all times, as required by field conditions and progress of work, all necessary safeguards, signs, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created in the course of construction.

b. In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization from the Engineer, is hereby permitted to act to prevent such threatened loss or injury; and Contractor shall so act, without appeal, if so authorized or instructed by the Engineer or the City. Any compensation claimed by

Contractor on account of emergency work shall be determined by and agreed upon by the City and the Contractor.

c. Contractor shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions.

d. Contractor shall take adequate precautions to protect existing sidewalks, curbs, pavements, utilities, and other adjoining property and structures, and to avoid damage thereto, and Contractor shall repair any damage thereto caused by The Work operations. Contractor shall:

1) Enclose the working area with a substantial barricade, and arrange work to cause minimum amount of inconvenience and danger to the public.

2) Provide substantial barricades around any shrubs or trees indicated to be preserved.

3) Deliver materials to the Project site over a route designated by the Engineer.

4) Provide any and all dust control required and follow the Applicable air quality regulations as appropriate. If the Contractor does not comply, the City shall have the immediate authority to provide dust control and deduct the cost from payments to the Contractor.

5) Confine Contractor's apparatus, the storage of materials, and the operations of its workers to limits required by law, ordinances, permits, or directions of the Engineer. Contractor shall not unreasonably encumber the Project site with its materials.

6) Take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed by accident, they shall be replaced by an approved civil engineer or land surveyor, at no cost to the City.

7) Ensure that existing facilities, fences and other structures are all adequately protected and that, upon completion of all Work, all facilities that may have been damaged are restored to a condition acceptable to the City.

8) Preserve and protect from injury all buildings, pole lines and all direction, warning and mileage signs that have been placed within the right-of-way.

9) At the completion of work each day, leave the Project site in a clean, safe condition.

10) Comply with any stage construction and traffic handling plans. Access to residences and businesses shall be maintained at all times.

These precautionary measures will apply continuously and not be limited to normal working hours. Full compensation for the Work involved in the preservation of life, safety and property as above specified shall be considered as included in the prices paid for the various contract items of Work, and no additional allowance will be made therefor.

e. Should damage to persons or property occur as a result of The Work, Contractor shall be responsible for proper investigation, documentation, including video or photography, to adequately memorialize and make a record of what transpired. The City shall be entitled to inspect and copy any such documentation, video, or photographs.

GC28. CONTRACTORS MEANS AND METHODS

Contractor is solely responsible for the means and methods utilized to Perform The Work. In no case shall the Contractor's means and methods deviate from commonly used industry standards.

GC29. INSPECTOR'S FIELD OFFICE

a. The Contractor shall be responsible for providing the inspector's field office. The Office shall be a substantial waterproof construction with adequate natural light and ventilation by means of stock design windows. Door shall have a key type lock or padlock clasp. The office shall have heating and air conditioning and shall be equipped with a telephone, a telephone answering machine, and a fax machine at Contractor's expense.

b. A table satisfactory for the study of plans and two chairs shall be Provided by Contractor. Contractor shall Provide and pay for adequate electric lights, local telephone service, and adequate heat and air conditioning for the field office until authorized removal.

GC30. AUTHORIZED REPRESENTATIVES

The City shall designate representatives, who shall have the right to be present at the Project site at all times. The City may designate an inspector who shall have the right to observe all of the Contractor's Work. The inspector is not authorized to make changes in the Contract Documents. The inspector shall not be responsible for the Contractor's failure to carry out The Work in accordance with the Contract Documents. Contractor shall provide safe and proper facilities for such access.

GC31. HOURS OF WORK

a. Eight (8) hours of work shall constitute a legal day's work. The Contractor and each subcontractor shall forfeit, as penalty to the City, twenty-five dollars ($25) for each worker employed in the execution of Work by the Contractor or any subcontractor 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 week in violation of the provisions of the Labor Code, and in particular, Section 1810 to Section 1815, except as provided in Labor Code Section 1815.

b. Work shall be accomplished on a regularly scheduled eight (8) hour per day work shift basis, Monday through Friday, between the hours of 7:00 a.m. and 5:00 p.m.

c. It shall be unlawful for any person to operate, permit, use, or cause to operate any of the following at the Project site, other than between the hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, with no Work allowed on City-observed holidays, unless otherwise Approved by the Engineer:

1) Powered Vehicles

2) Construction Equipment

3) Loading and Unloading Vehicles

4) Domestic Power Tool.

GC32. PAYROLL RECORDS

a. Pursuant to Labor Code Section 1776, the Contractor and each subcontractor shall maintain weekly certified payroll records showing the name, address, social security number, work classification, straight time and overtime hours paid each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed in connection with the work. Contractor shall certify under penalty of perjury that records maintained and submitted by Contractor are true and accurate. Contractor shall also require subcontractor(s) to certify weekly payroll records under penalty of perjury.

b. The payroll records described herein shall be certified and submitted by the Contractor at a time designated by the City. The Contractor shall also provide the following:

1) A certified copy of the employee's payroll records shall be made available for inspection or furnished to such employee or his or her authorized representative on request.

2) A certified copy of all payroll records described herein shall be made available for inspection or furnished upon request of the Department of Industrial Relations ("DIR").

c. The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement ("DLSE") of the DIR or shall contain the same information as the forms provided by the DLSE.

d. Any copy of records made available for inspection and furnished upon request to the public shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of the Contractor or any subcontractor shall not be marked or obliterated.

e. In the event of noncompliance with the requirements of this Section, the Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying any item or actions necessary to ensure compliance with this section. Should noncompliance still be evident after such ten (10) day period, the Contractor shall, as a penalty to the City, forfeit Twenty-five Dollars ($25.00) for each day, or portion thereof, for each worker until strict compliance is effectuated. Upon the request of the DIR, such penalties shall be withheld from contract payments.

GC33. PREVAILING RATES OF WAGES

a. The Contractor is aware of the requirements of Labor Code Sections 1720 et seq. and 1770 et seq., as well as California Code of Regulations, Title 8, Section 16000 et seq. ("Prevailing Wage Laws"), which require the payment of prevailing wage rates and the performance of other requirements on certain "public works" and "maintenance" projects. Since this Project involves an applicable "public works" or "maintenance" project, as defined by the Prevailing Wage Laws, and since the total compensation is $1,000 or more, Contractor agrees to fully comply with such Prevailing Wage Laws. The Contractor shall obtain a copy of the prevailing rates of per diem wages at the commencement of this Agreement from the website of the Division of Labor Statistics and Research of the Department of Industrial Relations located at www.dir.ca.gov/dlsr/. In the alternative, the Contractor may view a copy of the prevailing rates of per diem wages at the City. Contractor shall make copies of the prevailing rates of per diem wages for each craft, classification or type of worker needed to perform work on the Project available to interested parties upon request, and shall post copies at the Contractor's principal place of business and at the Project site. Contractor shall defend, indemnify and hold the City, its elected officials, officers, employees and agents free and harmless from any claims, liabilities, costs, penalties or interest arising out of any failure or allege failure to comply with the Prevailing Wage Laws.

b. The Contractor and each subcontractor shall forfeit as a penalty to the City not more than fifty dollars ($50) for each calendar day, or portion thereof, for each worker paid less than the stipulated prevailing wage rate for any work done by him, or by any subcontract under him, in violation of the provisions of the Labor Code. The difference between such stipulated prevailing wage rate and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate shall be paid to each worker by the Contractor.

c. Contractor shall post, at appropriate conspicuous points on the Project site, a schedule showing all determined general prevailing wage rates and all authorized deductions, if any, from unpaid wages actually earned.

d. If the Work involves federal funds or otherwise requires compliance with the Davis-Bacon Fair Labor Standards Act, the Contractor and all its subcontractors shall comply with the higher of the state or federal prevailing wage rates.

GC34. EMPLOYMENT OF APPRENTICES

The Contractor's attention is directed to the provisions of Sections 1777.5, 1777.6, and 1777.7 of the Labor Code concerning employment of apprentices by the Contractor or any subcontractor. The Contractor shall obtain a certificate of apprenticeship before employing any apprentice pursuant to Section 1777.5, 1777.6, and 1777.7 of the Labor Code. Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, the Administrator of Apprenticeships, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

GC35. NONDISCRIMINATION/EQUAL EMPLOYMENT OPPORTUNITY

Pursuant to Labor Code Section 1735 and other applicable provisions of law, the Contractor and its subcontractors shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, political affiliation, marital status, or handicap on this Project. The Contractor will take affirmative action to insure that employees are treated during employment or training without regard to their race, color, religion, sex, national origin, age, political affiliation, marital status, or handicap.

GC36. LABOR/EMPLOYMENT SAFETY

The Contractor shall maintain emergency first aid treatment for his employees which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.), and California Code of Regulations, Title 8, Industrial Relations Division 1, Department of Industrial Relations, Chapter 4.

GC37. WORKERS' COMPENSATION INSURANCE

The Contractor shall Provide, during the life of this Contract, workers' compensation insurance for all of the employees engaged in Work under this Contract, on or at the Project site, and, in case any of sublet Work, the Contractor shall require the subcontractor similarly to provide workers' compensation insurance for all the latter's employees as prescribed by State law. Any class of employee or employees not covered by a subcontractor's insurance shall be covered by the Contractor's insurance. In case any class of employees engaged in work under this Contract, on or at the Project site, is not protected under the Workers' Compensation Statutes, the Contractor shall provide or shall cause a subcontractor to provide, adequate insurance coverage for the protection of such employees not otherwise protected. The Contractor is required to secure payment of compensation to his employees in accordance with the provisions of Section 3700 of the Labor Code. The Contractor shall file with the City certificates of his insurance protecting workers. Company or companies providing insurance coverage shall be acceptable to the City, if in the form and coverage as set forth in the Contract Documents.

GC38. EMPLOYER'S LIABILITY INSURANCE

Contractor shall provide during the life of this Contract, Employer's Liability Insurance, including Occupational Disease, in the amount of, at least, one million dollars ($1,000,000.00) per person per accident. Contractor shall provide City with a certificate of Employer's Liability Insurance. Such insurance shall comply with the provisions of the Contract Documents. The policy shall be endorsed, if applicable, to provide a Borrowed Servant/Alternate Employer Endorsement and contain a Waiver of Subrogation in favor of the City.

GC39. COMMERCIAL GENERAL LIABILITY INSURANCE

a. Contractor shall procure and maintain during the life of this Contract and for such other period as may be required herein, at its sole expense, Commercial General Liability insurance coverage, including but not limited to, premises liability, contractual liability, products/completed operations if applicable, personal and advertising injury – which may arise from or out of Contractor's operations, use, and management of the Project site, or

the performance of its obligations hereunder. Policy limits shall not be less than **$2,000,000** per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

b. Such policy shall comply with all the requirements of this Article. The limits set forth herein shall apply separately to each insured against whom claims are made or suits are brought, except with respect to the limits of liability. Further the limits set forth herein shall not be construed to relieve the Contractor from liability in excess of such coverage, nor shall it limit Contractor's indemnification obligations to the City, and shall not preclude the City from taking such other actions available to the City under other provisions of the Contract Documents or law.

c. Contractor shall make certain that any and all subcontractors hired by Contractor are insured in accordance with this Contract. If any subcontractor's coverage does not comply with the foregoing provisions, Contractor shall indemnify and hold the City harmless from any damage, loss, cost, or expense, including attorneys' fees, incurred by the City as a result thereof.

d. All general liability policies provided pursuant to the provisions of this Article shall comply with the provisions of the Contract Documents.

e. All general liability policies shall be written to apply to all bodily injury, including death, property damage, personal injury, owned and non-owned equipment, blanket contractual liability, completed operations liability, explosion, collapse, under-ground excavation, removal of lateral support, and other covered loss, however occasioned, occurring during the policy term, and shall specifically insure the performance by Contractor of that part of the indemnification contained in these General Conditions, relating to liability for injury to or death of persons and damage to property. If the coverage contains one or more aggregate limits, a minimum of 50% of any such aggregate limit must remain available at all times; if over 50% of any aggregate limit has been paid or reserved, the City may require additional coverage to be purchased by Contractor to restore the required limits. Contractor may combine primary, umbrella, and as broad as possible excess liability coverage to achieve the total limits indicated above. Any umbrella or excess liability policy shall include the additional insured endorsement described in the Contract Documents.

GC40. AUTOMOBILE LIABILITY INSURANCE

Contractor shall take out and maintain at all times during the term of this Contract Automobile Liability Insurance in the amount of, at least, one million dollars ($1,000,000). Such insurance shall provide coverage for bodily injury and property damage including coverage for non-owned and hired vehicles, in a form and with insurance companies acceptable to the City. Such insurance shall comply with the provisions of Article 30 below.

GC41. BUILDER'S RISK ["ALL RISK"]

a. It is the Contractor's responsibility to maintain or cause to be maintained Builder's Risk ["All Risk"] extended coverage insurance on all work, material, equipment, appliances, tools, and structures which are a part of the Contract and subject to loss or damage by fire, and vandalism and malicious mischief, in an amount to cover 100% of the replacement cost. The City accepts no responsibility until the Contract is formally accepted by the Governing Board for the work. The Contractor is required to file with the City a certificate evidencing fire insurance coverage.

b. Provide insurance coverage on completed value form, all-risk or special causes of loss coverage.

   1) Insurance policies shall be so conditioned as to cover the performance of any extra work performed under the Contract.

   2) Coverage shall include all materials stored on site and in transit.

   3) Coverage shall include Contractor's tools and equipment.

   4) Insurance shall include boiler, machinery and material hoist coverage.

c. Such insurance shall comply with the provisions of the Contract Documents.

GC42. FORM AND PROOF OF CARRIAGE OF INSURANCE

a. Any insurance carrier providing insurance coverage required by the Contract Documents shall be admitted to and authorized to do business in the State of California unless waived, in writing, by the City Risk Manager. Carrier(s) shall have an A.M. Best rating of not less than an A:VIII. Insurance deductibles or self-insured retentions must be declared by the Contractor, and such deductibles and retentions shall have the prior written consent from the City. At the election of the City the Contractor shall either 1) reduce or eliminate such deductibles or self-insured retentions, or 2) procure a bond which guarantees payment of losses and related investigations, claims administration, and defense costs and expenses.

b. Contractor shall cause its insurance carrier(s) to furnish the City with either 1) a properly executed original Certificates(s) of Insurance and certified original copies of Endorsements effecting coverage as required herein, or 2) if requested to do so in writing by the City Risk Manager, provide original Certified copies of policies including all Endorsements and all attachments thereto, showing such insurance is in full force and effect. The City, its Director's and officers, employees, agents or representatives are named as Additional Insureds and Provide a Waiver of Subrogation in favor of those parties. Further, said Certificates(s) and policies of insurance shall contain the covenant of the insurance carrier(s) that shall provide no less than thirty (30) days written notice be given to the City prior to any material modification or cancellation of such insurance. In the event of a material modification or cancellation of coverage, the City may terminate or Stop Work pursuant to the Contract Documents, unless the City receives, prior to such effective date, another properly executed original Certificate of Insurance and original copies of

endorsements or certified original policies, including all endorsements and attachments thereto evidencing coverages set forth herein and the insurance required herein is in full force and effect. Contractor shall not take possession, or use the Project site, or commence operations under this Agreement until the City has been furnished original Certificate(s) of Insurance and certified original copies of Endorsements or policies of insurance including all Endorsements and any and all other attachments as required in this Section. The original Endorsements for each policy and the Certificate of Insurance shall be signed by an individual authorized by the insurance carrier to do so on its behalf.

c. It is understood and agreed to by the parties hereto and the insurance company(s), that the Certificate(s) of Insurance and policies shall so covenant and shall be construed as primary, and the City's insurance and/or deductibles and/or self-insured retentions or self-insured programs shall not be construed as contributory.

d. The City reserves the right to adjust the monetary limits of insurance coverage's during the term of this Contract including any extension thereof-if in the City's reasonable judgment, the amount or type of insurance carried by the Contractor becomes inadequate.

e. Contractor shall pass down the insurance obligations contained herein to all tiers of sub-contractors working under this Contract.

GC43. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

a. **Time for Completion/Liquidated Damages.** Work shall be commenced within ten (10) days of the date stated in the City's Notice to Proceed and shall be completed by Contractor in the time specified in the Contract Documents. The City is under no obligation to consider early completion of the Project; and the Contract completion date shall not be amended by the City's receipt or acceptance of the Contractor's proposed earlier completion date. Furthermore, Contractor shall not, under any circumstances, receive additional compensation from the City (including but not limited to indirect, general, administrative or other forms of overhead costs) for the period between the time of earlier completion proposed by the Contractor and the Contract completion date. If The Work is not completed as stated in the Contract Documents, it is understood that the City will suffer damage. In accordance with Government Code section 53069.85, being impractical and infeasible to determine the amount of actual damage, it is agreed that Contractor shall pay to the City as fixed and liquidated damages, and not as a penalty, **the sum of $2,000 for each day of delay** until The Work is fully completed. Contractor and its surety shall be liable for any liquidated damages. Any money due or to become due the Contractor may be retained to cover liquidated damages.

b. **Inclement Weather.** Contractor shall abide the Engineer's determination of what constitutes inclement weather. Time extensions for inclement weather shall only be granted when the Work stopped during inclement weather is on the critical path of the Project schedule.

c. **Extension of Time.** Contractor shall not be charged liquidated damages because of any delays in completion of The Work due to unforeseeable causes beyond the control and

without the fault or negligence of Contractor (or its subcontractors or suppliers). Contractor shall within five (5) Days of identifying any such delay notify the City in writing of causes of delay. The City shall ascertain the facts and extent of delay and grant extension of time for completing The Work when, in its judgment, the facts justify such an extension. Time extensions to the Project shall be requested by the Contractor as they occur and without delay. No delay claims shall be permitted unless the event or occurrence delays the completion of the Project beyond the Contract completion date.

d. **No Damages for Reasonable Delay.** The City's liability to Contractor for delays for which the City is responsible shall be limited to only an extension of time unless such delays were unreasonable under the circumstances. In no case shall the City be liable for any costs which are borne by the Contractor in the regular course of business, including, but not limited to, home office overhead and other ongoing costs. Damages caused by unreasonable City delay, including delays caused by items that are the responsibility of the City pursuant to Government Code section 4215, shall be based on actual costs only, no proportions or formulas shall be used to calculate any delay damages.

GC44. COST BREAKDOWN AND PERIODIC ESTIMATES

Contractor shall furnish on forms Approved by the City:

a. Within ten (10) Days of award of the Contract a detailed estimate giving a complete breakdown of the Contract price;

b. A monthly itemized estimate of Work done for the purpose of making progress payments. In order for the City to consider and evaluate each progress payment application, the Contractor shall submit a detailed measurement of Work performed and a progress estimate of the value thereof before the tenth (10th) Day of the following month.

c. Contractor shall submit, with each of its payment requests, an adjusted list of actual quantities, verified by the Engineer, for unit price items listed, if any, in the Bid Form.

d. Following the City's Acceptance of the Work, the Contractor shall submit to the City a written statement of the final quantities of unit price items for inclusion in the final payment request.

e. The City shall have the right to adjust any estimate of quantity and to subsequently correct any error made in any estimate for payment.

Contractor shall certify under penalty of perjury, that all cost breakdowns and periodic estimates accurately reflect the Work on the Project.

GC45. MOBILIZATION

a. When a bid item is included in the Bid Form for mobilization, the costs of Work in advance of construction operations and not directly attributable to any specific bid item will be included in the progress estimate ("Initial Mobilization"). When no bid item is provided

for “Initial Mobilization,” payment for such costs will be deemed to be included in the other items of The Work.

b. Payment for Initial Mobilization based on the lump sum provided in the Bid Form, which shall constitute full compensation for all such Work. No payment for Initial Mobilization will be made until all of the listed items have been completed to the satisfaction of the Engineer. The scope of the Work included under Initial Mobilization shall include, but shall not be limited to, the following principal items:

1. Obtaining and paying for all bonds, insurance, and permits.

2. Moving on to the Project site of all Contractor’s plant and equipment required for first month’s operations.

3. Installing temporary construction power, wiring, and lighting facilities.

4. Establishing fire protection system.

5. Developing and installing a construction water supply.

6. Providing and maintaining the field office trailers for the Contractor and the Engineer, complete, with all specified furnishings and utility services including telephones, telephone appurtenances, computer and printer, and copying machine.

7. Providing on-site communication facilities for the Owner and the Engineer, including telephones, radio pagers, and fax machines.

8. Providing on-site sanitary facilities and potable water facilities as specified per Cal-OSHA and these Contract Documents.

9. Furnishing, installing, and maintaining all storage buildings or sheds required for temporary storage of products, equipment, or materials that have not yet been installed in the Work. All such storage shall meet manufacturer’s specified storage requirements, and the specific provisions of the specifications, including temperature and humidity control, if recommended by the manufacturer, and for all security.

10. Arranging for and erection of Contractor’s work and storage yard, including required project signage.

11. Posting all OSHA required notices and establishment of safety programs per Cal-OSHA.

12. Full-time presence of Contractor’s superintendent at the job site as required herein.

13. Submittal of Construction Schedule as required by the Contract Documents.

GC46. PAYMENTS

a. The City shall make monthly progress payments following receipt of undisputed and properly submitted payment requests. Contractor shall be paid a sum equal to ninety percent (95%) of the value of Work performed up to the last day of the previous month, less the aggregate of previous payments.

b. The Contractor shall, after the full completion of The Work, submit a final payment application. All prior progress estimates shall be subject to correction in the final estimate and payment.

c. Unless otherwise required by law, the final payment of ten percent (5%) of the value of the Work, if unencumbered, shall be paid no later than sixty (60) Days after the date of recordation of the Notice of Completion.

d. Acceptance by Contractor of the final payment shall constitute a waiver of all claims against the City arising from this Contract.

e. Payments to the Contractor shall not be construed to be an acceptance of any defective work or improper materials, or to relieve the Contractor of its obligations under the Contract Documents.

f. The Contractor shall submit with each payment request the Contractor's conditional waiver of lien for the entire amount covered by such payment request, as well as a valid unconditional waiver of lien from the Contractor and all subcontractors and materialmen for all work and materials included in any prior invoices. Waivers of lien shall be in the forms prescribed by California Civil Code Section 3262. Prior to final payment by the City, the Contractor shall submit a final waiver of lien for the Contractor's work, together with releases of lien from any subcontractor or materialmen.

GC47. PAYMENTS WITHHELD AND BACKCHARGES

In addition to amounts which the City may retain under other provisions of the Contract Documents the City may withhold payments due to Contractor as may be necessary to cover:

a. Stop Notice Claims.

b. Defective work not remedied.

c. Failure of Contractor to make proper payments to its subcontractors or suppliers.

d. Completion of the Contract if there exists a reasonable doubt that the work can be completed for balance then unpaid.

e. Damage to another contractor or third party.

f. Amounts which may be due the City for claims against Contractor.

g. Failure of Contractor to keep the record ("as-built") drawings up to date.

h. Failure to provide updates on the construction schedule.

i. Site clean up.

j. Failure of the Contractor to comply with requirements of the Contract Documents.

k. Liquated damages.

l. Legally permitted penalties.

Upon completion of the Contract, the City will reduce the final Contract amount to reflect costs charged to the Contractor, backcharges or payments withheld pursuant to the Contract Documents.

GC48. CHANGES AND EXTRA WORK

a. **Change Order Work.**

1) The City, without invalidating the Contract, may order changes in the Work consisting of additions, deletions or other revisions, the Contract amount and Contract time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including any adjustment in the Contract amount or the Contract time, and the full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.

2) All claims for additional compensation to the Contractor shall be presented in writing before the expense is incurred and will be adjusted as provided herein. No work shall be allowed to lag pending such adjustment, but shall be promptly executed as directed, even if a dispute arises. No claim will be considered after the work in question has been done unless a written contract change order has been issued or a timely written notice of claim has been made by Contractor. Contractor shall not be entitled to claim or bring suit for damages, whether for loss of profits or otherwise, on account of any decrease or omission of any item or portion of Work to be done. Whenever any change is made as provided for herein, such change shall be considered and treated as though originally included in the Contract, and shall be subject to all terms, conditions and provisions of the original Contract.

3) Owner Initiated Change. The Contractor must submit a complete cost proposal, including any change in the Contract time, within seven (7) Days after receipt of a scope of a proposed change order, unless the City requests that proposals be submitted in less than seven (7) Days.

4) Contractor Initiated Change. The Contractor must give written notice of a proposed change order required for compliance with the Contract Documents within seven (7) Days of discovery of the facts giving rise to the proposed change order.

5) Whenever possible, any changes to the Contract amount shall be in a lump sum mutually agreed to by the Contractor and the City.

6) Price quotations from the Contractor shall be accompanied by sufficiently detailed supporting documentation to permit verification by the City.

7) If the Contractor fails to submit the cost proposal within the seven (7) Day period (or as requested), the City has the right to order the Contractor in writing to commence the work immediately on a force account basis and/or issue a lump sum change to the contract price in accordance with the City's estimate of cost. If the change is issued based on the City estimate, the Contractor will waive its right to dispute the action unless within fifteen (15) Days following completion of the added/deleted work, the Contractor presents written proof that the City's estimate was in error.

8) Estimates for lump sum quotations and accounting for cost-plus-percentage work shall be limited to direct expenditures necessitated specifically by the subject extra work, and shall be segregated as follows:

(a) Labor. The costs of labor will be the actual cost for wages prevailing locally for each craft or type of worker at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessment or benefits required by lawful collective bargaining agreements. The use of a labor classification which would increase the extra work cost will not be permitted unless the contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

(b) Materials. The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available in the quantities involved, plus sales tax, freight and delivery. Materials cost shall be based upon supplier or manufacturer's invoice. If invoices or other satisfactory evidence of cost are not furnished within fifteen (15) Days of delivery, then the Engineer shall determine the materials cost, at its sole discretion.

(c) Tool and Equipment Use. No payment will be made for the use of small tools, tools which have a replacement value of $1,000 or less. Regardless of ownership, the rates to be used in determining equipment use costs shall not exceed listed rates prevailing locally at equipment rental agencies, or distributors, at the time the work is performed.

(d) Overhead, Profit and Other Charges. The mark-up for overhead (including supervision) and profit on work added to the Contract shall be according to the following:

i. "Net Cost" is defined as consisting of costs of labor, materials and tools and equipment only excluding overhead and profit. The costs of applicable insurance and bond premium will be reimbursed to the Contractor and subcontractors at cost only, without mark-up.

ii. For Work performed by the Contractor's forces the added cost for overhead and profit shall not exceed fifteen (15%) percent of the Net Cost of the Work.

iii. For Work performed by a subcontractor, the added cost for overhead and profit shall not exceed fifteen (15%) percent of the Net Cost of the Work to which the Contractor may add five (5%) percent of the subcontractor's Net Cost.

iv. For Work performed by a sub-subcontractor the added cost for overhead and profit shall not exceed fifteen (15 %) percent of the Net Cost for Work to which the subcontractor and general contractor may each add an additional five (5 %) percent of the Net Cost of the lower tier subcontractor.

iv. No additional mark up will be allowed for lower tier subcontractors, and in no case shall the added cost for overhead and profit payable by City exceed twenty-five (25%) percent of the Net Cost as defined herein.

9) For added or deducted Work by subcontractors, the Contractor shall furnish to the City the subcontractor's signed detailed estimate of the cost of labor, material and equipment, including the subcontractor markup for overhead and profit. The same requirement shall apply to sub-subcontractors.

10) For added or deducted work furnished by a vendor or supplier, the Contractor shall furnish to the City a detailed estimate or quotation of the cost to the Contractor, signed by such vendor or supplier.

11) Any change in The Work involving both additions and deletions shall indicate a net total cost, including subcontracts and materials. Allowance for overhead and profit, as specified herein, shall be applied if the net total cost is an extra; overhead and profit allowances shall not be applied if the net total cost is a credit. The estimated cost of deductions shall be based on labor and material prices on the date the Contract was executed.

12) Contractor shall not reserve a right to assert impact costs, extended job site costs, extended overhead, constructive acceleration and/or actual acceleration beyond what is stated in the change order for work. No claims shall be allowed for impact, extended overhead costs, constructive acceleration and/or actual acceleration due to a multiplicity of changes and/or clarifications. The Contractor may not change or modify the City's change order form in an attempt to reserve additional rights.

13) If the City disagrees with the proposal submitted by Contractor, it will notify the Contractor and the City will provide its opinion of the appropriate price and/or time extension. If the Contractor agrees with the City, a change order will be issued by the City. If no agreement can be reached, the City shall have the right to issue a unilateral change order setting forth its determination of the reasonable additions or savings in costs and time attributable to the extra or deleted work. Such determination shall become final and binding if the Contractor fails to submit a claim in writing to the City within fifteen (15) Days of the issuance of the unilateral change order, disputing the terms of the unilateral change order.

14) No dispute, disagreement or failure of the parties to reach agreement on the terms of the change order shall relieve the Contractor from the obligation to proceed with performance of the work, including extra work, promptly and expeditiously.

15) Any alterations, extensions of time, extra work or any other changes may be made without securing consent of the Contractor's surety or sureties.

GC49. OCCUPANCY

The City reserves the right to occupy or utilize any portion of The Work at any time before completion, and such occupancy or use shall not constitute Acceptance of any part of Work covered by this Contract. This use shall not relieve the Contractor of its responsibilities under the Contract.

GC50. INDEMNIFICATION

Contractor shall defend (with counsel of City's choosing), indemnify and hold the City, its officials, officers, agents, employees, and representatives free and harmless from any and all claims, demands, causes of action, costs, expenses, liabilities, losses, damages or injuries, in law or equity, regardless of whether the allegations are false, fraudulent, or groundless, to property or persons, including wrongful death, to the extent arising out of or incident to any acts, omissions or willful misconduct of Contractor, its officials, officers, employees, agents, consultants and contractors arising out of or in connection with the performance of the Work or this Contract, including claims made by subcontractors for nonpayment, including without limitation the payment of all consequential damages and attorney's fees and other related costs and expenses. Contractor shall defend, at Contractor's own cost, expense and risk, with counsel of City's choosing, any and all such aforesaid suits, actions or other legal proceedings of every kind that may be brought or instituted against City, its officials, officers, agents, employees and representatives. To the extent of its liability, Contractor shall pay and satisfy any judgment, award or decree that may be rendered against City, its officials, officers, employees, agents, employees and representatives, in any such suit, action or other legal proceeding. Contractor shall reimburse City, its officials, officers, agents, employees and representatives for any and all legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided. The only limitations on this provision shall be those imposed by Civil Code Section 2782.

GC51. RECORD ("AS BUILT") DRAWINGS

a. Contractor shall prepare and maintain a complete set of record drawings (herein referred to as "as-builts") and shall require each trade to prepare its own as-builts. The as-builts must show the entire site for each major trade, including but not limited to water, sewer, electrical, data, telephone, cable, fire alarm, gas and plumbing. Contractor shall mark the as-builts to show the actual installation where the installation varies from the Work as originally shown. Contractor shall mark whichever drawings are most capable of showing conditions fully and where shop drawings are used, Contractor must record a cross-reference at the corresponding location on the contract drawings. Contractor shall give particular attention to concealed elements that would be difficult to measure and record at a later date. Contractor shall use colors to distinguish variations in separate categories of The Work.

b. Contractor shall note related change order numbers where applicable. Contractor shall organize as-builts into manageable sets, bound with durable paper cover sheets and shall print suitable title, dates and other identification on the cover of each set. Contractor to also provide an electronic version of the as-builts. The suitability of the as-builts will be determined by the Engineer.

GC52. RESOLUTION OF CONSTRUCTION CLAIMS

a. In accordance with Public Contract Code Sections 20104 *et seq.* and other applicable law, public works claims of $375,000 or less which arise between the Contractor and the City shall be resolved under the following the statutory procedure unless the City has elected to resolve the dispute pursuant to Public Contract Code Section 10240 *et seq.*

b. **All Claims:** All claims shall be submitted in writing and accompanied by substantiating documentation. Claims must be filed on or before the date of final payment unless other notice requirements are provided in the contract. "Claim" means a separate demand by the claimant for (1) a time extension, (2) payment of money or damages arising from work done by or on behalf of the claimant and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled, or (3) an amount the payment of which is disputed by the City.

c. **Claims Under $50,000.** The City shall respond in writing to the claim within 45 days of receipt of the claim, or, the City may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the City may have. If additional information is needed thereafter, it shall be provided upon mutual agreement of the City and the claimant. The City's written response shall be submitted 15 days after receiving the additional documentation, or within the same period of time taken by the claimant to produce the additional information, whichever is greater.

d. **Claims over $50,000 but less than or equal to $375,000.** The City shall respond in writing within 60 days of receipt, or, may request in writing within 30 days of receipt of the claim, any additional documents supporting the claim or relating to defenses or claims the City may have against the claimant. If additional information is needed thereafter, it

shall be provided pursuant to mutual agreement between the City and the claimant. The City's response shall be submitted within 30 days after receipt of the further documents, or within the same period of time taken by the claimant to produce the additional information or documents, whichever is greater. The Contractor shall make these records and documents available at all reasonable times, without any direct charge.

e. The Contractor will submit the claim justification in the following format:

1) Summary of claim merit and price, and Contract clause pursuant to which the claim is made.

2) List of documents relating to claim

(a) Specifications

(b) Drawings

(c) Clarifications (Requests for Information)

(d) Schedules

(e) Other

3) Chronology of events and correspondence

4) Analysis of claim merit

5) Analysis of claim cost

6) Analysis of time impact analysis in CPM format

7) Cover letter and certification of validity of the claim

f. If the claimant disputes the City's response, or if the City fails to respond within the statutory time period(s), the claimant may so notify the City within 15 days of the receipt of the response or the failure to respond, and demand an informal conference to meet and confer for settlement. Upon such demand, the City shall schedule a meet and confer conference within 30 Days.

g. If following the meet and confer conference, the claim or any portion thereof remains in dispute, the claimant may file a claim pursuant to Government Code 900 et seq. and Government Code 910 et seq. For purposes of those provisions, the time within which a claim must be filed shall be tolled from the time the claimant submits the written claim until the time the claim is denied, including any time utilized for the meet and confer conference.

h. Submission of a claim, properly certified, with all required supporting documentation, and written rejection or denial of all or part of the claim by City, is a condition precedent to any

action, proceeding, litigation, suit, general conditions claim, or demand for arbitration by Contractor.

GC53. CITY'S RIGHT TO TERMINATE CONTRACT

a. **Termination for Cause**: The City may, without prejudice to any other right or remedy, serve written notice upon Contractor of its intention to terminate this Contract if the Contractor: (i) refuses or fails to prosecute The Work or any part thereof with such diligence as will ensure its completion within the time required; (ii) fails to complete The Work within the required time; (iii) should file a bankruptcy petition or be adjudged a bankrupt; (iv) should make a general assignment for the benefit of its creditors; (v) should have a receiver appointed; (vi) should persistently or repeatedly refuse or fail to supply enough properly skilled workers or proper materials to complete the work; (vii) should fail to make prompt payment to subcontractors or for material or labor; (viii) persistently disregard laws, ordinances, other requirements or instructions of the City; or (ix) should violate any of the provisions of the Contract Documents.

The notice of intent to terminate shall contain the reasons for such intention to terminate. Unless within ten (10) Days after the service of such notice, such condition shall cease or satisfactory arrangements (acceptable to the City) for the required correction are made, this Contract shall be terminated. In such case, Contractor shall not be entitled to receive any further payment until the Project has been finished. The City may take over and complete The Work by any method it may deem appropriate. Contractor and its surety shall be liable to the City for any excess costs or other damages incurred by the City to complete the Project. If the City takes over The Work, the City may, without liability for so doing, take possession of and utilize in completing The Work such materials, appliances, plant, and other property belonging to the Contractor as may be on the Project site.

b. **Termination For Convenience:** The City may terminate performance of The Work in whole or, in part, if the City determines that a termination is in the City's interest.

The Contractor shall terminate all or any part of The Work upon delivery to the Contractor of a Notice of Termination specifying that the termination is for the convenience of the City, the extent of termination, and the effective date of such termination.

After receipt of Notice of Termination, and except as directed by the City, the Contractor shall, regardless of any delay in determining or adjusting any amounts due under this Termination for Convenience clause, immediately proceed with the following obligations:

1) Stop Work as specified in the Notice.

2) Complete any Work specified in the Notice of Termination in a least cost/shortest time manner while still maintaining the quality called for under the Contract Documents.

3) Leave the property upon which the Contractor was working and upon which the facility (or facilities) forming the basis of the Contract Documents is

situated in a safe and sanitary manner such that it does not pose any threat to the public health or safety.

4) Terminate all subcontracts to the extent that they relate to the portions of The Work terminated.

5) Place no further subcontracts or orders, except as necessary to complete the remaining portion of The Work.

6) Submit to the City, within ten (10) Days from the effective date of the Notice of Termination, all of the documentation called for by the Contract Documents to substantiate all costs incurred by the Contractor for labor, materials and equipment through the Effective Date of the Notice of Termination. Any documentation substantiating costs incurred by the Contractor solely as a result of the City's exercise of its right to terminate this Contract pursuant to this clause, which costs the Contractor is authorized under the Contract Documents to incur, shall: (i) be submitted to and received by the City no later than thirty (30) Days after the Effective Date of the Notice of Termination; (ii) describe the costs incurred with particularity; and (iii) be conspicuously identified as "Termination Costs Occasioned by the City's Termination for Convenience."

7) These provisions are in addition to and not in limitation of any other rights or remedies available to the City.

c. Notwithstanding any other provision of this Article, when immediate action is necessary to protect life and safety or to reduce significant exposure or liability, the City may immediately order Contractor to cease Work on the Project until such safety or liability issues are addressed to the satisfaction of the City or the Contract is terminated.

GC54. WARRANTY AND GUARANTEE

a. Contractor warrants that all materials and equipment furnished under this Contract shall be new unless otherwise specified in the Contract Documents; and that all Work conforms to the Contract Document requirements and is free of any defect whether performed by the Contractor or any subcontractor or supplier.

b. Unless otherwise stated, all warranty periods shall begin upon the filing of the Notice of Completion. Unless otherwise stated, the warranty period shall be for one year.

c. The Contractor shall remedy at its expense any damage to City-owned or controlled real or personal property.

d. Contractor shall furnish the City with all warranty and guarantee documents prior to final Acceptance of the Project by the City.

e. The City shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage. The Contractor shall within ten (10) Days after being

notified commence and perform with due diligence all necessary Work. If the Contractor fails to promptly remedy any defect, or damage; the county shall have the right to replace, repair, or otherwise remedy the defect, or damage at the Contractor's expense.

f. In the event of any emergency constituting an immediate hazard to health, safety, property, or licensees, when caused by Work of the Contractor not in accordance with the Contract requirements, the City may undertake at Contractor's expense, and without prior notice, all Work necessary to correct such condition.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for Work performed and Materials furnished under this Contract, the Contractor shall:

1) Obtain for City all warranties that would be given in normal commercial practice;

2) Require all warranties to be executed, in writing, for the benefit of the City; and

3) Enforce all warranties for the benefit of the City, unless otherwise directed in writing by the City.

This Article shall not limit the City's rights under this Contract or with respect to latent defects, gross mistakes, or fraud. The City specifically reserves all rights related to defective work, including but not limited to the defect claims pursuant to California Code of Civil Procedure Section 337.15.

GC55. DOCUMENT RETENTION & EXAMINATION

a. In accordance with Government Code Section 8546.7, records of both the City and the Contractor shall be subject to examination and audit by the State Auditor General for a period of three (3) years after final payment.

b. Contractor shall make available to the City any of the Contractor's other documents related to the Project immediately upon request of the City.

c. In addition to the State Auditor rights above, the City shall have the right to examine and audit all books, estimates, records, contracts, documents, bid documents, subcontracts, and other data of the Contractor (including computations and projections) related to negotiating, pricing, or performing the modification in order to evaluate the accuracy and completeness of the cost or pricing data at no additional cost to the City, for a period of four (4) years after final payment.

GC56. SOILS INVESTIGATIONS

When a soils investigation report for the Project site is available, such report shall not be a part of the Contract Documents. Any information obtained from such report as to subsurface soil condition, or to elevations of existing grades or elevations of underlying rock, is approximate only and is not guaranteed. Contractor acknowledges that any soils investigation report (including any borings) was prepared for purposes of <u>design only</u> and Contractor is required to examine the site

before submitting its bid and must make whatever tests it deems appropriate to determine the underground condition of the soil.

GC57. SEPARATE CONTRACTS

a. The City reserves the right to let other contracts in connection with this Work or on the Project site. Contractor shall permit other contractors reasonable access and storage of their materials and execution of their work and shall properly connect and coordinate its Work with theirs.

b. To ensure proper execution of its subsequent Work, Contractor shall immediately inspect work already in place and shall at once report to the Engineer any problems with the work in place or discrepancies with the Contract Documents.

c. Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by the City in prosecution of the Project to the end that Contractor may perform this Contract in the light of such other contracts, if any. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy at site of the Project. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project. If simultaneous execution of any contract for the Project is likely to cause interference with performance of some other contract or contracts, the Engineer shall decide which Contractor shall cease Work temporarily and which contractor shall continue or whether work can be coordinated so that contractors may proceed simultaneously. The City shall not be responsible for any damages suffered or for extra costs incurred by Contractor resulting directly or indirectly from award, performance, or attempted performance of any other contract or contracts on the Project site.

GC58. NOTICE AND SERVICE THEREOF

All notices shall be in writing and either served by personal delivery or mailed to the other party as designated in the Bid Forms. Written notice to the Contractor shall be addressed to Contractor's principal place of business unless Contractor designates another address in writing for service of notice. Notice to City shall be addressed to the City as designated in the Notice Inviting Bids unless City designates another address in writing for service of notice. Notice shall be effective upon receipt or five (5) Days after being sent by first class mail, whichever is earlier. Notice given by facsimile shall not be effective unless acknowledged in writing by the receiving party.

GC59. NOTICE OF THIRD PARTY CLAIMS

Pursuant to Public Contract Code Section 9201, the City shall provide Contractor with timely notification of the receipt of any third-party claim relating to the Contract.

GC60. STATE LICENSE BOARD NOTICE.

Contractors are required by law to be licensed and regulated by the Contractors' State License Board which has jurisdiction to investigate complaints against contractors if a complaint regarding a patent act or omission is filed within four (4) years of the date of the alleged violation. A

complaint regarding a latent act or omission pertaining to structural defects must be filed within ten (10) years of the date of the alleged violation. Any questions concerning a contractor may be referred to the Registrar, Contractors' State License Board, P.O. Box 26000, Sacramento, California 95826.

GC61. INTEGRATION

a. Oral Modifications Ineffective. No oral order, objection, direction, claim or notice by any party or person shall affect or modify any of the terms or obligations contained in the Contract Documents.

b. Contract Documents Represent Entire Contract. The Contract Documents represent the entire agreement of the City and Contractor.

GC62. ASSIGNMENT

Contractor shall not assign, transfer, convey, sublet, or otherwise dispose of this Contract or any part thereof including any claims, without prior written consent of the City. Any assignment without the written consent of the City shall be void. Any assignment of money due or to become due under this Contract shall be subject to a prior lien for services rendered or Material supplied for performance of Work called for under the Contract Documents in favor of all persons, firms, or corporations rendering such services or supplying such Materials to the extent that claims are filed pursuant to the Civil Code, the Code of Civil Procedure or the Government Code.

GC63. CHANGE IN NAME AND NATURE OF CONTRACTOR'S LEGAL ENTITY

Should a change be contemplated in the name or nature of the Contractor's legal entity, the Contractor shall first notify the City in order that proper steps may be taken to have the change reflected on the Contract.

GC64. ASSIGNMENT OF ANTITRUST ACTIONS

Pursuant to Section 7103.5 of the Public Contract Code, in entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, Contractor or subcontractor offers and agrees to assign to the City all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (chapter 2 (commencing with Section 16700) of part 2 of division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to this Contract or any subcontract. This assignment shall be made and become effective at the time the City makes final payment to the Contractor, without further acknowledgment by the parties.

GC65. PROHIBITED INTERESTS

No City official or representative who is authorized in such capacity and on behalf of the City to negotiate, supervise, make, accept, or approve, or to take part in negotiating, supervising, making, accepting or approving any engineering, inspection, construction or material supply contract or

any subcontract in connection with construction of the project, shall be or become directly or indirectly interested financially in the Contract.

GC66. LAWS AND REGULATIONS

a. Contractor shall give all notices and comply with all federal, state and local laws, ordinances, rules and regulations bearing on conduct of work as indicated and specified by their terms. References to specific laws, rules or regulations in this Contract are for reference purposes only, and shall not limit or affect the applicability of provisions not specifically mentioned. If Contractor observes that drawings and specifications are at variance therewith, he shall promptly notify the Engineer in writing and any necessary changes shall be adjusted as provided for in this Contract for changes in work. If Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, he shall bear all costs arising therefrom.

b. Contractor shall be responsible for familiarity with the Americans with Disabilities Act ("ADA") (42 U.S.C. § 12101 et seq.). The Work will be performed in compliance with ADA laws, rules and regulations. Contractor shall comply with the Historic Building Code, including, but not limited to, as it relates to the ADA, whenever applicable.

c. Contractor acknowledges and understands that, pursuant to Public Contract Code Section 20676, sellers of "mined material" must be on an approved list of sellers published pursuant to Public Resources Code Section 2717(b) in order to supply mined material for this Contract.

GC67. PATENT FEES OR ROYALTIES.

The Contractor shall include in its bid amount the patent fees or royalties on any patented article or process furnished or used in the Work. Contractor shall assume all liability and responsibility arising from the use of any patented, or allegedly patented, materials, equipment, devices or processes used in or incorporated with The Work, and shall defend, indemnify and hold harmless the City, its officials, officers, agents, employees and representatives from and against any and all liabilities, demands, claims, damages, losses, costs and expenses, of whatsoever kind or nature, arising from such use.

GC68. OWNERSHIP OF DRAWING

All Contract Documents furnished by the City are City property. They are not to be used by Contractor or any subcontractor on other work nor shall Contractor claim any right to such documents. With exception of one complete set of Contract Documents, all documents shall be returned to the City on request at completion of The Work.

GC69. NOTICE OF TAXABLE POSSESSORY INTEREST

In accordance with Revenue and Taxation Code Section 107.6, the Contract Documents may create a possessory interest subject to personal property taxation for which Contractor will be responsible.

APPENDIX-A TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Construction Documents
4. Phased construction
5. Facility operation during construction
6. Construction and schedule constraints
7. Phased construction
8. Sequence of construction
9. Owner selected equipment
10. Access to site.
11. Coordination with occupants.
12. Work restrictions.
13. Specification and drawing conventions.
14. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: **City of Beaumont Lift Stations PLC Upgrade**

1. Project Location: 550 East 6th Street, Beaumont California

B. Owner: City of Beaumont

Contacts:
1. Robert Vestal - Principal Engineer (951) 769-8522, rvestal@beaumontca.gov
2. Thaxton Van Belle - Plant Manager (951) 572-3195, TVanBelle@beaumontca.gov
3. Jeff Hart - Director of Public Works (951) 769-8522, jhart@beaumontca.gov

C. Engineer & Owner's System Integrator (OSI): SKM Engineering, Mark Jeppsen (801) 683-3760.

1. Engineers have been engaged for this Project to provide engineering services.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The following list has been furnished for the convenience of the Contractor and shall not be considered as representing all Work required in the Contract Documents. Contractor shall not take advantage of any errors or omissions in this listing and shall report any discrepancies or questionable items to the Engineer for clarification. The Work of Project is defined by the Contract Documents and consists of the following:

1. Removal and replacement of existing PLC control systems at nine (9) of the City's existing sewer lift stations.

2. Removal of existing wiring and reconnection to new PLC hardware with the use of provided I/O lists.

3. Pump seal and temperature detectors shall be relocated by the contractor to the MCC bucket for each pump. Control circuits shall be updated for each pump.

4. The Owner's System Integrator (OSI) will be performing the programming of the PLC's, network, and SCADA system for this project. The Contractor is responsible to coordinate with the OSI to successfully accomplish the cutover at each station. The OSI will have all programming completed prior to each station's cutover. The Contractor shall work with the OSI to coordinate cutover schedules so that the OSI may be on site at the appropriate dates and times. The Contractor will do all wiring and will lead all I/O testing, loop testing and commissioning activities.

5. The Mobilization of all equipment, labor, tools, and materials to and from the project site.

6. Field dimension verification, fabrication, furnishing and installation of new back panels for control system cabinets.

7. Installation and furnishing of new wireless radio components including 900MHz radios to replace the existing radios and cellular modem/router for each site.

8. Installation and furnishing of new Phoenix UPS and 7.2aH battery pack in each PLC cabinet.

9. Replacement of power supplies, network switches, relays, terminal blocks with new components supplied with the new back panel.

10. Demolition and removal of existing equipment and/or infrastructure as indicated in the Contract Documents.

11. All other electrical work included in the Contract Documents.

12. Testing and Startup and Commissioning as described in Section 017500 – Commissioning.

List above is intended to provide an overview of the major project components and does not include all work described in Contract Documents.

B. Type of Contract.

1. Project will be constructed under a single prime contract.

1.4 CONSTRUCTION DOCUMENTS

A. The Contractor may obtain copies of the construction documents as directed in the Instruction to Bidders in Volume 1, “Contract Documents and Conditions” Electronic copies of the existing facility drawings will be available to the successful Contractor through the same means. Note that these drawings are not “as-built” or “record” drawings and the contractor is responsible to field verify existing conditions.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in accordance to an approved Contractor Schedule.

B. The Contractor’s Schedule shall include completion dates for each lift station and for the overall project. It is anticipated and expected that work will begin with the Notice to Proceed.

1.6 LIFT STATION OPERATION DURING CONSTRUCTION:

A. Continuous operation of the Owner’s existing lift stations is of critical importance. The contractor shall develop a plan for cutover of each station’s control system while keeping the station operational.

1.7 ACCESS TO SITES

A. General: Contractor shall have full use of Project site, defined as the limits of construction, for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors for work on the site or facilities. Owner will inform the contractor of areas that are essential for facility operation which shall not be disturbed, blocked, or impacted by the construction efforts. Contractor may use facilities granted by the Owner for storage under the agreement that liabilities for damages fall on the Contractor.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing facilities to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated and/or agreed with the staff all in accordance with General Conditions.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

D. Noise, Vibration, and Odors: Coordinate with Owner all operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy.

1. Notify Owner not less than two days in advance of proposed disruptive operations.

E. Smoking requirements are to comply with California State law.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. General and Special Conditions: Requirements of General and Special conditions provided in Volume I of Contract Documents apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

END OF SECTION 011000

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination drawings.
2. Requests for Information (RFIs).
3. Requests for Change (RFCs)
4. Project Web site.
5. Project meetings.

1.2 DEFINITIONS

A. RFI: Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

B. RFC: Request from Contractor proposing a change to the contract requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.

4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified. A sample RFI form is included at the end of this Specification.

1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
3. Owner or Engineer will not review the Contractor’s RFIs that are in fact Requests for Changes (RFCs), as determined by the Owner. In such cases, Contractor will be required to resubmit on the appropriate RFC form.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Engineer.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven (7) working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. PST will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Engineer's actions on submittals.
    f. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a Change Proposal.

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer and Construction Manager in writing within 10 (10) days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's response was received.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven (7) days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 REQUEST FOR CHANGE (RFCs)

A. Contractor shall submit a Request for Change when Contractor proposes a change in the Contract requirements. All change requests shall be submitted on the RFC form attached to this Specification. As shown therein, Contractor is required to fully describe the benefit(s) to the Owner, benefit(s) to the Contractor, the cost and/or schedule impact(s) associated with the requested change, along with whether or not Contractor proposes or requires a Contract Change Order for implementing the change. Except for as described in Section 1.6 herein, any Contractor RFC that is submitted on the RFI form will be returned without review.

B. As noted on the RFC form, it is understood that certain RFCs can be responded to promptly, with minimal expenditures required by Owner. It is also understood that other RFCs require significant expenditures by Owner in order to properly evaluate and respond to Contractor's RFC. For those RFCs that fall in the latter category, Owner will provide an estimate (time and money) to Contractor as an initial response to RFC. Contractor may then elect to have Owner proceed with evaluating Contractor's RFC (with estimated value deducted from Contractor's Contract with the Owner), or elect to withdraw Contractor's RFC.

1.8 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Engineer, within three (3) days of the meeting.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than fifteen (15) days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Construction Manager, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of record documents.
    l. Use of the premises and existing building.
    m. Work restrictions.
    n. Working hours.
    o. Owner's occupancy requirements.
    p. Responsibility for temporary facilities and controls.
    q. Procedures for disruptions and shutdowns.

r. Construction waste management and recycling.
s. Parking availability.
t. Office, work, and storage areas.
u. Equipment deliveries and priorities.
v. First aid.
w. Security.
x. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer, Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Contractor shall prepare three-week look ahead schedules for review at each progress meeting. The three-week look ahead schedules are not an acceptable substitute for CPM schedule updates that must be submitted with Contractor’s monthly partial payment requests.

    c. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Status of documentation.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site utilization.
        9) Temporary facilities and controls.
        10) Progress cleaning.
        11) Quality and work standards.
        12) Status of correction of deficient items.
        13) Field observations.
        14) Status of RFIs.
        15) Status of proposal requests.
        16) Pending changes.
        17) Status of Change Orders.
        18) Pending claims and disputes.
        19) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will electronically record, transpose and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

4. It is noted that inspection will not be provided during scheduled progress meetings. Contractor is not permitted to perform work that requires inspection (as determined by Owner) during the progress meetings. Contractor shall adjust his schedule to accommodate said weekly progress meetings and no additional compensation will be provided for same. Contractor’s bid shall consider Owner’s requirements for weekly progress meetings. Owner, at its sole discretion, may decrease the frequency of progress meetings if deemed appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SAMPLE

CONTRACTOR'S REQUEST FOR INFORMATION (RFI) #_____

To (Engineer):	
From (Contractor):	
Subject:	
Reference: Construction Drawing:	Specification (Section and Page):
REQUEST	
Information is requested as follows:	
Information Requested By (Name):	**Date**:
Response Requested By (Date):	
Received by CM (Date):	
RESPONSE	
Response to Information Request:	
Response By (Name):	**Date**:

Final Distribution:

SAMPLE

CONTRACTOR'S REQUEST FOR CHANGE (RFC) #_____

To (Engineer):	
From (Contractor):	
Subject:	
Reference: Construction Drawing:	Specification (Section and Page):
REQUEST	
The following change is requested:	
Change Requested By (Name):	**Date**:
Response Requested By (Date):	
Received by CM (Date):	
Benefit to Owner:	
Benefit to Contractor:	
Cost and/or Schedule Impact:	
Change Order Required or Proposed? ____ YES ____ NO	
RESPONSE	

Response to Change Request: (1)	
RESPONSE (Continued)	
Response By (Name):	**Date**:

(1) It is understood that certain RFCs can be responded to promptly, with minimal expenditures required by Owner. It is also understood that other RFCs require significant expenditures by Owner in order to properly evaluate and respond to Contractor's RFC. For those RFCs that fall in the latter category, Owner will provide an estimate (time and money) to Contractor as an initial response to RFC. Contractor may then elect to have Owner proceed with evaluating Contractor's RFC (with estimated value deducted from Contractor's Contract with Owner), or elect to withdraw Contractor's RFC.

Final Distribution:

END OF SECTION 013100

SECTION 013130 - SAFETY

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor's safety program shall conform to the requirements specified in the General Conditions.

B. This specification provides general guidance for site safety and a site safety program.

1.2 DEFINITIONS

A. For the purposes of this Section, an "active construction area" is any area where construction activities are occurring or construction activities could be considered a potential hazard to people.

B. A "Designated Safety Officer" or "Safety Representative" for the purposes of this Contract, means anyone who is capable of identifying the existing and predictable hazards in the areas surrounding a construction project or those working conditions at a construction project that are unsanitary or dangerous to employees. A "Designated Safety Officer" has the authority to make prompt corrective measures to eliminate those hazards.

C. For the purposes of this Section, a "classified area" represents any area within the classified boundary or envelope of an active wastewater treatment process basin, channel, or other facility. A table summarizing the classified areas present within the boundaries and scope of this project is provided in paragraph 1.4 of this Section.

1.3 SUBMITTALS

A. Demonstrate compliance action with the stipulations of California Occupational Safety and Health Administration (CAL OSHA), Mine Safety and Health Administration (MSHA), and other applicable local, state, and federal safety requirements by submitting to Engineer a copy of all safety plans, programs, and permits. Such plans and programs shall include, but are not limited to:

1. Hazard Analysis Prior to Major Activities (job safety analysis, JSA).
2. Emergency Plan.
3. Rigging and Hoisting Plans.
4. Excavation and Trenching Plans.
5. Respiratory Protection Program.
6. Fire Protection Plan.
7. Confined Space Entry Program.
8. Explosives Handling and Storage.
9. Confined Space Entry Program.
10. Electrical Safety (drop cords, temporary power, GFCI's, etc.)
11. Lock Out/Tag Out.
12. Fall Protection.
13. Heavy Equipment Operations.
14. Burning and Welding Operations.
15. Training Plan.
16. Tunneling/Underground/Jacking/Boring Operations.
17. Project Site Rules and Regulations (hazard protection plan).
18. Material Handling (storage-disposal).

19. Fuel Storage and Refueling.
20. Hazard Communication/Right to Know.
21. Subcontractor Requirements.
22. Ventilation.
23. Personal Protective Equipment (hearing, eye, face).
24. Power Transmission/Distribution (temporary and/or permanent).
25. Traffic Control.
26. Environmental Controls.
27. Safety Meetings.
28. Spill Control Plan.
29. First Aid Facilities.

B. Engineer's receipt of safety plans or programs will not relieve Contractor in any way from the full and complete responsibility for safety and training of its personnel, and the onsite personnel of Owner, Engineer, and other visitors to areas of active construction areas. On a daily basis, inform Engineer of changes to the boundaries of the active construction areas.

C. Be responsible for safety training all personnel who will have access to the active construction areas to meet state, federal, local and Contractor requirements. Maintain reasonable, regularly scheduled training sessions in mutually accessible facilities through entire Contract. Training costs for all personnel and visitors, except those costs associated with training personnel of Contractor, subcontractors, suppliers, and visitors will be considered incidental to other lump-sum portions of the Work and no additional compensation for such training will be provided.

D. Safety Program Requirements:
   1. Safety Representative Requirements:
      a. Assign a full-time Safety Representative.
      b. The Safety Representative's duties and responsibilities will be hazard recognition, accidents prevention, new employee orientation (including subcontractors), and the maintaining and supervising of safety precautions and program. This person shall have no other duties. The Safety Representative or a qualified and approved deputy shall be onsite at all times while Work is ongoing.
      c. Qualifications of the Safety Representative and assigned deputies shall be submitted to Engineer for review. Acceptance of their qualifications by Engineer is required prior to the start of any activity on the Project. The Safety Representative will, as a minimum, meet the requirements of regulations per the CAL OSHA Enforcement Branch Program.
   2. Hazardous Substances:
      a. Provide Engineer with a list of all hazardous substances anticipated to be brought on-site.
      b. Maintain on site Material Safety Data Sheets (MSDS) prior to arrival of any hazardous substances on the Project.
      c. Use storage area(s) as outlined in the spill control plan.
   3. Job Safety Analysis (JSA):
      a. Outline the sequence of the Work, equipment to be used, identify hazards that may exist or may be created and what procedures and/or safety equipment will be used to eliminate or reduce these hazards. A Scope of Work JSA shall be prepared and provided to the Engineer prior to the start of unusual, hazardous, or have risk potential activities on the Project. The name of the competent person assigned to this activity will be included on the JSA.

b. Complete a JSA for any activity, which may be of an unusual nature or involves unique hazards.

4. Reports

a. Provide to Engineer copies of Contractor's and subcontractor's:

1) First aid, recordable, lost time and near miss, monthly logs.

2) OSHA 200 injury log (annually).

3) Safety meeting reports and topics (weekly).

4) List of competent persons as required by OSHA and the Project Health and Safety Manual for each required task and their qualification as such.

5) Injury and accident reports will be submitted to Engineer within 24 hours of any incident. **Immediate** notification to Engineer of an accident is **required**. Full cooperation with Engineer in accident investigation is required.

b. Conduct weekly safety inspections. Corrective actions shall be taken within 24 hours to address all deficiencies identified during inspections. Deficiency reports shall be prepared and submitted to Engineer within 48 hours indicating corrective actions taken. Failure to comply with required corrective measures identified in the safety inspection will result in the delayed signing of the monthly application for progress payment by Engineer.

c. Provide Engineer with a report of any periodic audit of Contractor's safety performance and/or records.

1.4 CLASSIFIED AREAS

A. The Site is an active wastewater treatment facility that must always remain operational and online. Consequently, construction activities for this project will involve working near wet wells and equipment that must remain online and operational. Sewer wet wells are considered classified zones (per NFPA 820) with potential hazards for fire and explosions due to the presence of explosive gases associated with wastewater.

B. Contractor shall take all additional precautions necessary when working within the classified zones and envelopes in these areas to prevent sparks, open flames, ignitions, and reduce the risk of fire or explosion. Precautions include but are not limited to: reviewing classified areas with all workers and subcontractors as part of the regular safety meetings and site orientation; providing proper PPE for workers entering classified areas; avoid using electrical tools, plugs, extension cords, welding equipment, open flames/heaters, and other potential sources for sparks or ignition within the classified envelopes; and following all guidelines and recommendations provided in NFPA and CALOSHA for working in classified areas,

C. Refer to Electrical Site Layout Drawings for classified areas.

END OF SECTION 013130

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

1.2 RELATED SECTIONS:

A. General Conditions

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Two (2) paper copies.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals to the Construction Manager.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Engineer.
2. Procurement Activities: Include procurement process activities for the long lead items, major items, and Owner Selected equipment requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times in schedule as indicated in Section 013300 "Contractor Submittals." Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.

3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare a computerized Work Break Down schedule utilizing Primavera Project Management, most current version.

B. Startup Network Diagram: Submit diagram within fourteen (14) days of date established for the Notice to Proceed. Outline significant construction activities for the first ninety (90) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than sixty (60) days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Engineer's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.

e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.
j. Punch list and final completion.
k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Sub networks on separate sheets are permissible for activities clearly off the critical path.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Responsible Person:

1. Designate, in writing and within five (5) calendar days after Notice of Award, person responsible for preparation, maintenance, updating, and revision of all schedules.
2. Qualifications of Responsible person:
    a. Authority to act on behalf of Contractor.
    b. 5 years verifiable experience in preparation of complex construction schedules for projects of similar value, size, and complexity.
    c. Knowledge of critical path method (CPM) scheduling utilizing Primavera Project Planner software.
3. References: Submit written reference of 3 project Owners who have personal experience with this scheduler on previous projects. Identify name, address, telephone number, project name, and cost.
4. Scheduler: Dedicated full time to this project, located on-site. All scheduling software and hardware located on-site. Scheduler will attend all project meetings called for as specified in section 013100.
5. Engineer reserves the right to disapprove scheduler when submitted by Contractor if not qualified. Engineer reserves the right to remove the scheduler from the project if found to be incompetent.

2.3 REPORTS

A. Daily Construction Reports: The Contractor shall prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

C. Quarterly Reports: The Contractor shall assist the Engineer, as requested, in preparing quarterly reports, which shall include at a minimum, the following:
   1. A summary of progress to date including a description of progress since the last report, percent construction complete, percent contractor invoiced, and percent schedule elapsed.
   2. A description of compliance with environmental requirements.
   3. A listing of change orders including amount, description of work, and change in contract amount and schedule.
   4. Any problems encountered, proposed resolution, schedule for resolution, and status of previous problem resolutions.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Engineer, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 – CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals. The Contractor shall coordinate the submittal requirements in this section with those given in the General and Special Conditions of Volume 1, “Bid and Contract Documents.” Where discrepancies exist, the requirements of Volume 1 shall govern.

B. Related Requirements:

1. Section 013200 “Construction Progress Documentation” for submitting schedules and reports, including Contractor's construction schedule.
2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

B. Construction Schedule: Within fourteen (14) days after the date of Notice to Proceed, the Contractor shall submit a construction schedule providing the starting and completion dates of the various stages of the Work. The Contractor shall be prepared to discuss its construction schedule at the pre-construction conference.

C. Schedule of Values or lump sum price breakdown: Within fourteen (14) days after the date of Notice to Proceed, the Contractor shall submit a schedule of values or lump sum price breakdown for progress payment purposes.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.

4. Submittal Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:

a. Project name.
b. Date.
c. Name and address of Engineer.
d. Name of Construction Manager.
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Specification paragraph number or drawing designation and generic name for each of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number.
q. Submittal and transmittal distribution record.
r. Other necessary identification.
s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

E. Options: Identify options requiring selection by Engineer.

F. Deviations: Identify deviations from the Contract Documents on submittals.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Action Submittals: Submit one (1) electronic copy and/or one (1) hard copy (if requested by the Owner) of each submittal unless otherwise indicated.
2. Informational Submittals: Submit one (1) electronic copy and/or one (1) hard copy (if requested by the Owner) of each submittal unless otherwise indicated. Engineer will not return copies.
3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.

c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two (2) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit two (2) sets of Samples. Engineer will retain one (1) Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:

a. Four (4) paper copies of product schedule or list unless otherwise indicated. Engineer will return three (3) copies.

F. Coordination Drawings Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure

Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

T. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed and certified.

3.2 ENGINEER'S ACTION

A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

1. “NO EXCEPTIONS TAKEN” or “EXCEPTIONS AS NOTED” will require no formal revision and resubmission.

2. “REVISE AND RESUBMIT” or “REJECTED” will require the Contractor to revise said submittal and shall resubmit the required number of copies of said revised submittal to the Engineer.

C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

F. Fabrication of an item shall commence only after the Engineer has reviewed the submittal and returned copies to the Contractor marked either “NO EXCEPTIONS TAKEN” or “EXCEPTIONS AS NOTED”. Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer or Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

B. In instances where a conflict arises between standards and/or between the Technical Specifications and the Design Drawings, the more stringent standard or requirement shall govern at the discretion of Owner and Engineer.

C. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Engineer.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Engineer.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

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

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
d. When testing is complete, remove test specimens, assemblies, and mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Engineer or Construction Manager.
2. Notify Engineer and Construction Manager seven (7) days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Engineer's and Construction Manager's approval of mockups before starting work, fabrication, or construction.

a. Allow seven (7) days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services. It is the Contractor’s responsibility to schedule the testing provided by such agencies.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Owner will engage a qualified testing agency to perform following services:
1. Soil Density Testing
2. Cast -in -Place concrete testing
3. Special Inspections

C. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

D. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Engineer, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in Statement of Special Inspections included in the Contract Documents (Drawings), and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Engineer, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Engineer.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014120 - PERMITS

PART 1 - GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

A. Obtain permits required for the execution of Work in accordance with the Contract Documents. Provide copies of these permits to Owner.

B. The intent of this Section is to furnish the known list of required permits for the Work under the Contract Documents. **Contractor is responsible for determining and verifying the extent of all permits required and for obtaining such permits.**

C. In the Bid Price, include costs for obtaining all necessary permits, including application fees and other costs, and the costs of complying with the conditions of all permits. Any fees listed in this section are estimates and are for information only. Verify and pay all actual fees.

D. Within 30 Days of the Limited Notice to Proceed, submit a list of all permits and licenses to be obtained, indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit.

1.2 SUMMARY OF PERMITS TO BE OBTAINED BY CONTRACTOR

A. Obtain the following permits. Submit copies of these permits to Engineer and maintain copies on-site. Comply with all conditions of the permits and pay all applicable fees. Types of permits that may be required include:

1. SWPPP
2. Any required construction permits from City, County, or State agencies. The City permit, if necessary, will be provided at no cost to the Contractor.
3. Permits for road construction
4. Permits for transport of equipment and materials to/from the site.
5. Permits for disposal of any debris or demolition materials (as needed)
6. Permits required for environmental protection including dewatering and discharging of waters.
7. Permits for noise or pollution control as required.
8. Any temporary AQMD permits associated with construction efforts.

END OF SECTION

SECTION 014200 – ABBREVIATIONS AND REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. All work specified herein shall conform to or exceed the requirements of the referenced specifications, codes and standards to the extent that the provisions of such documents are not in conflict with the requirements of these Specifications.

E. References herein to "Building Code" shall mean the California Building Code (CBC) of the International Code Council (ICC). The 2016 edition of the code, as approved and adopted by the agency having jurisdiction, including all addenda, modifications, amendments or other lawful changes thereto, shall apply to the Work.

F. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

G. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards and specifications listed herein.

H. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute (Formerly: ACI International)
ACPA	American Concrete Pipe Association
AGA	American Gas Association
AGC	Associated General Contractors
AHRI	Air-Conditioning, Heating, and Refrigeration Institute (The)
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
APA	APA - The Engineered Wood Association

APA	Architectural Precast Association
API	American Petroleum Institute
APWA	American Public Works Association
ASA	Acoustical Society of America
ASAE	American Society of Agriculture Engineer
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASSE	American Society of Safety Engineers (The)
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials International
ATIS	Alliance for Telecommunications Industry Solutions
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BOCA	BOCA (Building Officials and Code Administrators International Inc.)
CDA	Copper Development Association
CGA	Compressed Gas Association
CLFMI	Chain Link Fence Manufacturers Institute
CMA	Concrete Masonry Association
CPA	Composite Panel Association
CRSI	Concrete Reinforcing Steel Institute
DASMA	Door and Access Systems Manufacturers Association
DHI	Door and Hardware Institute
ETL	Electrical Test Laboratories
GA	Gypsum Association
GANA	Glass Association of North America
HI	Hydraulic Institute
HMMA	Hollow Metal Manufacturers Association (See NAAMM)
HPVA	Hardwood Plywood & Veneer Association
ICBO	International Conference of Building Officials (See ICC)
ICC	International Code Council
ICEA	Insulated Cable Engineers Association, Inc.
ICPA	International Cast Polymer Alliance
ICRI	International Concrete Repair Institute, Inc.
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IES	Illuminating Engineering Society
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	International Society of Automation
ISO	International Organization for Standardization
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MCA	Metal Construction Association
MHIA	Material Handling Industry of America

MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NAIMA	North American Insulation Manufacturers Association
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	NFPA (National Fire Protection Association)
NFPA	National Forest Products Association
NFRC	National Fenestration Rating Council
NHLA	National Hardwood Lumber Association
NLGI	National Lubricating Grease Institute
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSPE	National Society of Professional Engineers
NSSGA	National Stone, Sand & Gravel Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing & Drainage Institute
SDI	Steel Door Institute
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPFA	Spray Polyurethane Foam Alliance
SPRI	Single Ply Roofing Industry
SSPC	Society for Protective Coatings
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
SWPA	Submersible Wastewater Pump Association
UBC	Uniform Building Code (See ICC)
UL	Underwriters Laboratories Inc.
WASTEC	Waste Equipment Technology Association
WCRSI	Western Concrete Reinforcing Steel Institute
WDMA	Window & Door Manufacturers Association
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
   1. DIN- Deutsches Institut fur Normung e. V.; www.din.de.
   2. IAPMO – International Association of Plumbing and Mechanical Officials; www.iapmo.org.
   3. ICC – International Code Council; www.iccsafe.org.
   4. ICC-ES – ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
    USPS - United States Postal Service; www.usps.com.

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary of Work" for work restrictions and limitations on utility interruptions.

2. Requirements given in the General Conditions.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Engineer, occupants of Project, testing agencies, and authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel. Coordinate location with the Owner.

B. Erosion- and Sedimentation-Control Plan for projects disturbing more than 1 acre: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

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

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

C. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Contractor’s Field Office: Of sufficient size to accommodate needs of Owner, Engineer, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in Section 013100. Keep office clean and orderly.

C. Inspector’s Field Office: Provided by the contractor in accordance with Volume I requirements.

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

E. Final location of Contractor’s temporary facilities shall be coordinated with the Owner to ensure that access critical to plant operations is maintained at all times.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures. The Contractor shall provide fire extinguishers and other fire protection equipment to adequately protect new and existing facilities and temporary facilities against damage by fire. Hose connections and hose, water casks, chemical equipment or other sufficient means shall be provided for fighting fires in the new, existing and temporary structures and other portions of the Work and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The Contractor's fire protection program shall conform to the requirements of the OSHA Standards for Construction. The Contractor shall employ every reasonable means to prevent the hazard of fire.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary of Work."

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service:

1. All drinking water on the site during construction shall be furnished by the Contractor and shall be bottled water or water furnished in approved metal dispensers. Notices shall be posted conspicuously throughout the site warning the Contractor's personnel that piped water may be contaminated.

2. The Contractor shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the water system. For each such connection made the Contractor shall first attach to the fire hydrant or pipeline a valve, backflow preventer and a meter, if required by the said authority, of a size and type acceptable to said authority and agency.

C. Waste Collection: Provide trash cans and instruct personnel to maintain a clean site.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction. The Owner's toilet facilities shall not be used by the Contractor's work force.

2. The Contractor shall establish adequate and regular collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Electric Power Service from Existing System: Electric power from Owner's existing system will be made available for construction activities limited by the facility’s electrical system capacity as a whole or at a specific location. All use of power from Owner’s existing system shall be coordinated with the Owner and shall be associated with the activities related to construction.

The Contractor shall be responsible to provide necessary electrical power. The contractor will be responsible for all temporary power and generators required during the construction and planned power shut-downs. The Contractor shall provide all necessary temporary power connection, disconnects and distribution lines required for its operations under the Contract and shall provide and maintain all temporary power systems required to perform the Work in a safe

and satisfactory manner. All temporary connections for electricity shall be subject to approval of the Engineer and shall be completely removed at the Contractor's expense prior to final acceptance of the Work. All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of the OSHA Safety and Health Standards for Construction.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: The Owner's telephone system shall not be used by the Contractor's work force.

1. Post a list of important telephone numbers in the project field office.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Engineers' offices.
f. Owner's office.
g. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3. The Contractor shall provide a telephone in their facility with an adequate speaker phone for use on conference calls. This system may be used for weekly conference calls/project progress meetings.

J. Electronic Communication Service: Provide a computer in the primary field office adequate for use by Engineer and Owner to access project electronic documents and maintain electronic communications.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, with prior consent from the Owner and under conditions acceptable to Owner.

B. Temporary Roads: Access to the site shall be permitted by the Owner. The Contractor shall not construct any staging areas, haul roads, and access roads without the approval of the Owner.

1. Contractor to maintain clear access roadways and walkways necessary for the daily operation and maintenance of the facility. All road closures, trenching/excavation, or other construction activities that may interfere or impede access must be coordinated with and approved by Owner.

2. Where public road(s) pass through the construction area, access to and along this route must be maintained during construction. Contractor shall maintain a graded, non-paved road, to accommodate traffic on the road and allow for construction activities until the permanent road is installed. Contractor is responsible to provide suitable road-grade backfill, graded, for the road. Contractor shall maintain and regrade the road as required to maintain the road in acceptable condition. In addition, contractor shall maintain proper barricades and fencing along this road to secure the construction/staging areas from the public access road. Finally, contractor shall furnish traffic controls along public road as detailed below.

3. Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction and coordinate with the Owner's Facility personnel.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Contractor shall provide all lights, signs, barricades, flaggers, and other appurtenances necessary for safety.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with all Federal, State, and Local Government requirements. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project sign. Unauthorized signs are not permitted.

1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

J. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

G. Site Access: Prior to commencing work the Owner will supply the contractor with access key(s) for the facility front gate. The contractor is responsible to:
1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner for any gates, enclosures or fenced areas constructed by the contractor.
2. The contractor shall be responsible for security of the site during non-working hours of the facility personnel.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

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

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Discard or replace water-damaged and wet material.
4. Discard, replace, or clean stored or installed material that begins to grow mold.
5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

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

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may

have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015300 – PROTECTION OF EXISTING FACILITIES

PART 1 - GENERAL

1.1 GENERAL

A. The Contractor shall protect all existing utilities, piping and improvements not designated for removal and shall restore damaged or temporarily relocated utilities, piping and improvements to a condition equal to or better than they were prior to such damage or temporary relocation. Where required, existing improvements shall be protected with shoring, sheeting, piles, or other necessary means.

B. The Contractor shall verify the exact locations and depths of all underground piping and utilities shown and not shown and shall make exploratory excavations of all piping and utilities that may interfere with the Work. It shall be the Contractor's responsibility to ascertain the actual location of all existing utilities, piping and other improvements that will be encountered in its construction operations and to see that such utilities or other improvements are adequately protected from damage due to such operations.

C. The Contractor shall notify the Owner's representative of any change of condition or extra work as soon as it is discovered, including any damage to existing facilities, pipelines and improvements not designated for removal. The Contractor shall also notify the Owner's representative of any plans to relocate existing piping or facilities to accommodate new construction.

D. Maintaining in Service: All pipelines, electrical, power, telephone, communication cables, gas and water mains shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made with the Owner. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement the Contractor, after necessary scheduling and approval, shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the Engineer and the owner of the facility. In all cases of such temporary removal or relocation, the Work shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement to a new condition meeting the specification requirements.

E. Buried pipelines, utilities, conduits, duct banks, or other improvements that must remain in service and are exposed due to excavation or construction activities shall be protected and supported as required. Segments of pipelines or duct that is suspended over excavated areas shall be temporarily supported until they can be properly backfilled. All temporary support strategies shall be reviewed and approved by Owner and Engineer.

F. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the improvement owner before being concealed by backfill or other work.

1.2 RIGHTS-OF-WAY

A. The Contractor shall not do any work or enter upon the rights-of-way of any oil, gas, sewer or water pipeline; any telephone or electric transmission line; any fence; or any other structure, until notified by the Engineer that the Owner has secured authority to do so. After authority has been obtained, the Contractor shall give the governing utility proper advanced notice of its intention to begin work.

1.3 RESTORATION OF PAVEMENT AND SIDEWALKS

A. All paved areas and sidewalks not designated for replacement, cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas unless otherwise noted. All sidewalks and pavements which are subject to partial removal shall be neatly saw-cut in straight lines. All restoration shall be at the Contractor's expense.

1.4 UNDERGROUND UTILITIES

A. All care shall be exercised to protect existing underground utilities during construction activity. The contractor shall protect pipelines (existing and new) from heavy vehicle loads and ensure that cranes or other heavy outrigging equipment is not parked or stored directly above these utilities without added protection.

B. If the Contractor damages existing utilities, piping or improvements that are not shown or the location of which was not made known to the Contractor prior to excavation and the damage was not due to failure of the Contractor to exercise reasonable care the Contractor shall immediately notify the Engineer. If directed by the Engineer, repairs shall be made by the Contractor under the provisions for changes and extra work contained in the Contract Documents.

1.5 NOTIFICATION BY THE CONTRACTOR:

A. Prior to any excavation in the vicinity of any existing underground facilities, including water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications or telecommunication cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, the Contractor shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than three (3) working days prior to excavation so that a representative can be present during such work if they are required to do so.

END OF SECTION 015300

SECTION 015600 – PROJECT ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. The following sections include mitigation measures to be integrated into the project to reduce the potentially environmental impacts resulting from the construction activities. The Contractor shall implement mitigation measures identified below during the construction process, as well as any other measures required in these documents, on the design drawings, and as required by other local, state, and federal agencies.

1.2 WATER QUALITY

A. NPDES Construction Activity Stormwater Permit: Contractor shall comply with the provisions of the NPDES Construction Activity Stormwater permit, including preparation of Notice of Intent to comply with the provisions of this General Permit and preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP will identify implementation measures necessary to mitigate potential water quality degradation as a result of construction-related runoff. These measures will include BMPs and other standard pollution prevention actions, such as erosion and sediment control measures, proper control of non-stormwater discharges, and hazardous spill prevention and response. The SWPPP will also include requirements for BMP inspections, monitoring, and maintenance.

B. The following items are examples of BMPs that would be implemented during construction to avoid causing water quality degradation:

1. Erosion control BMPs, such as use of mulches or hydroseeding to prevent detachment of soil, following guidance presented in the California BMP Handbooks – Construction (CASQA 2003). A detailed site map will be included in the SWPPP outlining specific areas where soil disturbance may occur, and drainage patterns associated with excavation and grading activities. In addition, the SWPPP will provide plans and details for the BMPs to be implemented prior, during, and after construction to prevent erosion of exposed soils and to treat sediments before they are transported offsite.
2. Sediment control BMPs such as silt fencing or detention basins that trap soil particles.
3. Construction staging areas designed so that stormwater runoff during construction will be collected and treated in a detention basin or other appropriate structure.
4. Management of hazardous materials and wastes to prevent spills.
5. Groundwater treatment BMPs such that localized trench dewatering does not impact surface water quality.
6. Vehicle and equipment fueling BMPs such that these activities occur only in designated staging areas with appropriate spill controls.
7. Maintenance checks of equipment and vehicles to prevent spills or leaks of liquids of any kind.

1.3 AIR QUALITY

A. Construction Fugitive Dust Control Plan: Contractor shall prepare, submit for review and approval, and implement a dust control plan that conforms to the local requirements. The dust control plan shall include the following dust control procedures, or others as required the local authority:

1. Water all active construction areas at least twice daily, taking into consideration temperature and wind conditions.
2. Cover all trucks hauling soil, sand, and other loose materials or require trucks to maintain at least two feet of freeboard.
3. Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on unpaved access roads, parking areas and staging areas at construction sites.
4. Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
5. Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
6. Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).
7. Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.)
8. Limit traffic speeds on unpaved roads to 5 mph.
9. Install sandbags or other erosion control measures to prevent silt runoff to public roadways, consistent with Mitigation Measures for Erosion Control.
10. Replant vegetation in disturbed areas as quickly as possible.
11. Contractor may use onsite treated effluent for dust abatement. Coordinate access and allowable volumes with Owner.

B. Construction Exhaust Emissions Control Plan: Contractor shall implement an exhaust emissions control plan that shall include the following controls and practices:

1. On road vehicles with a gross vehicular weight rating of 10,000 pounds or greater shall not idle for longer than five minutes at any location as required by Section 2485 of Title 13, Division 3, Chapter 10, Article 1 of the California Code of Regulations. This restriction does not apply when vehicles remain motionless during traffic or when vehicles are queuing.
2. Off road equipment engines shall not idle for longer than five minutes per Section 2449(d)(3) of Title 13, Division 3, Chapter 9, Article 4.8 of the California Code of Regulations. All vehicle operators shall receive a written idling policy to inform them of idling restrictions. The policy shall list exceptions to this rule that include the following: idling when queuing; idling to verify that the vehicle is in safe operating condition; idling for testing, servicing, repairing or diagnostic purposes; idling necessary to accomplish work for which the vehicle was designed (such as operating a crane); idling required to bring the machine to operating temperature as specified by the manufacturer; and idling necessary to ensure safe operation of the vehicle.
3. Off road engines greater than 50 horsepower shall, at a minimum, meet Tier 2 emissions standards. When available, higher Tier engines shall be utilized.

1.4 NOISE

A. Contractor shall develop, submit for review and approval, and implement a Construction Noise Reduction Plan that requires, at a minimum, the following:

1. The contractor shall locate all stationary noise-generating equipment, including hammer bore and drill rigs, as far as possible from nearby noise-sensitive receptors. Stationary noise sources located within 500 feet of noise-sensitive receptors shall be equipped with noise reducing engine housings, and the line of sight between such sources and nearby sensitive receptors shall be blocked by portable acoustic barriers.
2. The contractor shall assure that construction equipment with internal combustion engines have sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an un-muffled exhaust.
3. All construction activities within unincorporated areas shall be limited to between the hours depending upon the jurisdiction.
4. Construction equipment including compressors, generators, and mobile equipment shall be fitted with properly working mufflers.
5. Residences and other sensitive receptors within 200 feet of a construction area shall be notified of the construction schedule in writing, at least two weeks prior to the commencement of construction activities. This notice shall indicate the allowable hours of construction activities as specified by the applicable local jurisdiction or as defined by this mitigation measure. The Owner shall designate a noise disturbance coordinator who would be responsible for responding to complaints regarding construction noise. The coordinator shall determine the cause of the complaint and ensure that reasonable measures are implemented to correct the problem. A contact number for the noise disturbance coordinator shall be conspicuously placed on construction site fences and entrances by the contractor and included in the construction schedule notification sent to nearby residences and sensitive receptors.

1.5 HAZARDS AND HAZARDOUS MATERIALS

A. In the event that evidence of potential soil contamination such as soil discoloration, noxious odors, debris, or buried storage containers, is encountered during construction, the contractor will have a contingency plan for sampling and analysis of potentially hazardous substances, including use of a photoionization detector. The required handling, storage, and disposal methods shall depend on the types and concentrations of chemicals identified in the soil. Any site investigations or remediation shall comply with applicable laws and will coordinate with the appropriate regulatory agencies.

B. If unknown USTs are discovered during construction, the UST, associated piping, and impacted soil shall be removed by a licensed and experienced UST removal contractor. The UST and contaminated soil shall be removed in compliance with applicable county and state requirements governing UST removal.

C. Contractor shall prepare, submit for review and approval, and implement a project-specific Health and Safety Plan that would apply to excavation activities. The plan shall establish policies and procedures to protect workers and the public from potential hazards posed by hazardous materials. The plan shall be prepared according to federal and California OSHA regulations and submitted to the appropriate agency with jurisdiction prior to beginning site

activities. The health and safety plan shall also be submitted to the Owner for review and approval.

D. Consistent with the SWPPP requirements, the construction contractor shall be required to implement BMPs for handling hazardous materials onsite. The use of construction BMPs will minimize any adverse effects on groundwater and soils, and will include, but not limited to, the following:

1. Follow manufacturers' recommendations and regulatory requirements for use, storage, and disposal of chemical products and hazardous materials used in construction;
2. Spill control and countermeasures, including employee spill prevention/response training;
3. Avoid overtopping construction equipment fuel gas tanks;
4. During routine maintenance of construction equipment, properly contain and remove grease and oils; and
5. Properly dispose of discarded containers of fuels and other chemicals.

E. The contractor shall follow the provisions of California Code of Regulations, Title 8, Sections 5163 through 5167 for General Industry Safety Orders to protect the project area from being contaminated by the accidental release of any hazardous materials and/or wastes. The local Certified Unified Program Agency (CUPA) will be contacted for any site-specific requirements regarding hazardous materials or hazardous waste containment or handling.

F. Oil and other solvents used during maintenance of construction equipment shall be recycled or disposed of in accordance with applicable regulatory requirements. All hazardous materials shall be transported handled and disposed of in accordance with applicable regulatory requirements.

G. In the event of an accidental release of hazardous materials during construction, containment and clean up shall occur in accordance with applicable regulatory requirements.

H. Contractor shall prepare, submit for review and approval, and implement a Fire Safety Plan for each of the service areas associated with the project. The Fire Safety Plan(s) will describe various potential scenarios and action plans in the event of a fire.

I. During project construction, all staging areas, welding areas, or areas slated for development using spark-producing equipment will be cleared of dried vegetation or other material that could ignite. Any construction equipment that includes a spark arrestor shall be equipped with a spark arrestor in good working order. All vehicles and crews working at the project site(s) will have access to functional fire extinguishers at all times. In addition, construction crews will be required to have a spotter during welding activities to look out for potentially dangerous situations, including accidental sparks.

1.6 CULTURAL RESOURCES

A. Inadvertent Discoveries: If discovery is made of items of historical or archaeological interest, the contractor shall immediately cease all work activities in the area (within approximately 100 feet) of discovery. Prehistoric archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as

hammerstones and pitted stones. Historic-period materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. After cessation of excavation the contractor shall immediately contact the NBWRA and the Owner. The contractor shall not resume work until authorization is received from the Owner.

1. In the event of unanticipated discovery of archaeological indicators during construction, the Owner shall retain the services of a qualified professional archaeologist to evaluate the significance of the items prior to resuming any activities that could impact the site.
2. In the case of an unanticipated archaeological discovery, if it is determined that the find is unique under the National Historic Preservation Act (NHPA) and/or potentially eligible for listing in the National Register, and the site cannot be avoided, the Owner shall provide a research design and excavation plan, prepared by an archaeologist, outlining recovery of the resource, analysis, and reporting of the find. The research design and excavation plan shall be submitted to NBWRA and the Owner and approved by the Owner prior to construction being resumed.

B. Discovery of Human Remains: If potential human remains are encountered, the Contractor shall halt work in the vicinity of the find and contact the county coroner in accordance with Public Resources Code Section 5097.98 and Health and Safety Code Section 7050.5. If the coroner determines the remains are Native American, the coroner shall contact the Native American Heritage Commission (NAHC). As provided in Public Resources Code Section 5097.98, the NAHC shall identify the person or persons believed to be most likely descended from the deceased Native American. The most likely descendent makes recommendations for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98.

1.7 EXPLOSIVES AND BLASTING:

A. The use or storage of explosives on the Work or site will not be permitted.

1.8 SANITATION

A. The Contractor shall provide approved fixed or portable chemical toilets wherever needed for its employees. The Contractor shall establish regular intervals of collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto. The Owner's toilet facilities shall not be used by the Contractor.

END OF SECTION 015600

SECTION 016100 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. General Conditions

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number, manufacturer name, or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable

product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section 013300 "Contractor Submittals."
b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Contractor Submittals." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. To the greatest extent possible for each unit of work, the Contractor shall provide products, materials or equipment from a single source.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

D. Fabricated structural components shall be stored on supports above ground and in a manner to prevent accumulation of water and warping. Products subject to deterioration from atmospheric conditions shall be covered in a manner that will provide adequate ventilation to avoid condensation.

E. Products, materials and equipment not stored in a manner that will insure the maintaining of a new condition will be rejected by the Engineer. Such rejected products, materials and equipment shall be immediately removed from the Work site.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Where Specifications name a product or manufacturer as the “Basis-of-Design”, provide product(s) as listed or by the manufacturer listed. Where Specifications include a list of available products or manufacturers, followed by the phrase “or equal,” provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer subject to requirements of General Conditions.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016100

SECTION 016600 – EQUIPMENT TESTING AND FACILITY STARTUP

PART 1 - GENERAL

1.1 GENERAL

A. Equipment testing and facility startup are required for satisfactory completion of the contract and shall be scheduled and completed within the contract time.

1.2 EQUIPMENT TESTING

A. The Contractor shall provide the services of an experienced and authorized representative of the manufacturer of each item of equipment indicated in the equipment schedules who shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The Contractor shall have the manufacturer's representative revisit the Work site as often as necessary until any and all problems are corrected. The Contractor shall require that each manufacturer's representative furnish to the Engineer a written report addressed to the Owner certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts and has been operated satisfactorily under full-load conditions.

B. The Contractor shall be responsible for scheduling all operations testing. The Contractor shall furnish all personnel, power, water, chemicals, fuel, oil, grease and all other necessary equipment, facilities and services required for conducting the tests. The Contractor is advised that the Engineer and the Owner's operating personnel will witness operations testing and that the manufacturer's representative shall be required to instruct the Owner's operating personnel in correct operation and maintenance procedures. This instruction shall be scheduled with the Engineer and the Owner at least ten (10) days in advance and shall be provided while the equipment is fully operational. The Contractor shall have previously furnished the technical manuals required under Section 013300 entitled, "Contractor Submittals".

1.3 LIFT STATION STARTUP

A. The startup of the lift station facilities and equipment is a coordinated operation requiring the combined technical expertise of the Contractor, suppliers, Engineer and the Owner. The Contractor shall provide the effective coordination of all parties necessary for successful facilities and equipment startup.

B. The Contractor shall be required to startup and operate the various pieces of equipment in accordance with requirements of section 17500 “Commissioning”.

C. All defects in materials or workmanship which appear during this test period shall be immediately corrected by the Contractor. The Contractor shall provide the services of authorized representatives of the manufacturer, in addition to those services required under equipment testing, as may be necessary, to correct faulty equipment operation. Time lost for equipment repairs, wiring corrections, control point settings or other reasons which actually

interrupt the startup may, at the discretion of the Engineer, be justifiable cause for extending the startup test duration.

END OF SECTION 016600

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 024116 "Demolition, Salvage and Reconstruction" for disposition of waste resulting from demolition of buildings, structures, and site improvements.
2. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.
3. General Conditions

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging. The Contractor shall be responsible for the disposal of his own waste. Waste shall daily be cleaned up and piled into proper containers by the Contractor.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.3 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for commencement of the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.

B. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

C. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

A. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

PART 2 - EXECUTION

2.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

2. Comply with Section 015000 "Temporary Facilities and Controls" and 015600 “Project Environmental Controls” for controlling dust and dirt, environmental protection, and noise control.

2.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Burning of waste materials is not permitted.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

2.3 DISPOSAL OF HAZARDOUS WASTE

A. It is not expected that hazardous materials will be encountered in the Work. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Owner’s representative.

END OF SECTION 017419

SECTION 017500 – COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This specification discusses pre-commissioning and commissioning activities. Pre-commissioning activities include all the activities associated with the first-time startup of all equipment, instruments, electrical gear and/or process. This includes all checks and tests prior to running equipment including any manufactures inspections. Commissioning activities include but are not limited to the Functional Acceptance Test (FAT) of equipment and facilities. The final step in commissioning includes a Reliability Acceptance Test (RAT). This test will require the system to function for an extended period without interruption as listed in Table 2. After the test period is complete, the system will be substantially complete and can be turned over to the Owner for beneficial use.

B. For the purpose of this Project, commissioning will start after Owner's acceptance of Operational Readiness Test (ORT) and the listed requirements in Table 1. Full operational tests that demonstrate functionality and reliability will be done during commissioning. It is the Contractor's responsibility to execute proper planning, notification, and scheduling. The commissioning activities will involve the Owner, Engineer, Construction Manager, Contractor, and staff responsible for facility operation.

C. This section identifies the tests and documentation that the Contractor shall be responsible for to complete pre-commissioning and commissioning. All pre-commissioning and commissioning work, as described in this section, shall be performed by the Contractor and witnessed by the Owner.

D. Related Requirements:

1. Section 011000 – Summary of Work
2. Section 016600 – Equipment Testing and Facility Startup
3. Section 017823 – Operation and Maintenance Data
4. Section 017839 – Project Record Documents
5. Section 260000 – General Electrical Requirements
6. Section 409000 – Instrumentation Control for Process Systems

1.2 DEFINITIONS

A. Operational Readiness Test (ORT): This test includes all parts of a system to verify they are in working order and functioning properly in the system including, but not limited to verification of proper alignment, pressure tests, rotational checks, control devices, loop checks and other items listed in Table 1. The requirements of the ORT are described in detail in Section 1.3 Pre-commissioning Work.

B. Functional Acceptance Test (FAT): The FAT is used to test the system prior to placing it into service. The test is to prove the system is operational. The requirements for the FAT are listed in Section 1.4 Commissioning Work.

C. Reliability Acceptance Test (RAT): The RAT is used to prove the reliability of the system for a duration listed in Table 2. The test is performed under normal station flows and conditions. The requirements for the RAT are listed in Section 1.4 Commissioning Work. Following successful completion of the RAT, and acceptance of the system by the Owner, the Contractor may apply for substantial completion of the system.

D. Substantial Completion: That date as certified by the Engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents so that the Project or specified part can be utilized for the purposes for which it is intended. The Contractor may apply for Substantial Completion after the Engineer has accepted all Reliability Acceptance Tests (RATs) in accordance with technical specifications section 017500 - Commissioning and the Contractor has submitted all Manufacturers' Certificates of Proper Installation and all Operation and Maintenance Manuals have been submitted and have been approved by the Engineer.

E. Final Completion: Includes all Work under the Contract as outlined in the contract documents, including any approved change orders.

F. System: A system means the overall process, or a portion thereof, that performs a specific function.

G. Commissioning Coordinator: The Commissioning Coordinator is employed by the Contractor and responsible for all commissioning activities, scheduling start-up and training sessions, developing and submitting all reports and certificates. The Commissioning Coordinator shall have no other responsibilities during commissioning and will be on site during all commissioning phases. The Commissioning Coordinator shall be a registered engineer in the State of California or a currently licensed grade 5 wastewater treatment operator in the state of California.

H. Owner: Owner is defined as the City of Beaumont. The term Owner also includes the Owners representatives, which includes the Construction Manager, Engineer and Operations Staff.

1.3 PRE-COMMISSIONING WORK

A. Pre-commissioning is made up of all the activities that shall be completed before the Contractor is permitted to begin Commissioning. Table 1 illustrates some of the tasks.

B. The primary activities for this are construction, factory testing, documentation, component testing, stand-alone equipment testing, and energization of electrical power distribution equipment. This also includes pipe pressure testing. The intent is to test isolated equipment and components. Pre-commissioning testing shall conclude with the Owner's acceptance of the Operational Readiness Tests.

C. Once all components have been tested individually, electrical power distribution equipment has been functionally tested and energized, and Owner has accepted all required deliverables, the Contractor may request to proceed to Commissioning. If the Owner agrees that the Contractor has successfully performed all tests and provided all required documentation, the Owner will notify the Contractor in writing that he may begin Commissioning.

1.4 COMMISSIONING WORK

A. Commissioning is composed of two parts, Phase 1 and Phase 2 (note that terms Phase 1 and Phase 2 are not associated with construction phasing and are solely used to describe commissioning requirements). Table 1 illustrates some of the tasks.

1. Phase 1 Commissioning will include operator training as well as comprehensive testing. The steps will include approval of Operational Readiness Tests and the Functional Acceptance Test (FAT). The purpose of the FAT is to test all equipment, instruments and software as an integrated system. The successful completion of the Functional Acceptance Test will allow the Contractor to request Operational Acceptance. When all deliverables have been accepted and operator and maintenance training is complete, the RAT may commence (Phase 2).
2. Phase 2 Commissioning is designed to functionally test the facility as an integrated system under normal operating conditions using wastewater. The testing includes the Reliability Acceptance Test (RAT) that will be conducted over a period of time that demonstrates the operational reliability of the system. (See Table 2 for test durations.) After successful completion of the RAT, and after the Contractor has submitted all Operation and Maintenance Manuals, the Contractor may request the Owners' acceptance that the system is Substantially Complete.

PART 2 - PRODUCTS

2.1 COMMISSIONING PLAN

A. The Commissioning Coordinator shall be responsible for preparing the Commissioning Plan.

B. As a condition precedent to receiving any progress payment for work 30 days prior to the pre-commissioning activities, the Commissioning Coordinator shall submit and receive the Owner's acceptance for all commissioning plan documents. The Owner shall require five (5) copies to review the submitted commissioning plan. The commissioning plan shall be submitted 60 days preceding commissioning of a system.

C. Once the Owner has accepted the Commissioning Plan, the Commissioning Coordinator shall reproduce the plans in sufficient number for the Commissioning Coordinator's purposes and an additional five (5) copies for delivery to the Owner. No test work shall begin until the Commissioning Coordinator has delivered the specified number of final commissioning plans to the Owner.

D. Testing

1. The Contractor shall develop and produce the ORTs, FATs and RATs to conduct the testing. Sample templates for ORT, FAT and RAT have been provided in Exhibit 1 – Commissioning Document Samples of this specification to help facilitate this production.
2. The Contractor shall submit an EPSET procedure, as defined in Section 2.2.B.1 entitled EPSET - Electrical Power System Energization Test.
3. The Commissioning Coordinator shall develop test plans detailing the coordinated, sequential testing of each item of equipment and system installed under this Contract. Each test plan shall be specific to the item of equipment or system to be tested. Test plans shall

identify by specific equipment or tag number each device or control station to be manipulated or observed during the test procedure. The specific results to be observed or obtained shall be identified in the plan. Test plans shall also be specific as to support systems required to complete the test work, temporary systems required during the test work, Subcontractors' and manufacturers' representatives to be present and expected test duration.

4. The Commissioning Coordinator shall prepare written test procedures for submittal to the owner and Engineer, for acceptance. The test procedures shall be submitted in hard copy and electronically as needed. For each test, the procedure form should clearly define the following:
    a. Test Number
    b. Purpose of the test: Describe what is being verified by this particular test.
    c. Test Method: Describe the setup for the test and the steps required to complete the test.
    d. Criteria: Describe the criteria for passing or failing the test.
    e. Provide space on the form for the Owner’s comments and for individual sign-off.
    f. Test on a loop-by-loop basis. Every loop shall be signed off individually.
    g. Provide a test schedule.
    h. Provide a list of all test equipment to be available for the tests.
    i. Provide a block diagram showing the test setup arrangement. The diagram shall illustrate the equipment under test, any special test equipment and indicate equipment interconnections.
5. Staffing for each test identifying roles and responsibilities.
6. For all ORT testing, the Contractor shall use the final project PLC hardware.
7. Instrumentation list with calibration methods and calibration dates.
8. Acceptance criteria required to release equipment and systems for commissioning.
9. Statement of successful test.
10. Forms for each test.

E. Training

1. Identify each operator and maintenance training class.
2. Lesson plan for each class.

F. Schedule: The Commissioning Coordinator shall produce a test and training schedule setting forth the sequence contemplated for performing the test and training work.

1. The schedule shall detail the equipment and systems to be tested, and shall be part of the Contractor’s Baseline Construction Schedule.
2. The schedule shall show the contemplated start date, duration of the test and completion of each pre-commissioning and commissioning activity.
3. The test schedule shall be submitted, reviewed, and accepted by the Owner with the Baseline Construction Schedule.
4. The test schedule shall be updated weekly, showing actual dates of test work, indicating systems and equipment testing completed satisfactorily and meeting the requirements of the Contract Documents.
5. Daily Schedule for Testing
    a. The Commissioning Coordinator shall begin each day of witnessed testing by meeting with the Owner.
    b. The meeting purpose is to review the test schedule, the test results from the previous day, and where applicable, to coordinate the testing schedule with Operations.

6. Show all tests with beginning and ending dates. At a minimum, the Commissioning Coordinator will show all ORT, FAT and RAT schedules.
7. Show all operations and maintenance training classes.

2.2 PRE-COMMISSIONING AND COMMISSIONING TESTS

A. The following tests are conducted by the Commissioning Coordinator during Pre-commissioning and Commissioning.

B. Pre-commissioning: The Contractor shall successfully complete each test and receive written confirmation prior to starting any Commissioning Tests.

1. EPSET - Electrical Power System Energization Test – This test is performed after installation of all electrical panels, after completion of NETA testing of the electrical power distribution system and after receipt of vendor certificate of proper installation. An accepted EPSET procedure shall be used to perform this test. The purpose of EPSET is to ensure 480V and greater power distribution is functional and ready for energization during commissioning. Prior to energization, PLC I/O check will not be possible; it will be part of ORTs and FAT testing. The Contractor cannot power any equipment i.e. lighting panel, PLC panels, etc. until EPSET is complete. Arc Flash labels shall be placed on electrical equipment prior to start of EPSET.
   a. This test will check and document that all local manual, remote and automatic interlocks, switching scenarios, I/O and controls are functional; any temporary power for testing of breakers, switchgear and battery charger system (125 V dc), if required, shall be provided. The Owner's personnel will witness this test. Qualified Contractor and vendor personnel capable of operating and troubleshooting electrical equipment shall be available during the course of this test. The Contractors' Commissioning Coordinator shall direct test.
   b. The Contractor shall submit an EPSET procedure. The EPSET procedure shall include the following:
      1) Steps to test and check all modes of operation (local, remote, manual, automatic and PLC), verify all required switching scenarios and functions, and verify that precluded switching scenarios do not occur,
      2) Methodology for supplying temporary power (if required)
      3) Steps to coordinate administrative control of project electrical equipment that interfaces with existing electrical equipment to ensure that testing does not negatively affect facility operations.
   c. Prior to commencement of the EPSET, the following documentation shall be submitted and made available to the Owner:
      1) An accepted EPSET procedure
      2) All associated redlined as-built single line and loop drawings
      3) Electrical equipment O&M manuals and schematics
      4) Certificate of Proper Installation
      5) NETA testing reports and required testing outlined in Division 26 – Electrical
   d. Prior to commencement of the EPSET, vendor training of personnel for electrical equipment shall be competed.
2. ORT - Operational Readiness Test - This test is performed after installation and calibration of instruments is complete. The test purpose is for the Contractor to check and document the complete control system, including I/O to/from PLC register but excluding the application software is ready for operation. In addition, the equipment shall be tested in

local/manual mode for operation and functionality. This test will be required for all electrical, piping and mechanical equipment, including but not limited to, actuated valves and gates, meters, conveyors, blowers, compressors, mixers, screens, motors, boilers, bio-gas handling equipment, pumps and filters. Upon completion of the test, the Contractor shall leave the equipment de-energized.

a. After the equipment supplier has certified proper installation, Contractor shall submit printouts for VFD, RVSS, relays and similar parameter settings for review by the Owner prior to starting the ORT. If further tuning is required when equipment is under load, as during FAT or RAT, the Contractor shall arrange to have on site the Supplier to finalize settings. When complete, the Contractor shall provide printouts of parameter settings and submit to the Owner. The final parameter settings shall be included in the Final Vendor Equipment Manual submittal. The Owner shall witness all ORT's. After the ORT's for a system is complete and approved by the Owner the commissioning can begin.

C. Commissioning

1. Phase 1. FAT – Functional Acceptance Test – The FAT is a combined effort between the Contractor and Owner. The combined software/hardware system is tested from this point forward. This test shall be conducted for LOCAL control; REMOTE MANUAL control; REMOTE AUTO control; REMOTE CASCADE (if applicable) control. The purpose for the test is to insure that the PLC and Operator Graphics software configuration is working in conjunction with the hardware and facility as intended. This test is accomplished with the system online under normal operating conditions. After acceptance of the FAT by the Owner, the Contractor may request to start with Phase 2.
2. Phase 2. RAT – Reliability Acceptance Test – The Purpose for this test is for the Contractor to demonstrate that all systems are capable of operating continuously in the intended manner for an extended period without failing. During the RAT, the Contractor will be responsible for recording all readings, collecting all samples and conducting laboratory analysis. During the RAT, the system under test will be operated within design parameters reflecting the day-to-day operation of the facilities for an uninterrupted period. The duration for each system is listed in Table 2. Several systems may have to test simultaneously in order to treat the wastewater adequately. Each system will require its own RAT, but all of the above systems must start up together. The existing systems must remain operational during the test in case of a problem during the test period.
3. Unless noted otherwise in Table 2 of this section, the RAT will run for 7 continuous days without interruption. During the test, operation of the system will be under the direction of the Contractors Commissioning Coordinator with assistance from Equipment Manufacturers, Sub-Contractors, Owner and Operators. The test, to the greatest extent possible, will take place at 80% of design flow for each process or piece of equipment. The test may need to be terminated due to above average rainfall, unforeseen conditions at the facility or any malfunction with the equipment causing the facility not to meet its discharge requirements. The Facility must be able to return to normal operation prior to the test if suspension of the test in necessary.
4. If the system test is suspended for a period over, 4 hours due to equipment malfunction or break down, the, the entire test will be void and will need to start at the beginning of the test period.

2.3 PRE-COMMISSIONING AND COMMISSIONING DOCUMENTATION

A. Pre-commissioning: The following documentation shall be up to date and accepted by the Owner prior to starting any Commissioning activities. The Owner will give written notice to the Contractor when all the documents are accepted.

1. Equipment Submittal Process Complete.
2. RFIs and Responses up to Date.
3. All Electrical Equipment Tests.
4. All Process and Instrumentation Equipment Tests.
5. All Mechanical Equipment Tests.
6. Contractor Lock-out Tag-out Procedures.
7. Draft Operations and Maintenance Manual.
8. Any and All Operating Permits.
9. Operator Training Plan.
10. Pre-commissioning Report.

B. Commissioning: The following documents shall be submitted by the Commissioning Coordinator to Owner during commissioning:

1. Redline As-Built Drawings.
2. Final Maintenance Manuals.
3. Final Punch List.
4. Commissioning – Phase 1 Report.
5. Commissioning – Phase 2 Report.

2.4 DOCUMENTATION

A. The Commissioning Coordinator shall develop a records keeping system to document compliance with the requirements of this Section. Calibration documentation shall include identification (by make, manufacturer, model, and serial number) of all test equipment, date of original calibration, subsequent calibrations, calibration method, and test laboratory.

B. Equipment and system documentation shall include date of test, equipment number or system name, nature of test, test objectives, test results, test instruments employed for the test, and signature spaces for Owner's witness and the Contractor. A separate file shall be established for each system and item of equipment. For process systems that require commissioning prior to taking another process system out of service, the documentation shall be provided for each process system to be completed independently. These files shall include the following information as a minimum:

1. Metallurgical tests (If applicable).
2. Factory performance tests.
3. Accelerometer recordings made during shipment.
4. Field calibration tests.
5. Field pressure tests.
6. Field performance tests.
7. Field operational tests.

C. The Commissioning Coordinator shall develop test documentation forms specific to each item of equipment and system installed under this Contract.

D. Once the Owner has reviewed and taken no exception to the forms proposed by the Commissioning Coordinator, the Commissioning Coordinator shall produce sufficient forms, at his expense, to provide documentation of all testing work to be conducted as a part of this Contract.

E. Reference Documentation

1. The Commissioning Coordinator shall make two sets and a digital file of the following documentation available to the Owner or its representatives, at the test site:
   a. All drawings, specifications, addenda and change-orders;
   b. Copy of the accepted test procedure for the specific equipment being tested and record keeping forms filled out during testing.

2.5 REPORTS

A. The Contractor shall submit several reports to the Owner for acceptance in order to continue with the Commissioning process. For process systems that require commissioning prior to taking another process system out of service the reports shall be submitted for each process system as completed. These shall be submitted in hard copy and electronic format. The reports are described below. One each of these tests is required even though not specifically listed in the detailed specification section.

B. Pre-commissioning Report: The Pre-commissioning Report is a collection of all test reports, test data, certificates and commissioning forms that are produced during the Pre-commissioning Stage. The first section of this document will be a summary of the contents certifying that all prescribed tests and procedures have been successfully completed. The Commissioning Coordinator is responsible for producing this document.

C. Commissioning – Phase 1 Report

1. The Phase 1 Report is a collection of all test reports, test data, certificates and commissioning forms that are produced during the Phase 1 Stage. The first section of this document will be a summary of the contents certifying that all prescribed tests and procedures have been successfully completed. The Commissioning Coordinator is responsible for producing this document.

D. Commissioning – Phase 2 Report

1. The Phase 2 Report is a collection of all test reports, test data, certificates and commissioning forms that are produced during the Phase 2 Stage. The first section of this document will be a summary of the contents certifying that all prescribed tests and procedures have been successfully completed. The Commissioning Coordinator is responsible for producing this document.
   a. Field recorded dimensional measurements and clearances.
   b. Pressure, pressure differential, level, flow and other field settings.
   c. All electrical devices field settings.

d. Operational pressure tests, control system timing tests and settings and other test data specified.
e. Field wiring changes made, including marked up drawings.

2.6 SUBMITTALS

A. Contractor shall submit the following information in addition to specific equipment where specified in individual sections and paragraphs:

1. Completed ORT, FAT and RAT forms.

B. Submit design and details of temporary test equipment and facilities.

C. Formal Reports

1. Submit two (2) bound copies and one (1) digital file of all start-up and test reports within thirty days after completion of last test.

PART 3 - EXECUTION

3.1 PRE-COMMISSIONING AND COMMISSIONING ACTIVITIES

A. The following is a partial list of activities that shall be complete during each stage of Commissioning.

B. Pre-commissioning

1. Electrical Testing.
2. Electrical Equipment is Clean and Energized.
3. Verify Rotation of Motors.
4. Verify Alignment of Equipment.
5. Perform Local Manual Mode Tests.
6. SCADA System is Complete and Energized.
7. Perform Wiring and Loop Tests.
8. PLC Programming Complete.
9. Perform Electrical Power System Energization Test (EPSET).
10. Perform Operational Readiness Test.
11. Pre-commissioning Requirements.

C. Commissioning

1. Operator Training.
2. Prepare As-Built Drawings.
3. Functional Acceptance Test (FAT).
4. Reliability Acceptance Test (RAT).
5. Prepare Final Maintenance Manuals.
6. Complete Final Punch List.

TABLE 1
PRE-COMMISSIONING AND COMMISSIONING

<table>
<tr><th rowspan="2">PRE-COMMISSIONING</th><th colspan="2">COMMISSIONING</th></tr>
<tr><th>PHASE 1</th><th>PHASE 2</th></tr>
<tr><td>Equipment Submittal Process Complete</td><td rowspan="2">Redline As-Built Drawings Received Prior to Operator Training</td><td rowspan="2">Reliability Acceptance Test (RAT)</td></tr>
<tr><td>RFI's and Responses up to Date</td></tr>
<tr><td>All Electrical Equipment Tests Complete</td><td rowspan="2">Operational Readiness Tests Reports Approved</td><td rowspan="2">All Manufactures Certificates of Proper Installation and Training</td></tr>
<tr><td>All Process and Instrumentation Tests Complete</td></tr>
<tr><td>All Mechanical Equipment Tests Complete</td><td rowspan="2">Operator Training Completed Prior to Phase 2</td><td>Commissioning - Phase 2 Report</td></tr>
<tr><td>Loop Drawings</td><td rowspan="2">Substantial Completion of System</td></tr>
<tr><td>P&ID Drawings</td><td>Functional Acceptance Test (FAT)</td></tr>
<tr><td>Contractor Safety Procedures in place</td><td>Commissioning - Phase 1 Report</td><td>Final O&M Manuals</td></tr>
<tr><td>Equipment, Valve and Pipe Labeling Complete</td><td rowspan="3">Obtain operational acceptance from the Owner to Proceed to Phase 2</td><td>Final Punch List Complete</td></tr>
<tr><td>All Manufactures Certificates of Proper Installation</td><td>Final As-Built Drawings</td></tr>
<tr><td>All Pressure Test Reports</td><td>Final Completion</td></tr>
<tr><td>All Loop Test Reports</td><td colspan="2" rowspan="15"></td></tr>
<tr><td>All Conductivity and Megger Test Reports</td></tr>
<tr><td>All Instrument Calibration Reports</td></tr>
<tr><td>All Breaker Setting Reports</td></tr>
<tr><td>All Mechanical Alignment Reports</td></tr>
<tr><td>Operator and Maintenance Training Plan</td></tr>
<tr><td>Commissioning Plan Accepted</td></tr>
<tr><td>Draft O&M Manuals Submitted and Approved</td></tr>
<tr><td>Electrical Power System Energization Test</td></tr>
<tr><td>Operational Readiness Tests (ORT's) Complete</td></tr>
<tr><td>Pre-commissioning Report Submitted</td></tr>
<tr><td>Obtain Owner Approval to Proceed to Commissioning Phase 1</td></tr>
</table>

TABLE 2
RELIABILITY ACCEPTANCE TEST PARAMETERS

SYSTEM	TEST DURATION
Group #1	30 Continuous Days without a problem
Headworks Area	
New Aeration Basins	
MBR Building	
Dewatering Building	
Emergency Generator	7 Continuous Days without a problem
Non-Potable Water Pump Station	

EXHIBIT 1

COMMISSIONING DOCUMENT SAMPLES

OPERATIONAL READINESS TEST (ORT)

FUNCTIONAL ACCEPTANCE TEST PROCEEDURE (FAT)

SAMPLE RELIABILITY ACCEPTANCE TEST PROCEEDURE (RAT)

OPERATIONAL READINESS TEST
CITY OF IMPERIAL WWTP
SALT MITIGATION UPGRADE

Date:_____
Equipment Name:_____ Equipment #:_____
Test Type:_____ System:_____

Step	ok Contractor	ok Sub	Signature or comments for non-acceptance(Owners Rep) Comment / Sign Off
Verify ready for startup by manufacture if applicable			
Verify correct installation			
Verify correct electrical and control wiring (voltage, breaker settings, etc.)			
Verify all lubrication is complete and correct			
Check rotation (uncouple motor from equipment if required)			
Verify all alarms and signals are functioning (simulate signal if needed)			
Verify all H/O/A switches function			
Verify all emergency stops function			
Check clearances and verify all guards are in place			
Verify loop checks are complete and test operation through the PLC			
Equipment is ready for system Functional Acceptance Test (FAT)			

FUNCTIONAL ACCEPTANCE TEST PROCEDURE (FAT)

1.1 OVERVIEW

A. The purpose of the Functional Acceptance Test (FAT) is to demonstrate to the Owner that both the software and hardware installed under this Contract is performing as specified. The test is performed with the equipment in service. The FAT is a combined effort between Contractor and Owner. The tests will require coordination with Operations to ensure normal processing is not disrupted. An Operator must be present when any system operated may disrupt normal facility operation. Each individual piece of equipment shall have a completed ORT prior to the system FAT. This schedule will be based on work sequencing as discussed in the Contract Documents.

1.2 TEST PROTOCOL

A. The combined software/hardware system is tested from this point forward. The test is performed with equipment in service under normal operating conditions, and extreme design conditions (max and min), to the extent that test conditions allow. The purpose of the test is to ensure that the PLC and Operator Graphics software configuration is working in conjunction with the hardware and facility as intended.

B. Application software problems encountered during the test will be investigated and corrected by the Contractor. Problems with PLC and/or SCADA software programming done by the Owner will be corrected by the Owner. The Contractor shall provide a qualified person familiar with the installation and trouble-shooting of PLC panels, working full time, under the direction of the Commissioning Coordinator, for the duration of the test. Prior to the test, the Contractor shall submit a written FAT procedure, prepared by the Commissioning Coordinator, to the Owner for approval. The Owner’s approval of the procedure prior to the start of the FAT is required.

C. Alarms and interlocks are simulated in the field by activating the final element (sensor) or where this is not possible, by simulating the test condition at field terminals as close as possible to the final element. Calibration checks completed for the Operational Readiness Test will not be repeated.

D. The Owner must be notified 48 hours prior to the start of the FAT and must be present during the test.

E. Any sections of the test are found to be unsatisfactory; the Contractor will be required to repeat the test at his expense.

1.3 COMPONENTS

A. Each component of a system shall be brought on line as required to simulate a fully functioning system.

B. Each component shall be tested at normal facility flows. If it is not possible to produce the flow, it can be simulated for this testing purpose.

C. Each component shall be fully functional and compatible with the system at the conclusion of the FAT.

D. Any repair or replacement of system components shall be completed and tested prior to final approval and beginning the RAT (Reliability acceptance Test).

1.4 TEST PROCEDURE

A. The Commissioning Coordinator shall prepare a written procedure and sign off sheet for each system. The sheet shall include all necessary components and requirements for the system. The procedure must be submitted to the Owner twenty-one (21) working days prior to the test for approval and comments. The Owner must approve the procedure prior to proceeding with the test.

B. Following is a general procedure for conducting the FAT:

1. Schedule test time with the Owner.
2. Set all valves and gates to the required position.
3. Energize electrical equipment.
4. Check and calibrate all transmitters, sensors, alarms and meters.
5. Simulate high, normal and low flow conditions.
6. Verify operation and reporting of the system through the SCADA System as well by manual operation.
7. Obtain approval from the Owner prior to terminating the test.

SAMPLE FUNCTIONAL ACCEPTANCE TEST PROCEDURE EXAMPLE PUMP STATION #1			
#	**Test and Setup**	**Required Results**	**Sign-off / Comments**
1	Verify all ORT's are complete and accepted by Owner	All ORT's complete (Provide copies of all ORT's)	
2	Notify Owner	All required people notified to observe test	
3	Verify all local and remote switches are in the off position	No unwanted starting of equipment	
4	Energize equipment at the MCC and power panel		
Example Pumps #1 through #3			
1	Open isolation valves	Pumps should not operate unless the isolation valves are open.	
2	Verify proper operation of level instruments	Verify the level instruments operate as intended.	
4	Verify downstream processes are ready to receive flow.	Pumps should not be operated unless downstream processes are available to receive flow.	
5	Provide utility water to wet well and fill wet well as needed.	Pumps should not operate without water in the wet well.	
6	Turn HOA switch to Hand	Verify the pump operates and run at appropriate flow/head conditions.	
7	Turn HOA switch to Auto	Pump should not operate until water level is at high level setpoint.	
8	Verify pump alarms along with pump on and pump off sequence with HOA in Auto.	Pump should operate as intended in Auto.	
9	De-energize equipment until Reliability Acceptance Test (RAT)	Contractor lock out tag out procedure	

Test Completion Endorsements			
		Signature/Date (Contractor)	Signature/Date(Owners Rep)
1	All components are complete and functioning.		
2	Acceptance to move on to Reliability Acceptance Test (RAT)		

SAMPLE RELIABILITY ACCEPTANCE TEST PROCEDURE (RAT)
EXAMPLE PUMP STATION #1

1.1 OVERVIEW

A. The RAT for the Example Pump Station #1 will involve other areas or systems that must start simultaneously; they are listed in Sequence of Operations in Section 011000, "Summary of Work". Each related area will have its own RAT. The Commissioning Coordinator will be responsible to prepare each RAT and schedule the startup of the systems with the Owner. The RAT cannot begin until the Functional Acceptance Tests (FAT) is complete and passed off by the Owner for all of the related areas.

1.2 CONSTRAINTS

A. The RAT will run for 7 continuous days without interruption or problem (unless a different duration is noted in Table 2 above). During the test, the responsibility for operation of the system and direction for testing falls on the Contractors Commissioning Coordinator with assistance from Equipment Manufacturers, Sub-Contractors, Engineer, Owner and Operators. The test, to the greatest extent possible, will take place at 80% of design flow for each process or piece of equipment. A contingency plan in case the RAT is suspended must be submitted.

B. If the system test is suspended for a period over 4 hours, due to equipment malfunction or break down, the entire test will be void and will need to start at the beginning of the test period.

C. The RAT must be repeated and run for an additional 7 continuous days without interruption and or problem following the construction and FAT for the Equalization Basin.

1.3 PROCEDURE

A. Prior to beginning the Influent Pump Station RAT, all of the related systems must be ready for their own RAT. These are identified in the Sequence of Operations in Section 011000, "Summary of Work." The contractor, with the approval of the Owner, may modify this list of related areas.

B. All ORT's and the FAT must be complete and approved prior to beginning the RAT. Documentation requirements will be discussed with the Commissioning Coordinator and Owner. The Commissioning Coordinator will create the logs, and record the information. The logs will be submitted to the Owner for acceptance at the conclusion of the test and have the logs available for review during the test.

C. A written procedure will be submitted to the Owner 60 days prior to the test for approval and comment. A sample startup activity list for the Influent Pump Station is provided below.

EXAMPLE WET WELL #1 STARTUP ACTIVITY		
1.	Verify completion of ORT's and FAT.	
2.	Verify the Owner has approved the RAT procedure.	
3.	Verify all downstream systems are ready to accept flow. (See Section 011000 for a list of related systems.)	
4.	Startup meeting with Owner, Operators, Commissioning Coordinator and Engineer reviewing the startup plan.	
Influent Pump Station		
	Downstream Process Equipment should be operating	
1.	Open the appropriate pump isolation valves.	
2.	Energize Pumps #1, #2 and #3	
4.	Set the HOA switch for Pumps #1, #2 and #3 to Auto.	
5.	Open the appropriate isolation valves and/or gates to introduce flow to the wet well.	
6.	Verify the operation of the pump station.	
8.	Start the clock for the RAT.	

DOCUMENTATION

A test and issue log will be the only required documentation for the Influent Pump Station RAT. A sample log sheet is provided below.

EXAMPLE PUMP STATION #1 TEST AND ISSUE LOG				
Activity/Equipment	Start	Verify Proper Operation	Stop	Comments/Issues

	Time/Date	Initial Y=Yes N=No							Time/Date	(Use additional sheet if needed.)
		S	M	T	W	T	F	S		
Pump #1										
Pump #2										
Pump #3										
Level Sensor #1										
Level Alarm Low										
Level Alarm High										
Level Alarm High/High										
Note:										
Contractor Approval:										
Engineer Approval:										
Owner Approval:										

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 017500 “Commissioning” for commissioning requirements.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents (submitted by the Contractor)

B. Contractor's List of Incomplete Items: Initial submittal by the Contractor at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal by the Contractor at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include comments from the Construction Manager, Owner and Engineer.
4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Engineer will return annotated copy.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer’s signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video as required.
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.

10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 14 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.5 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
1. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or

installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. Operating manuals, technical manuals and instructions. The Contractor's attention is directed to the condition that one percent (1%) of the contract price will be deducted from any monies due the Contractor as progress payments if at the seventy-five percent (75%) construction completion point the approved technical manuals have not been submitted in accordance with Section 013300 entitled, "Contractor Submittals". The aforementioned amount will be retained by the Owner as the agreed estimated value of the approved technical manuals. Any such retention of money for failure to submit the approved technical manuals on or before the seventy-five percent (75%) construction completion point shall be in addition to the retention of any payments due to the Contractor as specified in Article 4 of the Contract.

E. Releases from all parties who are entitled to claims against the subject project, property or improvement pursuant to the provisions of law.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    p. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired.

Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Four (4) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. One set will be provided to the Engineer and three sets to the Owner.

C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Engineer will return copy with comments.

1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

C. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Engineer.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily

navigated file tree. Configure electronic manual to display bookmark panel on opening file.

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.

2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: The Contractor shall submit one (1) set of marked-up record prints to the Engineer.

B. Record Specifications: The Contractor shall submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal to the Engineer.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Engineer through Construction Manager for resolution.
4. Engineer will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Engineer and Construction Manager.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's and Construction Manager's reference during normal working hours.

END OF SECTION 017839

SECTION 26 00 00 – GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. General requirements which apply to all electrical aspects of the work.

B. Related Sections

1. The Contract Documents are a single integrated document. As such, all Divisions and Sections are applicable. The CONTRACTOR and its SUBCONTRACTORS are responsible to review all parts of the Contract Documents to provide a complete and coordinated project.

1.2 REFERENCES

A. The installation and commissioning of the Electrical System shall conform to all applicable codes, regulations, standards, and specifications, including, but not limited to those listed below. These publications are referenced to by designation but not by edition. The latest edition accepted by the Authority Having Jurisdiction in effect at the time of bid shall govern.

a. State and Local Codes and Authority Having Jurisdiction (AHJ)
b. National Electric Code (NEC).
c. National Fire Protection Association (NFPA)
d. Institute of Electrical and Electronic Engineers (IEEE)
e. American National Standards Institute (ANSI)
f. American Society for Testing and Materials (ASTM)
g. Insulated Cable Engineers Association (ICEA)
h. National Electrical Manufacturers Association (NEMA)
i. Federal Occupational Safety and Health Act (OSHA)
j. Underwriters Laboratories, Inc. (UL)
k. International Society of Automation (ISA)

1.3 DEFINITIONS

A. Refer to the Contract Drawings sheet E001 for a list of abbreviations associated with the Electrical System. In addition, the following definitions are used in this section:

a. AHJ – Authority Having Jurisdiction
b. I&C – Instrumentation and Controls
c. IS – Instrumentation Supplier
d. NEC – National Electric Code
e. VFD – Variable Frequency Drive
f. UL - Underwriters Laboratories, Inc.

1.4 ELECTRICAL SYSTEMS REQUIREMENTS

A. The Work is to provide all labor and materials necessary for erecting a complete and operational Electrical System, tested and ready for continuous use as described by the Contract Documents. The Electrical System shall be constructed in accordance with the Contract Documents, and Federal, State, and Local codes and regulations. In addition, the Work shall adhere to the following general provisions:

1. The Electrical CONTRACOTR shall obtain all necessary permits required by the AHJ. In addition, the Electrical CONTRACTOR shall ensure that all inspections required by the AHJ are coordinated, conducted, and documented.

2. All work shall be completed in a neat, workmanlike manner in accordance with the latest NEC standards of installation under competent supervision.

3. The Electrical CONTRACTOR shall visit the job site prior to bidding to become familiar with existing conditions and other factors, which may affect the execution of the work. Include all related costs in the initial bid proposal.

4. Coordinate work with the utilities providing services on this project. This may include but is not limited to the electric utility, telephone utility, cable TV/Internet utility. All electrical work associated with utilities shall be provided and installed per the utility requirements.

5. All materials shall be new and of the best quality, manufactured in accordance with the requirements listed in part 1.2 of this section. The CONTRACTOR shall furnish and install the parts and pieces necessary to the installation of equipment, in accordance with the best practice of the trade, and in conformance with the requirements of these Contract Documents.

6. Protect all electrical material and equipment that is being stored or has been installed against damage by other trades, weather conditions, or any other preventable causes. Equipment damaged during shipping, storage, or construction, prior to acceptance by the engineer or the owner, will be rejected as defective.

7. Electrical wiring, conduits, etc. shall be installed within walls, ceilings, and other enclosures whenever feasible.

8. Leave the site clean. Remove all debris, empty cartons, tools, conduit, wire scraps and all miscellaneous spare equipment and materials used in the work during construction. All components shall be free of dust, grit, and foreign materials, left as new before final acceptance of work. Damaged paint and finishes shall be touched up or repainted with matching color paint and finish.

9. Electrical equipment shall be capable of operating successfully at full-rated load, without failure, at an ambient air temperature of 40 degrees C, and specifically rated for the altitude indicated on the Plans. Electrical equipment not rated for operation at that temperature shall be provided with air conditioning to meet the manufacturers' operating temperature.

10. If any contradictions, contrasts, non-homogeneity, or inconsistency appears, the strictest criteria noted and the collective requirements in any and all of the Contract Documents shall apply.

11. The Electrical CONTRACTOR shall perform necessary saw cutting, core drilling, excavating, removal, shoring, backfilling, and other work required for the proper installation of conduits, whether inside, or outside of the buildings and structures. The Electrical CONTRACTOR shall repair and patch where demolition has taken place in a manner to match existing original structure.

B. To provide a complete system, oversee and coordinate with all electrical equipment and services being provided outside of CONTRACTOR's scope.

1. The Engineer is responsible to ensure that equipment being supplied by others related to the electrical system complies with the requirements of the Contract Documents

2. The Electrical CONTRACTOR is responsible to coordinate the installation, commissioning and scheduling of equipment related to the I&C System that are provided by others.

C. Oversee and coordinate with all equipment and services being provided by the CONTRACTOR but outside of the Electrical CONTRACTOR's scope.

1. Inform all vendors and suppliers providing equipment related to the Electrical System the requirements of Division 26.

2. The Owner is not responsible for any additional costs incurred by requiring vendors and/or SUBCONTRACTORs to meet the requirements of Division 26.

3. If a vendor or supplier is unable to meet the requirements of Division 26, the CONTRACTOR may submit in writing to the Engineer the reasons for non-compliance. The Engineer will then evaluate the reasons and determine whether a solution may be determined or if a different vendor or supplier is required.

D. Prepare Electrical System Submittals as required by Division 26 and Section 013300 "Contractor Submittals". Coordinate with the IS and the requirements of Division 40 to ensure that all equipment being supplied by the Electrical CONTRACTOR and/or IS has been submitted.

E. Oversee the installation of the Electrical System.

F. Actively participate in loop testing as outlined in Division 40.

G. Actively participate in commissioning as outlined in Division 40.

H. Maintain record drawings.

1. Maintain on the construction site a set of the Electrical Drawings that shall be continuously marked up during construction.

a. The drawings should be updated at least weekly and will be checked monthly by the Owner's representative.
b. Upon completion of startup, submit the marked-up drawings to the Engineer for review and for drafting.

I. Prepare O&M manuals.

1. Provide O&M manuals in accordance with Section 017823 "Operation and Maintenance Data".

J. Provide training on electrical equipment that has been installed.

1.5 ACTION SUBMITTALS

A. General

1. Submittals for Division 26 shall meet the requirements of Section 013300 "Contractor Submittals". In addition, the following requirements shall be met:

a. Submittals shall include bills of materials with quantities, makes, models, exact part numbers and descriptions.
b. Edit all submittals such that only pertinent information is submitted. Neatly cross out information that does not apply, options that are not being supplied, etc.
c. Show product dimensions, construction, and installation details, wiring diagrams, and specifications.
d. If there are exceptions to the Contract Drawings and Specifications, provide a list of exceptions with detailed explanations for the exceptions. The Engineer will review the list of exceptions and determine whether a solution may be determined or if the exception(s) will not be allowed.

2. Furnish submittals required by each Section within Division 26.
3. When submitting on equipment, use the equipment and instrumentation tags depicted in the Contract Drawings.

B. Recommended Spare Parts Submittal

1. Submit a list of spare parts for all the equipment associated with the Electrical System. The list of spare parts shall include list pricing for each item.
2. Provide the name, address and phone number for each manufacturer and manufacturer's local sales representative.
3. Indicate whether the spare parts are being provided under this contract or not.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. All equipment supplied for this project shall meet the requirements of the NEC and shall be listed by and bearing the label of the UL.

B. The Electrical CONTRACTOR shall be a company that has been actively involved in the installation and commissioning of Electrical Systems for a minimum period of five years.

C. The Electrical CONTRACTOR shall have adequate facilities, manpower and technical expertise to perform the Work associated with the Electrical System and as outlined by the Contract Documents.

D. The Electrical CONTRACTOR shall have similar project experience of at least four successfully completed projects for a similar wastewater system. The Electrical CONTRACTOR company must have performed similar work for these projects as required herein.

PART 2 - PRODUCTS

2.1 MATERIALS AND METHODS

A. Materials, equipment, and parts comprising any unit, or part thereof, specified or indicated on the Plans, shall be new and unused, of current manufacture, and of highest grade consistent with the state of the art. Damaged or dirty materials, equipment, and parts are not considered to be new and unused and will not be accepted.

B. Field verification of scale dimensions on Plans is directed, since actual locations, distances, and levels will be governed by actual field conditions. The CONTRACTOR shall also review architectural, structural, yard, mechanical, and other Plans, and the accepted electrical and mechanical shop drawings, and shall adjust their work to conform to the conditions indicated therein.

C. The fabricator of major components, such as distribution panelboards, switchgear, and motor control centers, shall also be the manufacturer of the major devices therein. Where possible, the major components shall be manufactured and supplied by the same fabricator.

2.2 MANUFACTURERS

A. All equipment provided for the Electrical System shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.

B. Refer to various Division sections for individual equipment manufacturers. Indicated manufacturers are subject to strict compliance with the specifications and complete project documents. The reference to a particular manufacturer does not relieve the Electrical CONTRACTOR from conforming to the specified requirements.

C. When providing like electrical components they shall be furnished by a single manufacturer and shall be consistent throughout the project. For example, a 20A 2-way light switch in one

building should match a 20A 2-way light switch in another building in both make, model and features.

2.3 EQUIPMENT ASSEMBLIES

A. Equipment assemblies, such as Service Entrance Sections, Switchgear, Switchboards, Control and Distribution Panels, and other custom fabricated electrical enclosures shall bear a UL label as a complete assembly. The UL label on the individual components making up the assembly will not be considered sufficient to meet the present requirement. Whenever a generic UL label does not apply for the assembly, a serialized UL label shall be affixed to the assembly, and the serial number shall be submitted with the assembly record shop drawings.

B. Custom fabricated electrical control panels, and enclosures shall bear a serialized UL label affixed by a local inspector, and the serial number shall be submitted with the assembly record shop drawings.

2.4 OPERATING CONDITIONS

A. The Electrical System shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:

   a. Environment: Wastewater Lift Stations
   b. Temperature Extremes: 30°F to 122 °F (Outdoors); 40°F to 104 °F (Indoors).
   c. Relative Humidity: 20% to 90%, non-condensing.

B. Indoor and outdoor electrical equipment shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided to maintain electrical devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The CONTRACTOR shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. Electrical equipment in hazardous areas shall be suitable for and rated for use in the hazardous or classified location in which it is to be installed.

2.5 SEISMIC RESTRAINT

A. The construction area is classified by the International Building Code (IBC) as Seismic Class C. The Code requires that not only the structures, but also major electrical components be designed and installed in a manner which will preclude damage during a seismic event. All electrical equipment shall be securely anchored and seismic braced in accordance with regulations contained in the most recent adopted edition of the IBC, and the Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA) "Guidelines for Seismic Restraints of Electrical Systems".

B. Units mounted and secured directly to structure shall be provided with connectors of sufficient strength to meet the restraining criteria.

C. All electrical equipment which is securely anchored (hard mounted) to the building or structure shall have supports designed to withstand lateral and vertical "G" loadings equal to or greater than IBC requirements and SMACNA guidelines.

D. Shop drawings are required for all equipment anchors, supports and seismic restraints. Submittals shall include weights, dimensions, load/deflection data, center of gravity, standard connections, manufacturer's recommendations, and behavior problems (vibration, thermal, expansion, etc.) associated with equipment.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.

B. Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.

C. Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package.

D. Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the CONTRACTOR. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the Engineer. If such tests reveal defects, the equipment shall be replaced.

3.2 INSTALLATION

A. The Electrical System indicated throughout the design is diagrammatic and therefore locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Installation of systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the CONTRACTOR shall make such changes without additional cost to the Owner.

B. Discrepancies indicated on different Plans, between Plans and actual field conditions, or between Plans and Contract Documents shall be promptly brought to the attention of the Engineer for clarification, prior to purchasing and installing equipment.

C. The alignment of equipment and conduit shall be adjusted to accommodate architectural changes, or to avoid work of other trades, without extra expense to the Owner.

D. Items not specifically mentioned in these Contract Documents, or noted on the Plans, or indicated on reviewed shop drawings, but which are obviously necessary to make a complete working installation, shall be deemed to be included herein.

E. The Electrical CONTRACTOR shall layout and install electrical work prior to placing floors and walls. Furnish and install sleeves and openings through floors and walls, required for installation of conduits. Sleeves shall be rigidly supported and suitably packed, or sealed, to prevent ingress of wet concrete. Spacers shall be installed in order to prevent conduit movement. Dimensions indicated for electrical equipment and their installation are restrictive dimensions.

F. The Electrical CONTRACTOR shall furnish and install inserts and hangers required to support conduits and other electrical equipment. If the inserts, hangers, sleeves, or other mounting hardware are improperly placed, or installed, the CONTRACTOR shall do necessary work, at their own expense, to rectify the errors.

G. The Electrical System is integrally connected to I&C, mechanical and structural systems. Coordinate with these other disciplines the installation of these related components.

H. Electrical equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

I. The Contract Documents show necessary conduit and instruments required to make a complete instrumentation system. The CONTRACTOR shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the Engineer for approval prior to commencing that Work. Such changes shall not be a basis of claims for extra Work or delay.

J. Instrumentation, control panels, wiring and all other I&C equipment shall be properly tagged and/or labeled per the requirements of Section 260553 “Identification for Electrical Systems”.

K. Installation of the I&C System shall be according to the finalized Shop Drawings

3.3 FACTORY ACCEPTANCE TESTING (FAT)

A. The IS shall arrange for the manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the Engineer and Owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems, and other pertinent systems and devices. A minimum of 10 days notification shall be furnished to the Engineer prior to testing. No shipments shall be made without the Engineer's approval.

B. For each FAT, the IS shall develop and submit a FAT Plan and Procedure Document within 10 days of the FAT. The FAT Plan and Procedure shall as a minimum shall have the following:

    a. Descriptions of test methods to be performed during the FAT.

b. FAT Schedule and Procedure
c. FAT Checklists that allow for sign-off and comments for each test method and procedure.

C. Control Panel Completion Test Methods: The following test methods should be performed during the FAT for each control panel:

1. Completed Shop Drawings: Demonstrate that the control panel has been built according to the shop drawings and that the shop drawings are accurate.

2. Panel Layout: Demonstrate that the control panel has been laid out as designed and as required by Division 40.

3. Power Distribution: Demonstrate all power distribution circuits, including but not limited to AC power circuits, UPS operation, signals and circuits and DC circuits.

4. Control Circuits: Demonstrate the correct installation of each control circuit. Using a signal generator or multi-meter, show the correct operation of each input, output, relay, barrier, buttons, switches, or any other control device. Demonstrate the proper functionality of any hard-wired interlocks that may be associated with each control circuit.

5. Panel Networking/Communications: If any form of communications is associated with the control panel, verify the proper operation of each communication port and link.

D. Control Loop Test Methods: To demonstrate that the control panel will provide its function as intended, provide the following control loop test methods. If programming for the control panel is provided by others, coordinate with the programmer to have all programming completed and tested prior to the FAT. If needed, coordinate to have the programmer present for the FAT.

1. Alarm Functions: Verify and/or simulate each alarm condition associated with each control loop.

2. Local Manual and Auto Functions: Verify and/or simulate each Local Manual and/or Auto function associated with each control loop.

3. SCADA Manual and Auto Functions: Verify and/or simulate each SCADA Manual and/or Auto function associated with each control loop.

4. Control Loop Interlocks: Demonstrate the functionality of any software interlocks that may be associated with each control loop.

E. If the FAT does not pass and needs to be repeated, the IS shall be responsible for additional per diem costs incurred by the Engineer and Owner.

F. All changes and/or corrections made during the FAT shall be noted on the checklists.

G. Following completion and approval of all FAT, provide the finalized checklists to the Engineer and as part of the equipment shop drawings.

3.4 FIELD QUALITY CONTROL

A. Allow for inspections by the Engineer and/or Owner of the I&C System at any time during the construction. Inspections shall be conducted to verify that the installation is per the requirements of the Contract Documents.

3.5 CALIBRATION

A. Devices provided under Division 40 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.

B. Each instrument shall be calibrated at 0, 25, 50, 75, and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Standards and Testing.

C. Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations need adjustment. Such adjustments, if required, shall be made only after consultation with the Engineer.

D. Instruments which were not bench-calibrated shall be calibrated in the field to ensure proper operation in accordance with the instrument loop diagrams or specification data sheets.

E. Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. For each instrument calibration, provide a calibration sheet and update the corresponding TR20 Instrument Form with the new calibration data. The Calibration sheet shall include the following as a minimum:
   1. Date of calibration
   2. Project Name.
   3. Tag Number.
   4. Manufacturer, model, and serial number.
   5. Calibration data including range, input, output, and measurement at each calibration point.
   6. Space for comments.
   7. Space for sign-off by party performing calibration.

G. A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the Engineer. The IS shall sign the tag when calibration is complete. The Engineer will sign the tag when the calibration and testing has been accepted.

3.6 LOOP TESTING

A. Each control loop shall have been installed according to the finalized loop drawing. Prior to the commencement of loop testing, the following pre-requisites should have been met:
   1. All associated equipment, conduit and wire has been permanently installed, terminated, and inspected.

2. All wiring has been properly pulled, terminated, and labeled.
3. Each wire has been tested with a point-to-point test.
4. All control panels and electrical equipment have been checked out and tested as required by Division 26.
5. All instrumentation has been appropriately installed and calibrated.
6. Loop Test Forms for each loop to be tested have been created and will be available during the loop testing.

B. Each loop test shall have a Loop Test Form prepared and ready prior to each loop test. The loop test form shall have the following:
   1. Loop Number and Description
   2. Check-Off List with room for sign-off and dated by the IS, Programmer, and Owner's Witness as well as room for comments. The list of items to be checked off for each loop should include but is not limited to the following:
      a. Each power distribution circuit.
      b. Each control circuit.
      c. Each alarm circuit.
      d. Each PLC input/output point.
      e. Each Local Manual, Local Auto, SCADA Manual & SCADA Auto function.
      f. Each hard-wired and software interlock.

C. Upon completion of the above pre-requisites for loop testing, the IS shall oversee and coordinate each loop test. The IS is responsible to be present for all loop testing, whether the equipment was supplied by the IS or not. The IS is responsible to have all responsible parties associated with each loop present. This includes but is not limited to manufacturer representatives, vendor technicians, electrical installers, mechanical installers, and programmer. The IS shall coordinate with the Owner and Engineer to allow for witnessing of loop testing as deemed necessary by the Owner and Engineer.

D. Issues that arise during loop testing should be addressed and fixed immediately. If it is not feasible to immediately fix the issues, the loop testing should be re-scheduled as soon as possible to avoid delays. Any costs associated with re-testing and requiring all parties to return to the site shall in no way be incurred to the Owner.

E. Following a successful loop test, the appropriate parties should sign and date the Loop Test Forms. All Forms shall be certified and submitted to the Engineer as part of the O&M Manuals.

F. Following loop testing, in no way should any parts of the loop be modified. In no way shall any wiring be re-routed or re-terminated. If any such work occurs, all affected loops shall be re-tested at no expense to the Owner.

3.7 COMMISSIONING

A. The IS shall oversee, coordinate and be present during all commissioning activities. The IS shall be responsible for obtaining the assistance of the Contractor and Subcontractors as may be required for commissioning activities.

B. Commissioning shall commence after acceptance of wire test, calibration tests and loop tests, and inspections have demonstrated that the instrumentation and control system complies with Contract requirements. Pre-commissioning shall demonstrate proper operation of every system

with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.

C. Commissioning and test activities shall follow detailed test procedures and check lists accepted by the Engineer. Test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the Engineer, which include calculated tolerance limits for each step. Completion of system commissioning and test activities shall be documented by a certified report, including test forms with test data entered, delivered to the Engineer with a clear and unequivocal statement that system commissioning and test requirements have been satisfied.

D. Where feasible, system commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under startup and steady state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. Hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady state operation of final control elements running under the control of field mounted automatic analog controllers or software-based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software-based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any), and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.

E. Electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset, or rate settings as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 0, 25, 50, 75, and 100 percent of span and the results checked against indicated accuracy tolerances.

3.8 TRAINING

A. Develop a Training Plan for the training requirements of Division 40 and submit it to the Engineer for approval. Coordinate with the Engineer and Owner the time and locations of each training session. Schedule the trainings for after the equipment has been pre-commissioned.

B. As part of the Training Plan, submit a résumé for everyone to be providing training. Training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.

C. Each training session shall include a written agenda.

D. The CONTRACTOR shall train the Owner’s personnel on the maintenance, calibration and repair of instruments provided.

E. Within 10 days after the completion of each session, the CONTRACTOR shall submit the following:

a. A list of Owner personnel who attended the training.
b. A copy of the training materials used during the session with notes, diagrams, and comments.

END OF SECTION 26 00 00

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. All conductors, conductor insulation and multiconductor cables shall comply with NEMA WC 70.

B. Wire sizes shall be American Wire Gauge (AWG) sizes with Class B stranded construction Number 2 AWG and smaller shall be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables shall be coded by the use of colored tape. Conductors #6 AWG or smaller shall be THWN-2 or XHHW-2. Number 4 and larger shall be XHHW-2.

C. Individual or multiple conductor cables for power, control, and alarm circuits of 480 volts or less shall be insulated for not less than 600V.

D. Where wire size is not indicated, they shall be of the size required by the NEC, except that no wire external to panels and motor control centers shall be less than #12 AWG, unless specifically noted on the Plans. Control wires shall be allowed to be #14 so long as there is appropriate protection (fuse or circuit breaker sized at 15A or less).

E. Multi-conductor tray cables shall be rated 600 volts, listed by UL as Type TC cable or ITC for instrumentation cable only per Article 340 of the NEC. The individual conductors shall be UL listed as Type XHHW, with a sunlight-resistant overall jacket. Conductor sizes shall be the same as for power and lighting wire and control wire above. Connectors/Terminators shall be watertight and manufactured of the same material as the cabling system referenced elsewhere in division 26.

F. Multi-conductor tray cables to be installed in classified areas shall be armored, rated 600 volts, listed by UL as Type MC-HL cable per Article 340 of the NEC. The individual conductors shall be UL listed as Type XHHW, with a sunlight-resistant overall jacket. Conductor sizes shall be the same as for power and lighting wire and control wire above. Connectors/terminators shall be rated for classified areas and submitted upon accordingly.

G. All wiring shall be as indicated on the Plans. Wires shall be new and shall be soft drawn copper with not less than 97 percent conductivity. The wire and cable shall have size, grade of insulation, voltage, and manufacturer's name permanently marked on the outer covering at not more than 2-foot intervals. All wires shall conform to the latest Standards of the ASTM, and ICEA, and shall be tested for their full length by these Standards. Insulation thickness shall be not less than that specified by the National Electrical Code.

H. VFD Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.
3. Comply with UL requirements for cables in direct burial or Classes I and II, Division 2 hazardous location applications.

I. Table I below describes the conductor color code that shall be followed:

Table I

	120/208VAC	**480VAC**	**12VDC**	**24VDC**	**24VAC**
Phase 1	Black	Brown			
Phase 2	Red	Orange			
Phase 3	Blue	Yellow			
Neutrals/Commons	White	White	Orange/White	Blue/White	Yellow/White
Ground	Green	Green	Green	Green	Green
Control	Red		Orange	Blue	Yellow

J. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Insulated Wire Corporation

2. Cablec Corporation
3. Okonite Company
4. Southwire Company
5. Or Approved Equal

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

B. Connectors and splices shall be rated at not less than 600 volts. Splicing shall join conductors mechanically and electrically to provide a complete circuit prior to installation of insulation.

C. Splices in wires No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, Type I, Class 1, Grade B, Style G, or Type II, Class 1 of FS W-S-610 and conforming to the applicable requirements of UL 486A.

D. Splices in wires No. 8 AWG and larger shall be made with non-insulated, solderless, pressure type connector, Type II, Class 2 of FS W-S-610, conforming to the applicable requirements of UL 486A and UL 486B. They shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket.

E. Insulated conductor splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

F. Bare conductor splices in wet locations or below grade shall be of the exothermic type.

G. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Power Systems, Inc.
2. O-Z/Gedney; EGS Electrical Group LLC.
3. 3M; Electrical Products Division.
4. Or Approved Equal

2.3 PULLING LUBRICANT

A. All cables shall be properly coated with a water-based (wax-based is not acceptable) pulling compound before being pulled into conduits so as to prevent mechanical damage to the cables during installation. Lubricants shall be approved by the cable manufacturer for use with the cable being installed.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Polywater
2. Ideal Aqua-Gel

3. Or Approved Equal

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Stranded for all sizes.

B. Branch Circuits: Copper. Stranded for all sizes.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway

B. Exposed Feeders and Branch Circuits: Type THWN-2 or XHHW-2 based on wire size requirements described in Part 2, single conductors in raceway. Multiconductor Tray Cable type TC shall be used where runs are to be in cable trays as shown on the drawings.

C. Feeders and Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THWN-2 or XHHW-2 based on wire size requirements described in Part 2, single conductors in raceway. Metal-clad cable, Type MC shall be allowed in ceilings that are considered dry and non-corrosive areas.

D. Feeders and Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN-2 or XHHW-2 based on wire size requirements described in Part 2, single conductors in raceway.

E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

F. Class 1 Control Circuits: Type THWN-2, in raceway. Multiconductor Tray Cable type TC shall be used where runs are to be in cable trays as shown on the drawings.

G. Class 2 Control Circuits: Type THWN-2, in raceway. Power-limited tray cable shall be used where runs are to be in cable tray as shown on the drawings.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. As far as practical, all circuits shall be continuous from origin to termination without splices in intermediate pull boxes. Sufficient slack shall be left at the termination to make proper connections. In no case shall a splice be pulled into the conduit. Conductor splicing shall not be permitted without the Engineer's approval. Conductor splices shall not be made in underground junction boxes or manholes unless specifically noted on the plans.

C. Each feeder and branch circuit shall be installed in its own individual conduit unless combining feeder and branch circuits is permitted as defined in the following:

1. As specifically indicated on the Plans.
2. For lighting, multiple branch circuits may be installed in a conduit as allowed by the NEC and with the wire ampacity de-rated in accordance with the requirements of the NEC. Conduit fill shall not exceed the limits established by the NEC.
3. When field conditions dictate, and written permission is obtained from the Engineer.

D. Use manufacturer-approved pulling compound or lubricant when pulling conductors; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

E. Feeder and branch circuits shall be isolated from each other and from all instrumentation and control circuits.

F. Control circuits shall be isolated from all other feeder, branch and instrumentation circuits, except as noted above. 12VDC, 24VDC and 48VDC control circuits may be combined into one conduit. 120/208/240VAC control circuits shall be isolated from all DC control circuits. 277/480VAC circuits shall be isolated from all other voltages.

G. Single conductor cable in cable trays shall be No. 1/0 or larger and shall be of a type listed and marked for use in cable trays. Tray cable smaller than 1/0 shall be multi-conductor, with outer jacket.

H. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

I. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

J. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems".

K. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems".

L. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

M. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

N. Wiring at Outlets and Switches: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling".

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping".

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.

    a. All conductors with voltages at 277V or higher and corresponding neutrals and grounds.

    b. All conductors #8 and larger.
    c. All motor leads and corresponding grounds.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Instrumentation cabling.
2. Low-voltage control cabling.
3. Control-circuit conductors.
4. Identification products.

B. Related Sections

1. For structured cabling systems, including fiber optic cabling and CAT6 cabling refer to Section 409533.

1.2 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of an NRTL.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

B. Test each pair of each cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Conduit and Boxes: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 INSTRUMENTATION CABLE

A. Instrument cable shall be Type TC, and have the number of individually shielded twisted pairs indicated on the Plans and shall be insulated for not less than 600 volts. Unless otherwise indicated, conductor size shall be No. 18 AWG minimum. Shielded, grounded instrumentation cable shall be used for all analog and low voltage digital signals.

B. The jacket shall be flame retardant with 90 degrees C temperature rating. The cable shield shall be a minimum of 2.3 mil aluminum or copper tape overlapped to provide 100 percent coverage and a tinned copper drain wire.

C. The conductors shall be bare soft annealed copper, Class B, 7 strand minimum concentric lay with 15 mils nominal thickness, nylon jacket, 4 mil nominal thickness, 90 degrees C temperature rating. One conductor within each pair shall be numerically identified.

D. Pairs shall be assembled with a nominal 2-inch lay and shall then be group shielded with a minimum of 1.3 mil aluminum or copper tape overlapped to provide 100 percent coverage. All group shields shall be completely isolated from each other.

E. Pairs installed in a cable tray shall have a UV resistant jacket, and shall have a jacket intended for cable tray use.

2.3 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.4 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.5 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

C. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.

2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

D. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Plastic jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.6 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, complying with UL 83.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, complying with UL 83.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.7 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Panduit Corp.
3. Or Approved Equal.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Section 260553 "Identification for Electrical Systems".

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

B. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for installation of conduits and wireways.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

D. Pathway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed or in the corner of room if multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 12 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 24 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 48 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 6 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: 3 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

5. Separation between Cables and Electrical Motors and Transformers: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 6 inches.

3.3 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, No 12 AWG.

3.5 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. For data communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 260523

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Table or list of equipment, panel and disconnect switch labels.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Write-On Tags shall not be allowed.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label. Heat shrink tubing, or sleeve type wire markers are also acceptable.

A. Write-On Tags shall not be allowed.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

C. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label. Heat shrink tubing, or sleeve type wire markers are also acceptable.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags shall not be allowed.

2.5 FLOOR MARKING TAPE

A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type I:

1. Pigmented polyolefin, bright-colored, compounded for direct-burial service.
2. Thickness: 4 mils.
3. Weight: 18.5 lb/1000 sq. ft.
4. 3-Inch Tensile According to ASTM D 882: 30 lbf, and 2500 psi.

D. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft.
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 CONDUCTOR LABELING SCHEME

A. All control and instrumentation conductors shall be labeled with a “To/From” labeling scheme. Each conductor label shall have two lines of text. The first line of text shall indicate the enclosure and terminal where the wire is to terminate on the other end. The second line of text shall indicate the enclosure and terminal where the wire is to terminate on this end. The following example illustrates the “To/From” labeling scheme:

1. A wire is connected between a VFD and an LCP. The VFD equipment tag is VFD-100 and the LCP equipment tag is LCP-100. The connecting terminal at the VFD enclosure is terminal “5”. The connecting terminal at the LCP is terminal “7”. This wire would have the following labels:
   a. The wire label at the VFD end:
      Top Line: “LCP-100 : 7”
      Bottom Line: “VFD-100 : 5”
   b. The wire label at the LCP end:
      Top Line: “VFD-100 : 5”
      Bottom Line: “LCP-100 : 7”

3.2 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.3 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

a. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.

3) Phase C: Blue.

b. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 409000 – INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. General requirements which apply to all Instrumentation and Control for Process Systems (hereafter referred to as I&C).

B. Related Sections

1. The Contract Documents are a single integrated document. As such, all Divisions and Sections are applicable. The Contractor and its Subcontractors are responsible to review all parts of the Contract Documents in order to provide a complete and coordinated project.

C. Complete I&C System

1. The requirements for the I&C System shall be the responsibility of a single company hereafter referred to as the Instrumentation Supplier (IS). The IS shall be responsible for all parts of this Section and Sub-Sections as well as all other related sections that may pertain to the I&C System. The IS may also be the Electrical Contractor for the project.
2. The Contractor, through the IS and qualified electrical and mechanical installers, shall be responsible to the Owner for the implementation of a complete I&C System. The IS shall provide all necessary coordination, material and labor such that the entire system be complete and functional. This includes but is not limited to the proper operation and monitoring of electrical power systems, process systems, mechanical equipment, instrumentation, control panels, programmable controllers, communications/networking, and SCADA system.
3. The overall I&C system design is based upon non-certified information that has been furnished by various equipment manufacturers and vendors. It is the Contractor's responsibility to include in the bid and installation all labor and material to provide a complete system based upon actual information from equipment being supplied for the project. Any changes or additions due to non-certified manufacturer or vendor information shall be provided at no additional cost to the Owner.

1.2 REFERENCES

A. The installation and commissioning of the I&C System shall conform to all applicable codes, regulations, standards and specifications, including, but not limited to those listed below. These publications are referenced to by designation but not by edition. The latest edition accepted by the Authority Having Jurisdiction in effect at the time of bid shall govern.

1. State and Local Codes and Authority Having Jurisdiction (AHJ)
2. American National Standards Institute (ANSI)
3. American Petroleum Institute (API)

4. Federal Communications Commission (FCC)
5. Federal Occupational Safety and Health Act (OSHA)
6. International Society of Automation (ISA)
7. Institute of Electrical and Electronic Engineers (IEEE)
8. National Electric Code (NEC).
9. National Electrical Manufacturers Association (NEMA)
10. National Fire Protection Association (NFPA)
11. Underwriters Laboratories, Inc. (UL)

1.3 DEFINITIONS

A. The following definitions may be used throughout this section and subsections (refer to the contract drawings sheet GI-1 for instrumentation abbreviations):

1. CTC: Communications termination cabinet.
2. FAT: Factory acceptance test.
3. HMI: Human machine interface.
4. I&C: Instrumentation and control for process systems
5. IS: Instrumentation supplier.
6. LAN: Local area network.
7. LCP: Local control panel.
8. NC: Normally closed.
9. NO: Normally open.
10. OIT: Operator interface terminal.
11. OSI: Owner's System Integrator.
12. PC: Personal computer.
13. PID: Control action, proportional plus integral plus derivative.
14. PLC: Programmable logic controller.
15. P&ID: Process and instrumentation diagram
16. RIO: Remote input/output
17. SCADA: Supervisory control and data acquisition.
18. UPS: Uninterruptible power supply.
19. VCP: Vendor control panel.
20. WAN: Wide area network

1.4 I&C SYSTEM REQUIREMENTS

A. Work provided outside of Contractor's scope:
1. All PLC and HMI equipment being supplied by the Contractor is to be programmed by the Owner's System Integrator.

B. The Work is to provide a complete and operational I&C System as described by the Contract Documents. This includes but is not limited to the following:

1. Before providing a bid as the IS, coordinate with all bidders such that all costs associated with a complete I&C System are accounted for. The Owner shall not be responsible for any additional costs for scope items that have been excluded from the bid as a result of not coordinating with all bidders.

2. The IS shall submit a statement of qualifications verifying that it meets the requirements of 409000.1.8. The IS must be approved by the Engineer before proceeding with the Work.

3. In order to provide a complete system, oversee and coordinate with all equipment and services being provided outside of Contractor's scope.
   a. The Engineer is responsible to ensure that equipment being supplied by the Owner related to the I&C System complies with the requirements of the Contract Documents
   b. The Contractor and IS are responsible to coordinate the installation, commissioning and scheduling of equipment related to the I&C System that are provided by the Owner.

4. Oversee and coordinate with all equipment and services being provided by the Contractor but outside of the IS's scope.
   a. Inform all vendors and suppliers providing equipment related to the I&C System the requirements of Division 40.
   b. The Owner is not responsible for any additional costs incurred by requiring vendors and/or subcontractors to meet the requirements of Division 40.
   c. If a vendor or supplier is unable to meet the requirements of Division 40, the Contractor may submit in writing to the Engineer the reasons for non-compliance. The Engineer will then evaluate the reasons and determine whether a solution may be determined or if a different vendor or supplier is required.
   d. The Contractor and IS are responsible for coordinating with vendors and suppliers the FAT, installation, commissioning, calibration and scheduling for the associated I&C equipment.

5. The IS shall conduct a Pre-Submittal Conference before producing any submittals. The conference should include all parties involved with the I&C System including the Engineer and Owner. The purpose of the conference shall be to review the project as a whole, make sure all parties understand their roles and responsibilities and to go over submittal requirements.

6. Prepare I&C System Submittals which includes the following:
   a. Instrumentation hardware submittal (including TR20 forms).
   b. Control panels design and submittal.
   c. Recommended spare parts submittal.

7. Following submittal approvals, do the following:
   a. Procure all instrumentation hardware and accessories.
   b. Procure hardware for and fabricate all control panels being provided.
   c. Perform FAT's for all control panels being provided.

8. Programming and integration shall be supplied by the OSI. Oversee and coordinate the programming and integration with the OSI for a complete I&C System.

9. Oversee the installation of the I&C System.

10. Perform bench and field calibrations of instruments as required.

11. Oversee and document loop testing.

12. Oversee and document commissioning.

13. Maintain record drawings.
    a. Maintain on the construction site a set of the Instrumentation Drawings that shall be continuously marked up during construction.
    b. The drawings should be updated at least weekly and will be checked monthly by the Owner's representative.
    c. Upon completion of startup, submit the marked-up drawings to the Engineer for review and for drafting.

14. Prepare O&M manuals.
    a. Provide O&M manuals in accordance with Section 017823.
    b. Prepare an O&M manual for each major process area or building. Each of these manuals shall be divided into the following categories:
        1) Table of Contents/Index.
        2) Process & Instrumentation Diagrams
        3) Control Panel Record Drawings, Bill of Materials and Design Data.
    c. Prepare O&M manuals that cover comprehensive information for the I&C System. These manuals shall include the following:
        1) Table of Contents/Index.
        2) Finalized Instrument Summary
        3) Finalized TR20 Instrument Forms
        4) Instrumentation Installation Details
        5) Instrument Operational Manuals
        6) Recommended Spare Parts List

15. Provide training.

1.5 ACTION SUBMITTALS

A. General
1. Submittals for Division 40 shall meet the requirements of Section 013300 Contractor Submittals. In addition, the following requirements shall be met:
    a. Submittals shall include bills of materials with quantities, makes, models, exact part numbers and descriptions.
    b. Edit all submittals such that only pertinent information is submitted. Neatly cross out information that does not apply, options that are not being supplied, etc.
    c. Show product dimensions, construction and installation details, wiring diagrams, and specifications.
    d. If there are exceptions to the Contract Drawings and Specifications, provide a list of exceptions with detailed explanations for the exceptions. The Engineer will review the list of exceptions and determine whether a solution may be determined or if the exception(s) will not be allowed.
2. Furnish submittal required by each Section within Division 40.
3. When submitting on equipment, use the equipment and instrumentation tags depicted in the Contract Drawings.

B. Instrumentation hardware submittal
1. Provide a comprehensive submittal that includes all instrumentation being supplied by the IS. Divide the submittal into the following:

a. Table of Contents/Index.
b. Instrument summary.
c. Instrument TR20 Forms.
d. Instrument Cut Sheets.
e. Instrument Installation Drawings.

2. Provide an instrument summary (sorted by tag number) that has the following information:
   a. Tag number.
   b. Make, model and description.
   c. Associated process.
   d. Location.
   e. Calibrated range.
   f. Associated PLC.
3. Furnish TR20 instrumentation forms for each instrument using the forms outlined in ISA-TR20.00.01-2007. This requirement includes all instruments that are being installed as part of the project, whether they are Contractor, Owner and/or Vendor supplied. Show on each sheet who is the responsible party for supplying the instrument. The TR20 sheets should be provided electronically in Microsoft Word or Excel as well.
4. Provide instrument cut sheets for each instrument make and model being supplied for the project. Each cut sheet should have a list of instrument tag numbers that pertain to that particular cut sheet. The cut sheets should have enough information to verify that the instrument conforms to the Contract Drawings and Specifications.
5. Instrument installation drawings
   a. Provide instrument installation drawings for each make and model of instrument being supplied.
   b. Delineate what is being supplied by the IS and what is being supplied by other installers.
   c. Show overall dimensions, mounting locations and elevations.
   d. Show all cabling, conduit and piping locations.
   e. Show the ambient conditions of the location where the instrument is being installed which includes ambient temperature and humidity extremes, whether or not the atmosphere is corrosive and the area classification.
   f. Show mounting requirements, brackets, stands and anchoring.
   g. Show means for sun protection where required.

C. Control panels submittal
1. Provide a comprehensive submittal that includes all control panels supplied by the IS. The submittal should show that the panels are in conformance with the requirements of Section 409513. Divide the submittal into the following:
   a. Table of Contents/Index.
   b. Panel Bill of Materials and Design Data.
   c. Panel Shop Drawings.
   d. Panel Hardware Cut Sheets.
2. The Panel Bill of Materials and Design Data shall include the following:
   a. Each panel will have its own Bill of Materials and Design Data information presented in association with the panel drawings. The Bill of Materials shall include all hardware inside or on the enclosure. The design data will include UPS and/or battery load calculations to show that the UPS is sized appropriately for load and for backup time. The design data will show panel weight, materials and finishes. HVAC design data shall be shown. Seismic criteria shall be shown if required by the Contract Documents.
3. Panel Shop Drawings:

a. Each control panel shall be designed to perform its function(s) as shown in the Contract Drawings. The control panel designs shall take into account information shown throughout the Contract Drawings and Specifications.
b. Show every internal wire and connection diagrammatically. Show all interfaces between the control panel and external equipment to be connected for power, controls, signal, communications, etc.
c. All shop drawings shall include a title block with the name of the firm designing the control panels. The title block shall also include project information, Owner information and/or logo, drawing number and description, revision fields and date.
d. All shop drawings shall be developed utilizing AutoCAD version 2008 or later. All shop drawings should be submitted in PDF and AutoCAD formats and as required by Section 013300.
e. Panel layout drawing(s):
    1) Each control panel shall have shop drawing(s) which depict the front, back, sides and top/bottom of the panel. This includes showing any hardware mounted on the inside or outside of the panel.
    2) Layout drawings should include subpanel and swing-out panel layouts.
    3) Layout drawings should show locations of panel penetrations for cutouts, conduit entry and/or access plates.
    4) Layout drawings should show all of the components and provide a reference to the bill of materials.
    5) Show the elevations of door devices from the finished floor.
f. AC and/or DC power distribution diagrams:
    1) Each panel shall show power distribution schematics that show how the panel receives power and feeds all of its internal loads as well as associated external loads.
g. Communications and/or Network diagrams:
    1) For panels that utilize any means of communications both internally and externally, provide a diagram depicting each communication connection.
h. Input/Output and/or Internal wiring diagrams
i. Terminal block diagrams

4. Provide panel hardware cut sheets for each make and model of equipment being supplied for the project. The cut sheets should have enough information to verify that the equipment conforms to the Contract Drawings and Specifications.

D. Recommended Spare Parts Submittal
1. Submit a list of spare parts for all of the equipment associated with the I&C System. The list of spare parts shall include list pricing for each item.
2. Provide the name, address and phone number for each manufacturer and manufacturer's local sales representative.
3. Indicate whether or not the spare parts are being provided under this contract or not.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.8 QUALITY ASSURANCE

A. All equipment supplied for this project shall meet the requirements of the National Electric Code (NEC) and shall be listed by and bearing the label of the Underwriters' Laboratories (UL).

B. The IS shall be a company that has been actively involved in the installation and commissioning of I&C Systems for a minimum period of five years.

C. The IS shall have adequate facilities, manpower and technical expertise to perform the Work associated with the I&C System and as outlined by the Contract Documents.

D. The IS shall have similar project experience of at least four successfully completed projects for a similar wastewater system. The IS company must have performed similar work for these projects as required herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials provided under this Contract shall be new and free from defects.

2.2 MANUFACTURERS

A. All equipment provided for the I&C System shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.

B. Instruments which utilize a common measurement principle (for example, float switches) shall be furnished by a single manufacturer. Panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.

2.3 OPERATING CONDITIONS

A. The I&C System shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
   1. Environment: Wastewater Lift Stations
   2. Temperature Extremes: 30°F to 122°F (Outdoors); 40°F to 104°F (Indoors).
   3. Relative Humidity: 20% to 90%, non-condensing.

B. Indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. Instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

2.4 SPECIAL TOOLS

A. The IS shall furnish a priced list of special tools required to calibrate and maintain the instrumentation provided. The Owner and Engineer will select which tools are to be purchased and the IS will supply them at the prices listed.

B. Special tools shall be delivered to the Owner before startup commences.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.

B. Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.

C. Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package.

D. Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the Contractor. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the Engineer. If such tests reveal defects, the equipment shall be replaced.

3.2 MANUFACTURER'S SERVICES

A. Manufacturer's services shall be furnished for the following equipment:
   1. Vendor supplied equipment that contain programmable controllers, operator interfaces and/or instrumentation that requires site calibration.
   2. Ammonia Analyzers
   3. pH Analyzers
   4. ORP Analyzers
   5. Dissolved Oxygen Analyzers
   6. Open Channel Flow Meters
   7. Mass Flow Meters
   8. Turbidity Analyzers

9. TSS Analyzers
10. Gas Detectors

B. The Contractor shall furnish the following manufacturer's services for the instrumentation listed below:
1. Perform bench calibration.
2. Oversee installation.
3. Verify installation of installed instruments.
4. Certify installation and reconfirm manufacturer's accuracy statement.
5. Oversee loop testing and pre-commissioning
6. Train the Owner's personnel.

3.3 INSTALLATION

A. Instrumentation shall be installed per the Instrument Installation Drawings that have been submitted and approved and per the requirements of Division 40. This includes all instrumentation for the I&C System, regardless of who the supplier is. Instrumentation shall be mounted so that it is easily accessible and viewable and such that it does not restrict access to other equipment. Mount instrumentation to pipe stands or wall mounts if they are not directly mounted or if the Contract Drawings indicate otherwise.

B. The I&C System indicated throughout the design are diagrammatic and therefore locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the Contractor shall make such changes without additional cost to the Owner.

C. The I&C System is integrally connected to electrical, mechanical and structural systems. Coordinate with these other disciplines the installation of these related components. All conduit, cables and field wiring shall be as required by Division 26.

D. Instruments, control panels and all other I&C System related equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

E. Each existing instrument to be removed and reinstalled shall be cleaned, reconditioned, and recalibrated by an authorized service facility of the instrument manufacturer. The Contractor shall provide certification of this Work prior to reinstallation of each instrument.

F. The Contract Documents show necessary conduit and instruments required to make a complete instrumentation system. The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the Engineer for approval prior to commencing that Work. Such changes shall not be a basis of claims for extra Work or delay.

G. Instrumentation, control panels, wiring and all other I&C equipment shall be properly tagged and/or labeled per the requirements of Section 260553.

H. Installation of the I&C System shall be according to the finalized Shop Drawings

3.4 FACTORY ACCEPTANCE TESTING (FAT)

A. The IS shall arrange for the manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the Engineer and Owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems, and other pertinent systems and devices. A minimum of 10 days notification shall be furnished to the Engineer prior to testing. No shipments shall be made without the Engineer's approval.

B. For each FAT, the IS shall develop and submit a FAT Plan and Procedure Document within 10 days of the FAT. The FAT Plan and Procedure shall as a minimum shall have the following:
   1. Descriptions of test methods to be performed during the FAT.
   2. FAT Schedule and Procedure
   3. FAT Checklists that allow for sign-off and comments for each test method and procedure.

C. Control Panel Completion Test Methods: The following test methods should be performed during the FAT for each control panel:
   1. Completed Shop Drawings: Demonstrate that the control panel has been built according to the shop drawings and that the shop drawings are accurate.
   2. Panel Layout: Demonstrate that the control panel has been laid out as designed and as required by Division 40.
   3. Power Distribution: Demonstrate all power distribution circuits, including but not limited to AC power circuits, UPS operation, signals and circuits and DC circuits.
   4. Control Circuits: Demonstrate the correct installation of each control circuit. Using a signal generator or multi-meter, show the correct operation of each input, output, relay, barrier, buttons, switches, or any other control device. Demonstrate the proper functionality of any hard-wired interlocks that may be associated with each control circuit.
   5. Panel Networking/Communications: If any form of communications is associated with the control panel, verify the proper operation of each communication port and link.

D. Control Loop Test Methods: In order to demonstrate that the control panel will provide its function as intended, provide the following control loop test methods. If programming for the control panel is provided by others, coordinate with the programmer to have all programming completed and tested prior to the FAT. If needed, coordinate to have the programmer present for the FAT.
   1. Alarm Functions: Verify and/or simulate each alarm condition associated with each control loop.
   2. Local Manual and Auto Functions: Verify and/or simulate each Local Manual and/or Auto function associated with each control loop.
   3. SCADA Manual and Auto Functions: Verify and/or simulate each SCADA Manual and/or Auto function associated with each control loop.
   4. Control Loop Interlocks: Demonstrate the functionality of any software interlocks that may be associated with each control loop.

E. If the FAT does not pass and needs to be repeated, the IS shall be responsible for additional per diem costs incurred by the Engineer and Owner.

F. All changes and/or corrections made during the FAT shall be noted on the checklists.

G. Following completion and approval of all FAT, provide the finalized checklists to the Engineer and as part of the equipment shop drawings.

3.5 FIELD QUALITY CONTROL

A. Allow for inspections by the Engineer and/or Owner of the I&C System at any time during the construction. Inspections shall be conducted to verify that the installation is per the requirements of the Contract Documents.

3.6 CALIBRATION

A. Devices provided under Division 40 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.

B. Each instrument shall be calibrated at 0, 25, 50, 75, and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Standards and Testing.

C. Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the Engineer.

D. Instruments which were not bench-calibrated shall be calibrated in the field to insure proper operation in accordance with the instrument loop diagrams or specification data sheets.

E. Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. For each instrument calibration, provide a calibration sheet and update the corresponding TR20 Instrument Form with the new calibration data. The Calibration sheet shall include the following as a minimum:
   1. Date of calibration
   2. Project Name.
   3. Tag Number.
   4. Manufacturer, model and serial number.
   5. Calibration data including range, input, output and measurement at each calibration point.
   6. Space for comments.
   7. Space for sign-off by party performing calibration.

G. A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the Engineer. The IS shall sign the tag when calibration is complete. The Engineer will sign the tag when the calibration and testing has been accepted.

3.7 LOOP TESTING

A. Each control loop shall have been installed according to the finalized shop drawings. Prior to the commencement of loop testing, the following pre-requisites should have been met:
   1. All associated equipment, conduit and wire has been permanently installed, terminated and inspected.
   2. All wiring has been properly pulled, terminated and labeled.
   3. Each wire has been tested with a point-to-point test.
   4. All control panels and electrical equipment have been checked out and tested as required by Division 26.
   5. All instrumentation has been appropriately installed and calibrated.
   6. Loop Test Forms for each loop to be tested have been created and will be available during the loop testing.

B. Each loop test shall have a Loop Test Form prepared and ready prior to each loop test. The loop test form shall have the following:
   1. Loop Number and Description
   2. Check-Off List with room for sign-off and dated by the IS, Programmer, and Owner's Witness as well as room for comments. The list of items to be checked off for each loop should include but is not limited to the following:
      a. Each power distribution circuit.
      b. Each control circuit.
      c. Each alarm circuit.
      d. Each PLC input/output point.
      e. Each Local Manual, Local Auto, SCADA Manual & SCADA Auto function.
      f. Each hard-wired and software interlock.

C. Upon completion of the above pre-requisites for loop testing, the IS shall oversee and coordinate each loop test. The IS is responsible to be present for all loop testing, whether the equipment was supplied by the IS or not. The IS is responsible to have all responsible parties associated with each loop present. This includes but is not limited to manufacturer representatives, vendor technicians, electrical installers, mechanical installers, and programmer. The IS shall coordinate with the Owner and Engineer to allow for witnessing of loop testing as deemed necessary by the Owner and Engineer.

D. Issues that arise during loop testing should be addressed and fixed immediately. If it is not feasible to immediately fix the issues, the loop testing should be re-scheduled as soon as possible to avoid delays. Any costs associated with re-testing and requiring all parties to return to the site shall in no way be incurred to the Owner.

E. Following a successful loop test, the appropriate parties should sign and date the Loop Test Forms. All Forms shall be certified and submitted to the Engineer as part of the O&M Manuals.

F. Following loop testing, in no way should any parts of the loop be modified. In no way shall any wiring be re-routed or re-terminated. If any such work occurs, all affected loops shall be re-tested at no expense to the Owner.

3.8 COMMISSIONING

A. The IS shall oversee, coordinate and be present during all commissioning activities. The IS shall be responsible for obtaining the assistance of the Contractor and Subcontractors as may be required for commissioning activities.

B. Commissioning shall commence after acceptance of wire test, calibration tests and loop tests, and inspections have demonstrated that the instrumentation and control system complies with Contract requirements. Pre-commissioning shall demonstrate proper operation of every system with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.

C. Commissioning and test activities shall follow detailed test procedures and check lists accepted by the Engineer. Test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the Engineer, which include calculated tolerance limits for each step. Completion of system commissioning and test activities shall be documented by a certified report, including test forms with test data entered, delivered to the Engineer with a clear and unequivocal statement that system commissioning and test requirements have been satisfied.

D. Where feasible, system commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under startup and steady state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. Hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software-based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any), and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.

E. Electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset, or rate settings as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 0, 25, 50, 75, and 100 percent of span and the results checked against indicated accuracy tolerances.

3.9 TRAINING

A. Provide training in accordance with Section 409000.

B. Develop a Training Plan for the training requirements of Division 40 and submit it to the Engineer for approval. Coordinate with the Engineer and Owner the time and locations of each training session. Schedule the trainings for after the equipment has been pre-commissioned.

C. As part of the Training Plan, submit a résumé for each individual to be providing training. Training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.

D. Each training session shall include a written agenda.

E. The Contractor shall train the Owner's personnel on the maintenance, calibration and repair of instruments provided.

F. Within 10 days after the completion of each session, the Contractor shall submit the following:
   1. A list of Owner personnel who attended the training.
   2. A copy of the training materials used during the session with notes, diagrams and comments.

END OF SECTION 409000

SECTION 409443 – PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the programmable logic controllers (PLC) used for control and monitoring as indicated on the Contract Documents.

B. Provide one full version of PLC programming software that is applicable to the PLC hardware being supplied for the project. Include auxiliary software (such as communications software, drivers, networking configuration software, etc.) that may be required for a complete and operable system.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Wiring diagrams showing connections to all devices; input and output (I/O), analog and discrete. The wiring diagrams shall indicate the I/O address point to be used in the PLC programs.

C. Submit calculations that show the following:
   1. PLC Power Supply Budget
   2. Calculated number of I/O quantities required
   3. Estimated PLC memory usage

1.3 QUALITY ASSURANCE

A. Hardware and software to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that PLC equipment and software being provided is compatible with the requirements. Provide all necessary accessories to the PLC equipment for a complete and operable system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver the PLC hardware and software as a complete system in accordance with Section 409000.

PART 2 - PRODUCTS

2.1 GENERAL

A. PLCs shall be furnished with hardware and software necessary to monitor and control equipment, as listed in the specifications, and shown on the Plans.

B. Each field input and output shown as an I/O Point shall be connected as per the manufacturers' recommendations.

C. The Contractor shall provide the hardware, software, and installation necessary for connecting additional future equipment as indicated on the Plans. In addition to allocating for future I/O, each PLC shall be supplied with a minimum of 20% spare I/O of each type. In other words, the total I/O for each type shall be (current I/O + future I/O) * 120%. Provide enough panel space to install up to 200% of future I/O modules and/or PLC racks/bases.

D. The type of field input and output shall be defined as follows unless specified otherwise on the plans:
   1. Analog inputs and outputs: 4-20mA DC.
   2. Discrete inputs: I/O device shall be a dry contact, inputs shall be powered by the PLC at 24VDC (preferred) or 120VAC.
   3. Discrete outputs: Isolated dry contact outputs.

E. All PLC I/O shall have I/O modules that are installed and wired at a UL508 Panel Shop. All I/O points shall be wired down to terminal blocks. In no way should field wiring go to any part of the PLC assembly.

F. Vendor and Contractor supplied PLC's shall meet the requirements of this Section and of Division 40. Vendor supplied PLC's shall have a Factory Acceptance Test (FAT) performed by the Vendor as required by Section 409000. Contractor supplied PLC's shall have a FAT performed by the Contractor as required by Section 409000.

G. The PLC shall be capable of handling online program modifications without taking the system offline or requiring a download.

H. Acceptable Manufacturers
   1. Allen Bradley CompactLogix

2.2 PROCESSORS

A. The PLC processor shall be a microprocessor based industrial controller with a temperature rating of 0 to 60 degrees C, and a humidity rating of 5 to 85% non-condensing, minimum.

B. The processor's memory shall be sized according to the number of I/O points and amount of logic required for the application. As a minimum, the memory shall be at least 2 megabytes.

C. The processor shall retain its memory and programming when power is removed.

D. The processor shall have tag-based memory.

E. Processors shall be CompactLogix L33ER.

2.3 PLC POWER SUPPLY

A. The power supply shall provide power for the processor, and I/O modules. The power supply shall have built-in over voltage and under voltage detection circuitry, protection against overcurrent conditions, and automatic power-up sequence that enables outputs only when proper operating tolerances are reached. Power requirements shall be 24 VDC unless shown as otherwise on the Contract Documents.

2.4 COMMUNICATIONS NETWORKS

A. Each PLC shall be equipped with network ports (and corresponding network modules if necessary) as shown on the Contract Drawings. Each PLC shall be equipped with an Ethernet port for connection to the Plant SCADA System.

B. Ethernet ports shall be setup to communicate with the Allen-Bradley Ethernet/IP protocol.

C. The PLC shall be programmable through the Ethernet port or through a USB port.

2.5 INPUT/OUTPUT MODULES

A. Only I/O modules that have typical wiring diagrams shown in the Contract Drawings shall be allowed for each PLC.

B. Analog I/O modules shall have a minimum of 12 bits of resolution and shall be setup as 4 to 20 mA signals unless indicated otherwise on the Contract Drawings. Analog inputs shall be setup to be connected to loop powered (2-wire) or self-powered (4-wire) signals. All analog inputs and outputs shall be protected by a fuse. 4 to 20 mA signals shall be protected by a 32mA fuse.

C. Each discrete I/O module shall be fused (fuse body shall be equipped with a blown fuse indicator). Each discrete output module and shall have interposing relays for each point with form C relay contacts. Indicator lights shall also be provided on each I/O point to indicate status of each signal. Each individual input or output point shall be optically isolated to protect the controller I/O circuitry from high voltage transients.

2.6 SPARE PARTS

A. In addition to the spare parts requirements of Section 409000, provide the following:
   1. One spare processor for each type of PLC processor supplied for the project.
   2. One spare I/O card for every type of I/O card supplied for the project.
   3. One spare PLC power supply for every type supplied for the project.
   4. One spare network adapter for each type of network adapter supplied for the project.
   5. One spare base for rack style PLC’s.

PART 3 - EXECUTION

3.1 FACTORY ACCEPTANCE TESTING

A. All PLC assemblies shall be built up in control panels and shall be part of a Factory Acceptance Test as required by Section 409000.

3.2 INSTALLATION

A. The PLC assemblies shall be installed in control panels made specifically for the PLC. The control panel assembly and installation shall be as required by Section 409513.

B. The PLC assemblies shall be installed in accordance with the manufacturer's installation guidelines and instructions.

3.3 TRAINING

A. Provide training for the PLC hardware supplied for the project as required by Section 409000.

END OF SECTION 409443

SECTION 409513 – PROCESS CONTROL PANELS AND HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the requirements for all control panels and associated hardware for the project. This includes, but is not limited to, vendor control panels, PLC panels, local control panels and instrumentation panels.

B. Related Requirements:
   1. The requirements of Division 26 shall apply to this section.

1.2 ACTION SUBMITTALS

A. Submit the Control Panels Submittal as required by Section 409000.

1.3 CLOSEOUT SUBMITTALS

A. Submit the operation and maintenance data, including record control panel drawings for all control panels as required by Section 409000.

1.4 QUALITY ASSURANCE

A. Referenced Standards:

   1. National Electric Code (NEC).
   2. American Society for Testing and Materials (ASTM).
   3. Joint Industrial Council (JIC).
   4. National Electrical Manufacturers Association (NEMA):
      a. ICS 4, Terminal Blocks for Industrial Use.
      b. ICS 6, Enclosures for Industrial Controls and Systems.
      c. 250, Enclosures for Electrical Equipment (1000 V Maximum).
   5. Underwriters Laboratories Inc. (UL):
      a. 50, Enclosures for Electrical Equipment.
      b. 508, Industrial Control Equipment.
      c. 508A, Standard for Industrial Control Panels.

B. Hardware to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. All panels shall be assembled in and labeled by a listed UL 508A panel shop. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

C. Examine the Contract Documents and verify that control panel hardware being provided is compatible with the requirements. Provide all necessary accessories to the control panels for a complete and operable system.

D. The Contractor shall not place any conduit feeds for any control panel until the Control Panel Submittal has been approved. Once approved, conduits shall be placed strategically to best suit the layout of the control panel. Power entry and separation of power, controls and signal shall be considered.

E. All painted control panels shall have matching paint colors and tones.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the control panel hardware as required by Section 409000.

PART 2 - PRODUCTS

2.1 GENERAL

A. All control panels shall have an overall NEMA rating suitable for withstanding the mechanical, electrical, thermal stresses, humidity, and corrosion that the panel will be subjected to in its installed location.

B. The following rules shall be followed when determining the NEMA rating requirement for each control panel:

1. NEMA 1, 3 & 3R shall not be allowed for control panels.
2. NEMA 4 shall be utilized for outdoor or wet locations in non-corrosive, unclassified areas. NEMA 4 control panels shall be painted steel.
3. NEMA 4X shall be utilized in corrosive, unclassified areas. NEMA 4X enclosures shall be 316SS except for the following exceptions with which the enclosure shall be polycarbonate or fiberglass reinforced polyester (FRP):
    a. Chemical areas or rooms.
    b. Locations where stainless steel is incompatible.
    c. Where specifically noted on the Contract Drawings.
4. NEMA 7 shall be utilized for classified areas as required by NEC. NEMA 7 enclosures shall be constructed of cast aluminum.
5. NEMA 12 shall be utilized in dry, non-corrosive, unclassified areas. NEMA 12 control panels shall be painted steel.

C. Each source of foreign voltage shall be isolated by providing disconnecting or pull-apart terminal blocks or a disconnect operable from the control panel front. Each control panel shall be provided with identified terminal strips for the connection of external conductors. The SUPPLIER shall provide sufficient terminal blocks to connect 30 percent additional conductors for future use.

D. PLC Discrete outputs from the control panel shall be provided by electrically-isolated contacts rated for 10 amps at 120 VAC. Analog inputs and outputs shall be isolated 4 to 20 mA, 2 wire signals with power supply.

E. Control panel mounted devices shall be mounted a minimum of 3-feet above finished floor elevation. Touchscreens shall be mounted at a height of 66” from the finished floor to the center of the touchscreen. All control panels will be situated on housekeeping pads, this is not considered the finished floor elevation.

2.2 ENCLOSURES

A. Enclosures shall be either freestanding, pedestal-mounted or equipment skid-mounted, as indicated. Internal control components shall be mounted on an internal back-panel or side-panel as required.

B. Enclosure dimensions indicated on the Contract Drawings are based upon non-certified information and shall be considered the minimum panel size. It is the responsibility of the Contractor to design the size of all control panels. When sizing the control panels, adhere to the following criteria:
   1. Maximum panel depth is 24”. If there are special reasons for a deeper enclosure, approval must first be obtained from the Engineer.
   2. The panel size shall provide space for all equipment, wire-ducts, wire, terminations, and space for future expansion.
   3. If the panel size needs to be enlarged, coordinate with the installing Contractor that there is adequate space for the larger size. If there is not space, coordinate with the Engineer to come up with a solution.

C. Materials
   1. Steel panel section faces shall be 12-gauge minimum thickness for free standing panels and 14-gauge minimum thickness for wall-mounted or pedestal-mounted panels. Materials shall be selected for levelness and smoothness.
   2. Structural shapes and strap steel shall comply with ASTM A 283 - Low and Intermediate Tensile Strength Carbon Steel Plates, Grade C.
   3. Bolting Material: For outdoor, wet or corrosive areas, all bolting materials shall be 316SS. In dry, non-corrosive locations, carbon steel may be used. Commercial quality bolts, nuts, and washers shall be 1/2-inch diameter with UNC threads. Carriage bolts shall be used for attaching end plates. Other bolts shall be hex end machine bolts. Nuts shall be hot pressed hex, American Standard, heavy. Standard wrought washers shall be used for foundation bolts and attachments to building structures. Other bolted joints shall have SAE standard lock washers.
   4. Control panels shall be structurally designed such that the completed and installed control panels shall safely withstand seismic requirements for the project. All equipment mounted within the panel shall be properly braced to prevent damage during a seismic event.

D. Acceptable Manufacturers
   1. Hoffman.
   2. Saginaw.
   3. Or Approved Equal.

2.3 CONTROL PANEL ASSEMBLY

A. General

1. The following requirements must be met when mounting to the back panels or side panels of the control panel:
    a. Holes shall be drilled and tapped with less than 50% diminishment in thread.
    b. Backpan shall be cleaned front and back after any drilling and tapping.
    c. Tek Screws are not acceptable.
    d. Any component mounted to a back panel or side panel shall be mounted at an exact square to the vertical and horizontal planes.
    e. Any duct running between back panels and side panels shall align horizontally with no overlaps.
    f. All DIN rail mounted to the panels shall have ½" stand-offs allowing for wires and other equipment to be routed beneath the rail if necessary.
2. Enclosure doors shall be flush fitting, gasketed, and be of the hinged lift-off type with lockable door handles. A common key shall be provided for the doors on each panel assembly. Removable access panels shall be provided with dished handle fasteners. Screw driver 1/4 turn or Dzus type fasteners are not acceptable.
    a. The flanged edges of panels shall be straight and smooth. Corners shall be welded and ground smooth.
    b. The face of the panel shall be true and level after flanging.
    c. Panel cutouts and holes may be cut or drilled by any standard method that does not cause deformation. Burrs shall be ground smooth.
    d. Adjacent panels shall assemble with faces flush. Gaps or cracks shall not be visible from the front of the assembled instrument board.
    e. Panels shall be self-supporting.
3. Control panels that are supplied with three phase power and/or are powering motor loads shall be supplied with a main feeder disconnect that is door operated. The door operator for the disconnect shall be defeat-able with a screwdriver. If the upstream overcurrent protection device feeding the control panel is not in the same room as the control panel, provide a main circuit breaker as part of the main disconnect assembly. Fused disconnects shall not be used unless specifically shown on the Contract Drawings.

B. Preparation of Bare Metal Panel Surfaces

1. Grind high spots, burrs, and rough spots.
2. Sand or sandblast to a smooth, clean, bright finish.
3. Every trace of oil shall be removed with a solvent.
4. Apply the first coat of primer immediately.

C. Panel Finishing

1. Repair damaged primer on inside surfaces.
2. Apply primer to the entire panel surface.
3. Apply 2 coats of satin finish lacquer enamel over the entire surface.
4. Colors shall match original paint color.

D. Instrument Finishing: The final coat applied to painted surfaces of instrument cases, doors, or bezels which are visible from the front of panels shall be manufacturer's standard unless otherwise indicated. Black japan or "crinkle" finishes on instrument cases are not acceptable.

E. Mounting of Instruments

1. The panel shop shall provide cutouts and shall mount instrument items indicated to be panel mounted, including any instruments indicated to be furnished by other vendors but installed in the panel.
2. The panel shop shall also mount behind the panels other instrument accessory items as required.
3. Equipment mounted at the rear of panel shall be installed to allow for commissioning adjustments, servicing requirements, and cover removal
4. Spare space shall be kept clear of wiring, etc., to give maximum space for future additions.
5. All equipment mounted with fasteners shall be mounted with grade 5 or greater Phillips head fasteners.

F. Electrical Requirements
1. Each panel shall be serialized with its own UL serial number and label.
2. Each terminal block shall have a printed label as shown on the panel drawings. Hand written labels in any location of the panel will not be accepted. Wiring shall be identified with printed tubular wire end markers.
3. Back panels and side panels shall have visible machine printed adhesive labels that detail the following items:
    a. Terminal block torque ratings for field connections.
    b. Terminal block sections as detailed in the panel drawings.
    c. All equipment within the panel including, but not limited to, PLCs, switches, circuit breakers, UPS, Power Supplies, and any other piece of equipment.
4. Screw torque shall not exceed 0.4 N*M (4.4 Lb*In) (7 Lb-In).
5. Wire duct for AC signals and wiring shall be light grey. All duct for DC signals shall be white. Wiring for AC circuits and DC circuits must be kept within their respective ducts.
6. Freestanding panels shall be provided with switched lighting as indicated in the panel drawings.
7. Freestanding panels shall be provided with a 15-amp, 120-volt, service outlet circuit within the back-of-panel area as shown in the panel drawings.
8. Wall-mounted or pedestal-mounted panels shall be sized to adequately dissipate heat generated by equipment mounted in or on the panel.
9. Outdoor panels shall be provided with thermostatically controlled heaters to maintain inside temperatures between above 40°F.
10. Any panel with heat producing equipment such as a PLC, UPS or VFD shall have cooling capabilities to maintain the inside temperature below 104°F.
11. All outdoor panels equipped with heating and/or cooling shall be insulated with a minimum R value of 2.0.
12. Provide a laminated fuse list matrix detailing fuse numbers and sizes mounted on the inside of the enclosure door. The fuse list matrix must be easily visible and at minimum size 14 font. Hand-written fuse matrices will not be accepted. See panel drawings approximate locations.
13. Provide a pocket mount on the inside of each panel door large enough to hold type 8.5 x 11 size paper. See panel drawings for approximate locations. Pockets must be accessible with no equipment obstructing the entrance of the pocket for at least ten inches above the pocket. The pocket mount shall be fastened. No adhesive type pockets allowed.
14. Where required crimped fork or ring terminals will be properly installed on the conductors for connection integrity.
15. Signal and Control Circuit Wiring
    a. Wire type and sizes: Conductors shall be flexible stranded tin machine tool wire, UL 1015 listed Type MTW, and shall be rated 600 volts. Wires for instrument signal

circuits and alarm input circuits shall be 14 AWG. Other wires, including shielded cables, shall be 16 AWG minimum.

b. Wire Insulation Colors: Conductors supplying 120 VAC power on the line side of a disconnecting switch shall have a black insulation for the ungrounded conductor. Grounded circuit conductors shall have white insulation. Insulation for ungrounded 120 VAC control circuit conductors shall be red. Wires energized by a voltage source external to the control panel shall have yellow insulation. Insulation for DC conductors shall be blue.

c. Wire Marking: Wire numbers shall be marked using white numbered wire markers made from plastic-coated cloth, Brady Type B 500 or equal, or shall be heat shrink plastic. Wire labels must be machine printed. All conductors within the control panel are to be permanently marked with wire labels at each end. Wire labels are to correspond to the labels on the approved shop drawings.

d. For case grounding, panels shall be provided with a ground lug complete with solderless connector for one no. 1 AWG bare stranded copper cable.

e. Panel doors shall be connected to panel ground.

f. Wire Fastening: Provision shall be made utilizing cable tie bases such as type CTM1 or equivalent, fastened inside the wire duct to allow for the fastening of the shop wire harnesses upon final installation.

16. Power Supply Wiring

a. Unless otherwise indicated, control power shall be 120-VAC. Where the electrical power supply to the control panel is something other than 120-VAC, the control panel shall be provided with a control panel transformer. Control conductors shall be provided in accordance with the indicated requirements.

b. At a location near the top of the panel (or bottom), the panel fabricator shall provide terminal box connections for the main power supply entry.

17. Signal Wiring

a. Signal wire shall be shielded twisted pair or triads. Cable shall be 18 AWG copper signal wires.

b. Color code for instrument signal wiring shall be as follows:

1) Positive (+) – Red or Clear

2) Negative (-) – Black

c. Multiconductor cables where indicated shall consist of no. 16 AWG copper signal wires twisted in pairs with 90-C, 600 V fault insulation. A copper drain wire shall be provided for the bundle with a wrap of aluminum polyester shield. The overall bundle jacket shall be PVC.

d. RTD cabling shall be Belden 8770 cabling or equal.

e. Multi-conductor cables, wireways, and conduit shall be sized to allow for 25 percent spare signal wire.

18. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.

19. Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.

G. Labor and Workmanship: Panels shall be fabricated, piped, and wired by fully qualified workmen who are properly trained, experienced, and supervised.

2.4 CONTROL PANEL COMPONENTS

A. Nameplates and labels

1. All control components within the control panel shall be labeled with adhesive labels that have a thermal transfer type ink system on a UL-508A approved label. Labels shall be provided for marking wire ducts, terminal block sections, PLC modules, networking modules, signal isolators, intrinsic barriers, relays, breakers, power supplies, surge suppressors and all other pertinent components within the control panel.
2. All components on the exterior of the control panel shall have nameplates fabricated from black-letter, white-face laminated plastic engraving stock, Rowmark Ultramatte or equal. Engraved characters shall be block style with no characters smaller than 1/8 inch. Adhesive shall be high strength, low profile double strength, double sided as produced by Bron or Tessa or approved equal. Stainless steel fasteners shall be used in addition to the adhesive on all equipment where the fasteners do not derate the NEMA rating of the enclosure.

B. Pilot Devices

1. Provide pilot devices from a single manufacturer.
2. Pilot devices shall have NEMA ratings that match the overall control panel rating. They shall be 30mm in diameter and heavy duty.
3. All pilot devices shall have an associated nameplate that clearly describes the function of the device.
4. Pilot lights shall be LED and shall have colors as follows:
    a. The Contract Drawings shall take precedence for light colors. Refer to the P&ID's and schematics.
    b. On/Running/Opened: Green.
    c. Off/Stopped/Closed: Red.
    d. Power: White.
    e. Alarm/Fail: Red.
5. Acceptable Manufacturers
    a. Square D Types K (for NEMA 4 or 12) or Types SK (NEMA 4X).
    b. Allen-Bradley Types 800T (NEMA 4/12) or Types 800H (NEMA 4X, 7).
    c. Or Approved Equal.

C. Door Mounted Meters

1. Digital Process Meters
    a. Provide digital process meters to display a numeric process value as required by the Contract Drawings.
    b. The meter shall accept and re-transmit an analog input signal which is in proportion with the process value. The meter shall be capable of receiving the following signals:
        1) 0 or 4 to 20 mA current.
        2) 0 to 5 or 10 DC volts.
        3) RTD and Thermocouple type inputs.
    c. The meter shall be programmable to scale the numeric display to process engineering units. It shall be capable of showing up to three decimal points.
    d. The meter shall be capable of powering the input and re-transmitted signal.
    e. Acceptable Manufacturers:
        1) Precision Digital Trident Series.

2) Red Lion PAX Series.
3) Or Approved Equal.

2. Elapsed Time Meters (ETM)
   a. Provide ETM's for each motor and/or machine provided for the project. Each ETM shall accumulate hours in tenths of an hour.
   b. The ETM enclosure shall be panel mount, polycarbonate, shock resistant and totally sealed.
   c. Acceptable Manufacturers:
      1) Hobbs 20000 Series.
      2) Or Approved Equal.

D. Terminal Blocks

1. Terminal blocks shall mount on standard DIN rail, and be of the size required for conductors therein. A minimum of 25 percent spares shall be provided in each terminal box. No more than 2 conductors shall be allowed per termination. Jumper bar assemblies shall be installed for interconnecting terminal blocks, distributing power and signal commons. Terminal blocks shall be U.L. rated for 600 Volts, and 30 Amps, minimum.
2. Grounding terminal blocks shall be provided for instrumentation cable shields. The terminal blocks shall have distinctive 2-color bodies yellow and green, and shall be mounted to the DIN rail with metal screw down type clamps, providing a positive ground connection. One grounding terminal block shall be installed for every 2 instrument cables terminated. Grounding terminal blocks shall be U.L. rated for 600 Volts, and 20 Amps, minimum.
3. Terminal blocks shall be available in a variety of colors, including red, green, blue, gray, black, yellow, and orange.
4. DIN mount fuse holders shall have blown fuse indicators for DC and AC circuits. Fuse holders shall be of the compression clamp type. Fuse holders shall be U.L. listed, and rated for 600 Volts. Fuse sizes shall not exceed the U.L. current rating for the fuse holders.
5. Terminal blocks for 4 to 20 milliamp signals shall have knife disconnect switches, and accessible test points for testing and measurement of current loop signals, without the need for removing wire terminations.
6. Approved Manufacturers
   a. Phoenix Contact UT Series.
   b. Allen-Bradley 1492 Series.
   c. Or Approved Equal.

E. DIN Rail

1. DIN rail shall be pre-punched, RoHS compliant, treated with galvanic zinc plating and passivation. Symmetrical DIN rail shall be 35 mm X 15 mm.
2. Acceptable Manufacturers
   a. Iboco Omega 3AF.
   b. Or Approved Equal.

F. Wire Ducts

1. Wire ducts shall have narrow slots (approximately every ½") to accommodate high-density terminal blocks and other hardware.
2. Wire ducts shall be made of lead-free PVC, shall be UL rated for continuous use up to 122°F, and shall be flame retardant.

3. Wire duct colors shall be as follows:
    a. Light grey for all wiring 120V and higher.
    b. White for all wiring 48V and lower.
    c. Blue for all intrinsically safe wiring.
4. Acceptable Manufacturers
    a. Panduit Type F Series.
    b. Or Approved Equal.

G. Surge Protection Devices

1. Provide a Surge Protection Device (SPD) for power feeds which feed power to the control panel.
2. Each SPD shall have a short circuit current rating that exceeds the rating of the power feed that it is protecting.
3. All SPD's shall be properly grounded to the ground grid per NEC and per the SPD manufacturer's recommendations.
4. Three phase power feeds and single-phase power feeds for non-sensitive loads.
    a. Provide a parallel, DIN rail mountable, SPD whose location is immediately downstream of the main panel disconnect or circuit breaker.
    b. Capable of handling a 10kA surge current.
    c. Acceptable Manufacturers
        1) Transtector 12R Series.
        2) Or Approved Equal.
5. Single phase power feeds for control panels with sensitive electronics
    a. Provide an inline, DIN rail mountable, SPD that also provides EMI filtering.
    b. The SPD shall be capable of handling a 10kA surge current.
    c. The inline SPD shall have a set of dry contacts that indicate when the unit is healthy and operating correctly.
    d. Acceptable Manufacturers
        1) Phoenix Contact SFP Series.
        2) Or Approved Equal.
6. Low Voltage Signals
    a. Provide surge protection for low-voltage signals where shown on the Contract Drawings.
    b. Acceptable Manufacturers
        1) Phoenix Contact Termitrab.
        2) Or Approved Equal.
7. Coaxial Transmission Lines
    a. For radio type systems, provide surge/lightning protection for all coaxial lines leaving the control panel.
    b. Surge/lightning protectors shall be rated for the frequency at which signals are to be transmitted on the cabling.
    c. Acceptable manufacturers
        1) Polyphaser.
        2) Or Approved Equal.

H. Circuit Breakers

1. Circuit breakers shall meet the requirements of Section 262816.
2. Provide a main circuit breaker with panel disconnect if required as described in 2.3.A.
3. All control panels fed by 120VAC shall have a main DIN rail mounted circuit breaker.

4. The following types of loads shall be individually fed by circuit breakers:
    a. Panel mounted receptacles.
    b. UPS equipment.
    c. DC Power Supplies.
5. Circuit breakers shall be sized according to the loads they are powering.
6. Acceptable Manufacturers
    a. Square D.
    b. Cutler Hammer.
    c. Or Approved Equal.

I. Uninterruptible Power Supplies (UPS)

1. UPS equipment intended to be installed in control panels shall meet the following criteria:
    a. The UPS shall be UL listed and shall maintain the UL listing of the control apnel.
    b. The UPS shall be properly mounted to withstand vibration and seismic requirements for the project.
    c. The UPS shall be sized for 200% of the calculated panel load.
    d. The UPS shall have a minimum backup time of 15 minutes unless specifically stated as otherwise on the Contract Drawings.
    e. For PLC panels, the UPS shall be equipped with dry contacts for monitoring the UPS for any alarm conditions and low battery.
2. Where specifically shown on the Contract Drawings, an industrial DC UPS may be used as backup power for the control panel. This will typically be the case where all critical loads are at 24VDC.
3. Unless indicated as otherwise on the Contract Drawings, the UPS equipment shall be the line-interative type and operate at 120VAC.
4. UPS equipment shall provide surge, EMI
5. Acceptable Manufacturers
    a. Phoenix Contact.
    b. Sola.

J. Power Supplies

1. Provide 24VDC Power Supplies or other DC voltages as required for the application.
2. All power supplies shall be oversized for a minimum 150% of the calculated load.
3. All power supplies shall be properly protected by a DIN rail mount circuit breaker whose trip rating is per the manufacturer's recommendation.
4. All power supplies shall have a set of dry contacts that indicate when the power supply is operating normally.
5. Where shown on the Contract Drawings, provide redundant power supplies and corresponding diodes.
6. Power supplies shall meet the following criteria:
    a. Input Voltage: 100 to 240VAC.
    b. Output Voltage: ±1% of rated output.
    c. Operating Temperature: 0°C to 60°C.
    d. Built in transient surge protection.
    e. DIN rail mountable, metal housing.
7. Acceptable Manufacturers
    a. Phoenix Contact Quint 4 Series.
    b. Or Approved Equal.

K. Signal Isolators/Converters

1. Furnish signal isolators as required that optically isolate the input signal from the output signal. If output signal is to be a different type of signal than the output than the isolator shall convert the signal as required.
2. Isolators output shall be adjustable for zero and span.
3. If input signal is part of a Hart system, the isolator shall be made specifically to pass on the Hart signal.
4. Acceptable Manufacturers
    a. Phoenix Contact.
    b. Action Instruments.
    c. Or Approved Equal.

L. Intrinsically Safe Barriers

1. Provide intrinsically safe barriers wherever analog or discrete input signals are coming from classified areas.
2. Intrinsically safe barriers shall be located in their own enclosure whose assembly is UL rated. Install the barriers and field wiring as per the requirements of NEC and the manufacturer's installation guidelines.
3. If input signal is part of a Hart system, the isolator shall be made specifically to pass on the Hart signal.
4. Acceptable Manufacturers
    a. Phoenix Contact.
    b. Pepperl Fuchs.
    c. Or Approved Equal.

M. Relays

1. Provide relays whose contact ratings are sized according to the load requirements and size of the protection device associated with the circuit in which the contacts are wired. As a minimum contact ratings shall be 10A resistive up to 250VAC.
2. Provide relays whose coil voltage is as required by the application.
3. Relays with DC rated coils shall have a freewheel diode installed across the coil.
4. Relays with AC rated coils shall have a surge suppressor installed across the coil.
5. Relays shall have based with relays which plug into the base. Bases shall have screw-type connections.
6. Relays shall have an LED indicating when the relay is coil is energized.
7. Provide enough relay contacts for each relay as required by the application. If the number of contacts required exceeds the number of contacts on the relay, provide additional relay(s) to provide enough sets of contacts.
8. Acceptable Manufacturers
    a. Idec R Series.
    b. Allen-Bradley 700H Series.
    c. Or Approved Equal.

N. Time Delay Relays

1. Provide time delay relays to control on and off delay times as required by the application.
2. Time delay relays shall meet the requirements of relays as listed above with the following additional requirements:

a. Time delay shall be adjustable from 0.1 seconds to 600 hours.
b. Timers shall be multi-function and shall be capable of providing on-delay, off-delay, cycle timing and one-shot type timing control.

3. Acceptable Manufacturers
a. Idec RTE Series.
b. Phoenix Contact ETD Series.
c. Or Approved Equal.

O. Ethernet Switches

1. Provide industrial Ethernet switches as shown on the Contract Drawings. Switches shall meet the following minimum requirements:
a. 5 Copper RJ45 Port 10/100Mbps auto-negotiating
b. Operating temperature: 32 to 140 Degrees F
c. Complies with IEEE 802.3
d. 24VDC Power Supply

2. Acceptable Manufacturers
a. Phoenix.
b. N-Tron.
c. Moxa.
d. Cisco.

P. 900MHz Radio System

1. Provide Freewave Zumlink 900 MHz unlicensed radios (part number Z9-PE) as shown on the Contract Drawings. The radio shall accept 24VDC power and shall be mounted in the control panel with the Freewave DIN rail mounting bracket.
2. Provide for each radio a new coaxial jumper (LMR240 or equal) and new lightning arrestor (Polyphaser). The Contractor shall assume that the existing coaxial cable from the lightning arrestor to the antenna shall be reused. However, the Contractor shall inspect and test the cable to verify.
3. Provide and install new 900MHz Yagi antennas (SCADA TY-900) for each radio.

Q. Cellular Remote Access Modem

1. Provide Peplink Max BR1 Mini cellular modems (part number MAX-ZBR1-MINI-LTE-U-S-T) as shown on the Contract Drawings. The modem shall accept 24VDC power and shall be mounted in the control panel.
2. Provide for each modem a new coaxial jumper (LMR240 or equal) and new lightning arrestor (Polyphaser). Install a new coaxial cable (LMR600 or equal) from the lightning arrestor to a new omnidirectional antenna. It is assumed that the omnidirectional antenna may be installed atop the existing control panel and not on the existing antenna mast.

R. Panel HVAC Components

1. Provide heating, ventilation, and air conditioning, devices in order to maintain all components within the control panel within the acceptable range as specified in Section 409000.
2. HVAC equipment shall maintain the required NEMA rating for the control panel assembly.
3. Externally mounted HVAC equipment (such as air-to-air exchangers or air conditioners) shall be housed in an enclosure whose material matches the material of the control panel. Where in corrosive environments, all components that will come in contact with outside air shall be corrosion resistant for that environment.

4. All HVAC equipment shall be UL rated. For equipment mounted on the control panel, the equipment shall have a corresponding NEMA rating.
5. Provide power as required for the HVAC equipment. HVAC loads shall be included in feeder and control power transformer sizing calculations.
6. Panel Heating
    a. Heating shall be provided when ambient temperatures are expected to fall below the allowed range as specified in Section 409000. As a minimum, heating shall be sized to keep the panel temperature at or above 50°F.
    b. Except for small anti-condensation heaters, heating equipment shall have fans which distribute the heat throughout the enclosure. Heaters shall be installed according to the manufacturer's installation instructions. Provide enough space between the heating equipment and other components such that the other components to not experience abnormally high temperatures.
    c. Provide anti-condensation heaters for all outdoor enclosures which house electronics, instrumentation and/or motor controllers.
    d. All heaters shall be thermostatically controlled by a DIN rail mounted thermostat.
    e. Acceptable Manufacturers
        1) Hoffman.
        2) Or Approved Equal.
7. Panel Ventilation
    a. Where ventilation is determined to maintain the control panel's maximum temperature as required by Section 409000, the following requirements shall be adhered to:
        1) Ventilation shall maintain the required NEMA rating for the control panel assembly.
        2) For indoor, non-corrosive locations (panels with NEMA 12 ratings), conventional ventilation with fans and vents may be used.
        3) For corrosive or outdoor locations, side or top mounted air-to-air heat exchangers shall be used.
    b. The fan(s) and corresponding vents or air-to-air heat exchangers shall be properly sized and located to move enough air through the panel to remove the generated heat as well as allow air flow across all heat generating equipment.
    c. All ventilation shall be thermostatically controlled by a DIN rail mounted thermostat.
    d. Acceptable Manufacturers
        1) Hoffman.
        2) Pfannenberg.
        3) Or Approved Equal.
8. Panel Air Conditioning
    a. Where it is deemed necessary to air condition a control panel to maintain the control panel's maximum temperature as required by Section 409000, the following requirements shall be adhered to:
        1) Air conditioners shall be side or top mounted and shall be sized based upon the heat generated within the control panel, the maximum outside air temperature, and the amount of sunlight the control panel may be exposed to. Air conditioners shall be oversized by a safety factor of 25%.
        2) Air conditioners shall be thermostatically controlled by a DIN rail mounted thermostat. In addition, the air conditioner shall turn off if the panel door(s) are not closed.
    b. Acceptable Manufacturers
        1) Hoffman.

2) Pfannenberg.
3) Thermal Edge.
4) Kooltronics.

PART 3 - EXECUTION

3.1 FACTORY ACCEPTANCE TESTING

A. All control panels shall be factory acceptance tested (FAT) as required by Section 409000.

3.2 INSTALLATION

A. All control panels shall be installed according to the requirements of Section 409000.

B. All control panels shall be installed so that their surfaces are plumb and level.

C. All control panels shall be properly mounted so as to withstand the seismic requirements for the Site. Anchor panels securely to the wall or floor at each corner as a minimum.

D. Control panels shall have been designed according to locations for conduit entry. Floor mounted panels in electrical rooms shall have cutouts in the bottom of the enclosure that were cutout by the panel shop. All conduit holes shall be cut in the field.

E. Field wiring
   1. Wires that are terminated in control panels after permanent panel installation are deemed as field wires. Field wiring shall be installed in the allocated wire ducts and shall be properly labeled and terminated.
   2. All field wires shall be long enough to reach each corner of the enclosure. Neatly coil up extra wire length at the bottom of the enclosure. Do not use the wire ducts for storing extra wire length.

3.3 FIELD QUALITY CONTROL

A. Refer to Section 409000.

END OF SECTION 409513

APPENDIX B-CONSTRUCTION PLANS

(Reduced Scale)

SCHEMATIC LINETYPES

- ELECTRICAL BUS
- EXISTING OR FUTURE ELECTRICAL BUS
- MANUFACTURER/SHOP WIRE TYPICALLY INSTALLED OFF-SITE
- EXISTING OR FUTURE MANUFACTURER/SHOP WIRE
- FIELD/CONTRACTOR INSTALLED WIRE
- EXISTING OR FUTURE FIELD/CONTRACTOR INSTALLED WIRE

SCHEMATIC SYMBOLS

- DEVICE CONNECTION LUG OR TERMINAL
- SCHEMATIC POINT OF CONNECTION
- POWER STABS BUS CONNECTION
- POWER STABS LOAD CONNECTION

CIRCUIT BREAKER
- 100AF ← FRAME SIZE
- 50AT ← TRIP RATING
- MCP ← BREAKER TYPE

DISCONNECT
- 30A ← AMPERE RATING
- 4X ← NEMA RATING

FUSE
- 30A ← AMPERE RATING
- R ← FUSE TYPE

FUSED DISCONNECT
- 30A ← AMPERE RATING
- 4X ← NEMA RATING
- 30A ← AMPERE RATING
- R ← FUSE TYPE
- TRANSFORMER

CURRENT TRANSFORMER
- 100:5 ← CT TURNS RATIO
- 3 ← NUMBER OF CT'S

POTENTIAL TRANSFORMER
- 480:120 ← PT VOLTAGE RATIO
- 3 ← NUMBER OF PT'S

METERING EQUIPMENT
- UM ← METER TYPE DESIGNATION
  - AM = AMMETER
  - SSM = SOLID STATE METER
  - UM = UTILITY METER
  - VM = VOLTMETER
  - WHM = WATT HOUR METER
  - WM = WATT METER
- GENERATOR

MANUAL OR AUTOMATIC TRANSFER SWITCH
- 600A ← AMPERE RATING
- 3R ← NEMA RATING

TRANSIENT VOLTAGE SURGE SUPRESSOR
- TVSS CLASS C ← TVSS CLASSIFICATION

- MOTOR OVERLOAD RELAY

FULL VOLTAGE NON-REVERSING STARTER (FVNR)
- NEMA SIZE 1 ← STARTER TYPE AND SIZE

FULL VOLTAGE REVERSING STARTER (FVR)
- NEMA SIZE 1 ← STARTER TYPE AND SIZE

TWO-SPEED STARTER
- NEMA SIZE 1 ← STARTER TYPE AND SIZE

- HF — HARMONIC FILTER
- LR — LOAD REACTOR
- VFD — VARIABLE FREQUENCY DRIVE
- RVSS — REDUCED VOLTAGE SOFT STARTER
- GROUND CONNECTION
- 5 — MOTOR, NUMBER DESIGNATES NEMA HORSEPOWER SIZE
- M — MOTOR STARTER, CONTACTOR, RELAY OR TIMER COIL
- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT
- SOLENOID VALVE
- EQUIPMENT PROGRAMMING CONSOLE
- OFF ON XO — 2 POSITION SELECTOR SWITCH POSITION LEGEND: X=CLOSED O=OPEN
- H O A XOO — 3 POSITION SELECTOR SWITCH HAND - OFF - AUTO POSITION LEGEND: X=CLOSED O=OPEN
- O C A XOO — 3 POSITION SELECTOR SWITCH OPEN - CLOSE - AUTO POSITION LEGEND: X=CLOSED O=OPEN
- F O R XOO — 3 POSITION SELECTOR SWITCH FORWARD - OFF - REVERSE POSITION LEGEND: X=CLOSED O=OPEN
- STOP — NORMALLY CLOSED PUSH BUTTON
- START — NORMALLY OPEN PUSH BUTTON

TYPICAL SWITCH CONFIGURATION
- FLOAT SWITCH - MAKE ON FALL
- FLOAT SWITCH - MAKE ON RISE
- FLOAT SWITCH - BREAK ON FALL
- FLOAT SWITCH - BREAK ON RISE
- SWITCH TYPE SYMBOL (SEE BELOW)
  - LEVEL SWITCH
  - PRESSURE SWITCH
  - FLOW OR TORQUE SWITCH
  - TEMPERATURE SWITCH
  - LIMIT SWITCH
- NOTC — TIMER RELAY CONTACT NORMALLY OPEN TIME DELAY CLOSE
- ETM — ELAPSED TIME METER
- CR — CONTROL RELAY
- TD — TIME DELAY RELAY
- AR — ALARM RELAY
- R — PILOT LIGHT LETTER INDICATES COLOR R=RED, A=AMBER, B=BLUE, G=GREEN
- 50 — INSTANTANEOUS SHORT-CIRCUIT TRIP DEVICE
- 51 — TIME OVERCURRENT TRIP DEVICE
- 51G — GROUND FAULT TRIP DEVICE

ELECTRICAL PLAN LINETYPES

- EXPOSED CONDUIT
- EXISTING OR FUTURE EXPOSED CONDUIT
- UNDERGROUND CONDUIT
- EXISTING OR FUTURE UNDERGROUND CONDUIT
- E — E — CONDUIT DUCTBANK
- E — E — EXISTING OR FUTURE CONDUIT DUCTBANK
- BARE COPPER GROUND CONDUCTOR
- ELECTRICAL EQUIPMENT
- EXISTING OR FUTURE ELECTRICAL EQUIPMENT
- DEMOLITION
- E — CAPPED UNDERGROUND CONDUIT

ELECTRICAL PLAN HAZARDOUS LOCATION CLASSIFICATION LINETYPES

- C1D1 — CLASS I DIV 1
- C1D2 — CLASS I DIV 2
- C2D1 — CLASS II DIV 1
- C2D2 — CLASS II DIV 2

ELEC. PLAN SYMBOLS

SITE PLAN DEVICES

- X ← X= (SEE BELOW)
  - AE - ANALYZER ELEMENT
  - AIT - ALALYZING INDICATING TRANSMITTER
  - FE - FLOW ELEMENT
  - FIT - FLOW INDICATING TRANSMITTER
  - FS - FLOW SWITCH
  - J - JUNCTION BOX
  - JS - TORQUE SWITCH
  - LE - LEVEL ELEMENT
  - LIT - LEVEL INDICATING TRANSMITTER
  - LS - LEVEL SWITCH
  - M - MOTOR
  - MH - MANHOLE
  - MV - MOTOR OPERATED VALVE
  - PB - PULLBOX
  - PIT - PRESSURE INDICATING TRANSMITTER
  - PS - PRESSURE SWITCH
  - PT - PRESSURE TRANSMITTER
  - SV - SOLENOID VALVE
  - TS - TEMPERATURE SWITCH
  - WE - WEIGHT ELEMENT
  - WIT - WEIGHT INDICATING TRANSMITTER
  - ZS - LIMIT SWITCH
- GROUND ROD
- WP — DUPLEX RECEPTACLE; DENOTES RECEPTACLE TYPE (BLANK) = STANDARD INDOORS GFCI = GND FLT CURRENT INT. WP = WEATHER PROOF & GFCI
- QUADRAPLEX RECEPTACLE
- DATA JACK
- $ — SINGLE POLE SWITCH
- $3 — 3-WAY SWITCH
- $4 — 4-WAY SWITCH
- CONDUIT SEALOFF
- LTC CONNECTION
- MC CONNECTION
- DISCONNECT SWITCH
- T — THERMOSTAT
- 3 — CONDUIT HOME RUN NUMBER INDICATES QUANTITY OF CONDUCTORS INCLUDING GROUND

TB'S & PLC SYMBOLS

LOCAL PANEL OR DEVICE TERMINAL BLOCK
- TERMINAL LABEL
- X

PLC PANEL TERMINAL BLOCK
- TERMINAL LABEL
- X

MCC TERMINAL BLOCK
- TERMINAL LABEL
- X

DEVICE TERMINAL BLOCK
- TERMINAL LABEL
- X

PLC DISCRETE INPUT
- DISCRETE INPUT LABEL
- DIXX

PLC DISCRETE OUTPUT (NORMALLY OPEN)
- DISCRETE OUTPUT LABEL
- DOXX

PLC DISCRETE OUTPUT (NORMALLY CLOSED)
- DISCRETE OUTPUT LABEL
- DOXX

PLC ANALOG INPUT
- ANALOG INPUT LABEL
- AIXX

PLC ANALOG OUTPUT
- ANALOG OUTPUT LABEL
- AOXX

PLC RTD
- RTD LABEL
- RTDXX

EQUIPMENT CALLOUT

- EQUIP. TAG — EQUIPMENT CALLOUT
- DESCRIPTOR #1
- DESCRIPTOR #2
- DESCRIPTOR #3
- 100 / TYP — DETAIL CALLOUT
- FE / 101 — FIELD INSTRUMENT CALLOUT

CONDUIT CALLOUT

- CXXX
- PXXX
- FXXX
- SPXXX

GROUPED CONDUIT AND CIRCUIT IDENTIFICATION TAGS. REFER TO THE POWER ONE-LINE AND CONTROL ONE-LINE DIAGRAMS OR CONDUIT SCHEDULES FOR CONDUIT SIZES AND CONTENTS.
C-CONTROL/INSTRUMENTATION
P-POWER
F-FIBER OPTIC/NETWORK
SP-SPARE CONDUITS

ABBREVIATIONS

A	AMPERE
AFF	ABOVE FINISHED FLOOR
AI	ANALOG INPUT
AIC	AMPS INTERRUPTING CAPACITY
AO	ANALOG OUTPUT
AS	AIR SUPPLY
ATS	AUTOMATIC TRANSFER SWITCH
C	CONDUIT
CB	CIRCUIT BREAKER
CL2	CHLORINE
CPT	CONTROL POWER TRANSFORMER
CTC	COMMUNICATIONS TERMINATION CABINET
CU	COPPER, BARE
CV	CONTROL VALVE
DCS	DISTRIBUTED CONTROL SYSTEM
DI	DISCRETE INPUT
DO	DISCRETE OUTPUT
DP	DISTRIBUTION PANEL
DS	DISCONNECT SWITCH
DV/DT	DIFFERENTIAL VOLTAGE/TIME
DWG	DRAWING
ETM	ELAPSED TIME METER
EOL	ELECTRONIC OVERLOAD
FE	FLOW ELEMENT
FLA	FULL LOAD AMPS
FOC	FIBER OPTIC CABLE
FOR	FORWARD-OFF-REVERSE
FS	FLOW SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFP	GROUND FAULT PROTECTION
GND	GROUND
GPM	GALLONS PER MINUTE
GRS	GALVANIZED RIGID STEEL
H2S	HYDROGEN SULFIDE
HH	HANDHOLE
HMI	HUMAN MACHINE INTERFACE
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
I	CURRENT
IC	INSTRUMENTATION CABLE
IO	INPUT/OUTPUT
ISC	SHORT CIRCUIT CURRENT
J	JUNCTION BOX
LAN	LOCAL AREA NETWORK
LCP	LOCAL CONTROL PANEL
LOS	LOCK-OUT-STOP
LP	LIGHTING PANEL
LR	LOCAL/REMOTE
LS	LEVEL SWITCH
LTC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT
M	MOTOR
MA	MANUAL/AUTO, MILLIAMP
MC	MANUFACTURER'S CABLE
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR(S)	MANUFACTURER(S)
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MOV	MOTOR OPERATED VALVE
MTU	MASTER TELEMETRY UNIT
NEC	NATIONAL ELECTRICAL CODE
NOTC	NORMALLY OPEN TIMED CLOSED
NPW	NON-POTABLE WATER
NTS	NOT TO SCALE
NTU	TURBIDITY
OIT	OPERATOR INTERFACE TERMINAL
OL	OVERLOAD
OO	ON/OFF (MAINTAINED)
OR	OFF-REMOTE
PB	PULL BOX
PC	PERSONAL COMPUTER
PFR	PHASE/POWER FAILURE RELAY
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL
PPM	PARTS PER MILLION
PR	PAIR
P	PRESSURE
PS	PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
PV	PROCESS VARIABLE
RCP	REMOTE CONTROL PANEL
RF	RADIO FREQUENCY
RIO	REMOTE INPUT OUTPUT
RST	RESET
RTD	RESISTANCE TEMPERATURE DETECTOR
RTU	REMOTE TELEMETRY UNIT
RVSS	REDUCED VOLTAGE SOFT STARTER
SEQ	SERVICE ENTRANCE EQUIPMENT
SES	SERVICE ENTRANCE SECTION
SLOS	START-LOCK-OFF-STOP
SMC	SUBMERSIBLE MANUFACTURER CABLE
SO2	SULFUR DIOXIDE
SP	SET POINT/SPARE
SPD	SURGE PROTECTION DEVICE
SS	START/STOP
ST	SHUNT TRIP
TC	TELEPHONE CABLE
TS	TEMPERATURE SWITCH
TYP	TYPICAL
UG	UNDERGROUND
V	VOLT
VA	VOLTAMP
VFD	VARIABLE FREQUENCY DRIVE
W	WATT, WIRE
WP	WEATHERPROOF
XFMR	TRANSFORMER
ZS	POSITION SWITCH

NOTES

1. THE COMPLETED INSTALLATION SHALL COMPLY WITH APPLICABLE FEDERAL, STATE, AND LOCAL CODES, ORDINANCES, AND REGULATIONS. THE CONTRACTOR SHALL OBTAIN NECESSARY PERMITS AND INSPECTIONS REQUIRED BY THE AUTHORITIES HAVING JURISDICTION. ALL WORK SHALL BE COMPLETED IN A NEAT, WORKMANLIKE MANNER IN ACCORDANCE WITH THE LATEST NEC STANDARDS OF INSTALLATION UNDER COMPETENT SUPERVISION. INSTALL GROUNDING PER NEC.
2. VISIT THE SITE PRIOR TO BIDDING TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND OTHER FACTORS, WHICH MAY AFFECT THE EXECUTION OF THE WORK. INCLUDE ALL RELATED COSTS IN THE INITIAL BID PROPOSAL.
3. THE CONTRACTOR SHALL COORDINATE WORK WITH THE UTILITIES PROVIDING SERVICES ON THIS PROJECT, AND SHALL COMPLY WITH ALL THEIR INSTALLATION REQUIREMENTS.
4. ALL MATERIALS SHALL BE NEW AND OF THE BEST QUALITY, MANUFACTURED IN ACCORDANCE WITH NEMA, ANSI, UL, OR OTHER APPLICABLE STANDARDS. THE USE OF MANUFACTURERS' NAMES, MODELS, AND NUMBERS IS INTENDED TO ESTABLISH STYLE, QUALITY, APPEARANCE, USEFULNESS, AND BID PRICE.
5. PROTECT ALL ELECTRICAL MATERIAL AND EQUIPMENT INSTALLED AGAINST DAMAGE BY OTHER TRADES, WEATHER CONDITIONS, OR ANY OTHER PREVENTABLE CAUSES. EQUIPMENT DAMAGED DURING SHIPPING OR CONSTRUCTION, PRIOR TO ACCEPTANCE BY THE ENGINEER OR THE OWNER, WILL BE REJECTED AS DEFECTIVE.
6. LEAVE THE SITE CLEAN. REMOVE ALL DEBRIS, EMPTY CARTONS, TOOLS, CONDUIT, WIRE SCRAPS AND ALL MISCELLANEOUS SPARE EQUIPMENT AND MATERIALS USED IN THE WORK DURING CONSTRUCTION. ALL COMPONENTS SHALL BE FREE OF DUST, GRIT AND FOREIGN MATERIALS, LEFT AS NEW BEFORE FINAL ACCEPTANCE OF WORK. DAMAGED PAINT AND FINISHES SHALL BE TOUCHED UP OR REPAINTED WITH MATCHING COLOR PAINT AND FINISH.
7. CIRCUIT CONDUCTORS #6 AWG OR SMALLER SHALL BE THWN STRANDED COPPER. #4 AWG THROUGH #2 AWG SHALL BE XHHW STRANDED COPPER. #1 AWG OR LARGER SHALL BE XHHW-2 STRANDED COPPER. MINIMUM POWER CONDUCTOR SIZE SHALL BE #12 AWG WITH #12 AWG GROUND. ALL WIRE TO BE SIZED PER NEC TABLE 316-10, 75° C BASED ON A 30° C AMBIENT.

REGISTERED PROFESSIONAL ENGINEER — MARK P JEPPESEN — NO. E13627 EXP. 12-31-20 — ELECTRICAL — STATE OF CALIFORNIA

11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE, 1/2" = HALF SCALE (0, 1/2, 1)

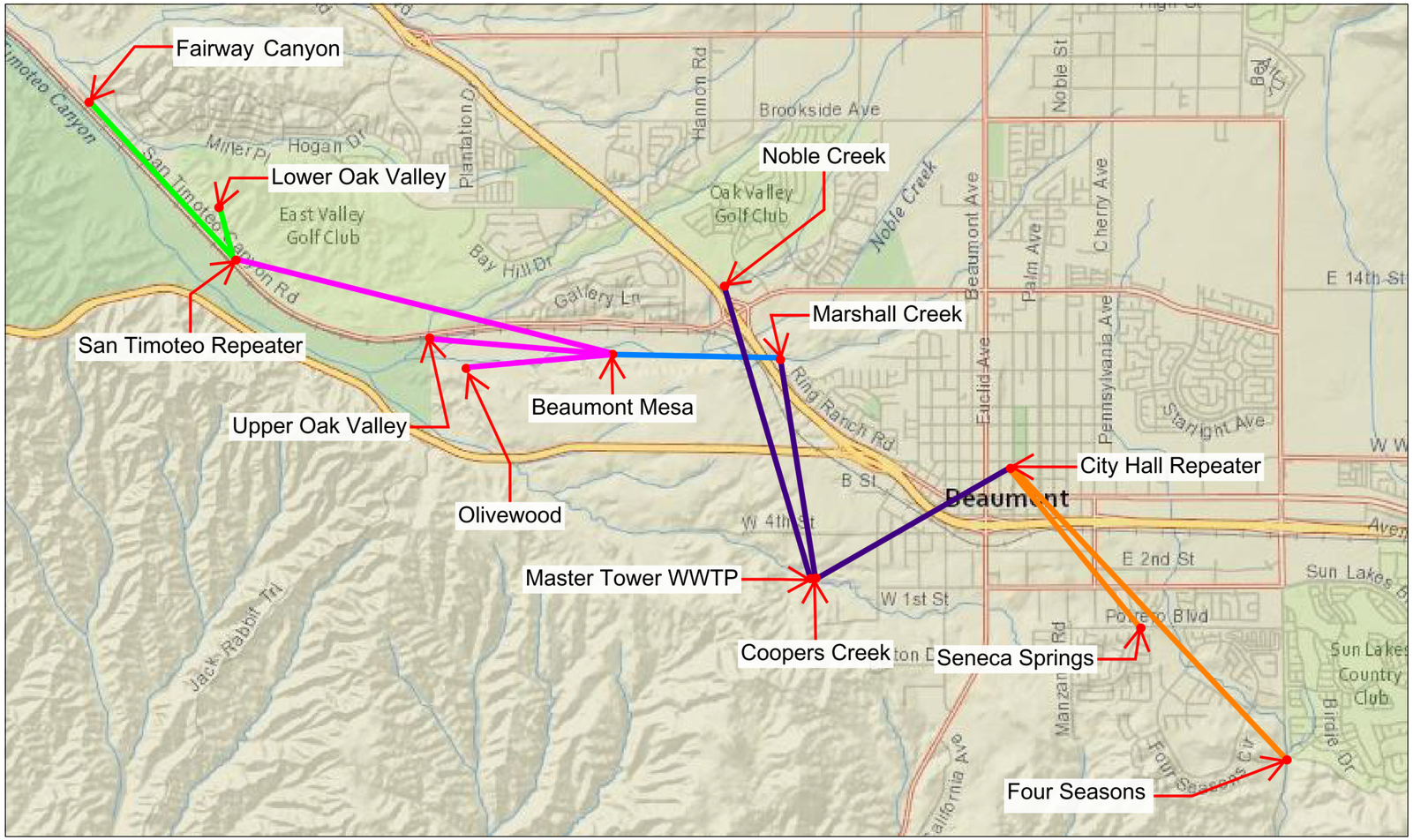
NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
REVISIONS	07/31/2020	MPJ	BB	MPJ

SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - GENERAL
ELECTRICAL LEGEND
20

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E001
SHEET 1 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\E999-E001.DWG



SITE PLAN

SITE INFORMATION		
SITE	LOCATION	GPS COORDINATES
FOUR SEASONS	1075 S HIGHLAND SPRINGS AVE	33.906343, -116.946653
SENECA SPRINGS	1390 POTRERO BLVD	33.918476, -116.962131
NOBLE CREEK	1899 OAK VALLEY PKY	33.944852, -117.001335
MARSHALL CREEK	990 RING RANCH RD	33.940505, -116.998363
MESA	12940 POTRERO BLVD	33.940260, -117.015935
UPPER OAK VALLEY	35980 OAK VALLEY PKY	33.943407, -117.034685
LOWER OAK VALLEY	11246 PALMER AVE	33.9599518, -117.061619
LITTLE CREEK	34003 CRENSHAW ST	33.964271, -117.070633
COOPERS CREEK	715 W. 4th STREET	33.924028, -116.993966
CITY HALL (REPEATER)	550 E 6th STREET	33.930035, -116.975176
BEAUMONT WWTP	715 W. 4th STREET	33.924028, -116.993966
SAN TIMOTEO REPEATER	OAK VALLEY PARKWAY	33.95844, -117.058051
OLIVEWOOD	36594 ARTISAN PL	33.940049, -117.030562

LIFT STATION AND RADIO LOCATIONS

GREEN RADIO PATHS TO SAN TIMOTEO REPEATER
PINK RADIO PATHS TO BEAUMONT MESA
BLUE RADIO PATHS TO MARSHALL CREEK
VIOLET RADIO PATHS TO MASTER TOWER WWTP, CITY HALL REPEATER
ORANGE RADIO PATHS TO FOUR SEASONS

REGISTERED PROFESSIONAL ENGINEER
CLARK P JEPPSEN
NO. E 8627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE

NO.	DATE	ORIGINAL / REVISIONS	DRAWN	CHECKED
		DESIGN	MPJ	MPJ
A	07/31/2020	REVISIONS	BB	

SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - SITE
SITE MAP

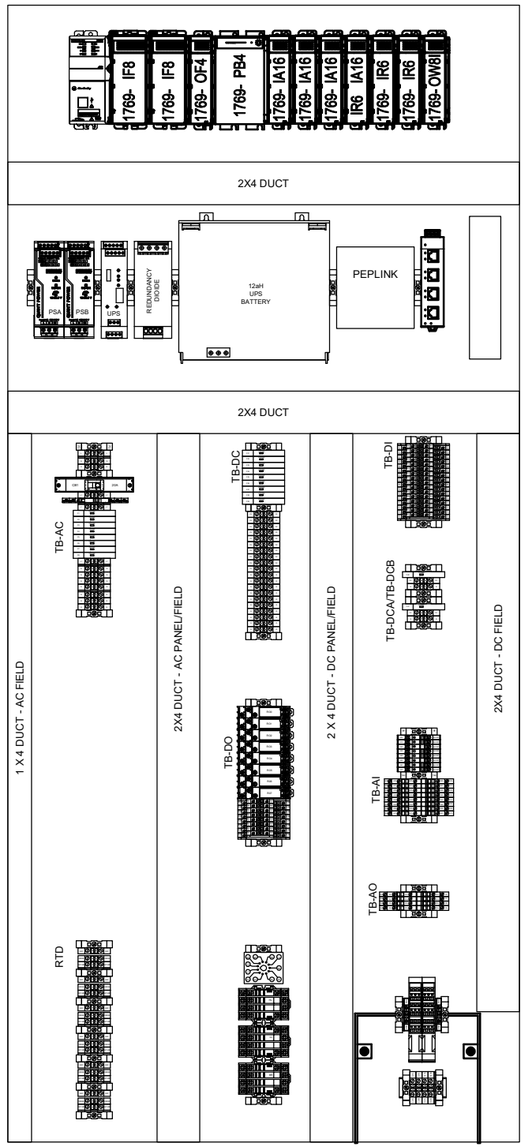
skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E201

SHEET 2 OF 20

LINE	MAKE	MODEL	DESCRIPTION	TOTAL	FOUR SEASONS	SENECA	COOPERS CREEK	MARSHALL CREEK	NOBLE	UPPER OAK	LOWER OAK	LITTLE LOWER	MESA	CITY HALL REPEATER	SAN TIMOTEO REPEATER	OLIVEWOOD	SPARE PARTS
PLC & COMMUNICATION EQUIPMENT																	
1	AB	1769-L33ER	COMPACTLOGIX 5370 2MB	10	1	1	1	1	1	1	1	1	1			1	1
2	AB	1769-PB4	COMPACTLOGICX POWER SUPPLY 24VDC	10	1	1	1	1	1	1	1	1	1			1	1
3	AB	1769-IA16	COMPACT IO 16PT DI 120VAC	28	3	3	3	3	3	4	3		4				2
4	AB	1769-IQ16	COMPACT IO 16PT DI 24VDC	3								2				2	1
5	AB	1769-OW8I	COMPACT IO 8PT DO	10	1	1	1	1	1	1	1	1	1			1	1
6	AB	1769-IF8	COMPACT IO 8PT AI	12	1	1	1	1	1	2	1	1	2			1	1
7	AB	1769-OF4	COMPACT IO 4PT AO	7			1	1	1	2			1				1
8	AB	1769-IR6	COMPACT IO 6PT RTD	3									2				1
9	AB	1769-ECR	COMPACT IO END CAP RIGHT	10	1	1	1	1	1	1	1	1	1			1	1
10	PHOENIX	2891152	5-PORT ETHERNET SWITCH	12	1	1		1	1	1	1	1	1	2	1		1
11	FREEWAVE	Z9-PE	ZUMLINK 900 MHZ RADIO	15	1	1		2	1	1	1	1	2	2	2	1	1
12	FREEWAVE	AOH4003SP	DIN RAIL BRACKET FOR ZUMLINK	15	1	1		2	1	1	1	1	2	2	2	1	1
13	POLYPHASER	IS-B50LN-C2	LIGHTNING ARRESTOR 1000MHz	15	1	1		2	1	1	1	1	2	2	2	1	1
14	TIMES	LMR240-06-NMTM	TNC(M) TO N(M) COAXIAL CABLE 6'	15	1	1		2	1	1	1	1	2	2	2	1	1
15	SCALA	TY-900	900MHZ YAGI ANTENNA 12DB N(F)	15	1	1		2	1	1	1	1	2	2	2	1	1
16	PEPLINK	MAX-BR1-MINI-LTE-US-T	CELLULAR MODEM/ANTENNA	9	1	1		1	1	1	1	1	1			1	1
17	POLYPHASER	RGT	LIGHTNING ARRESTOR 2.4GHz	9	1	1		1	1	1	1	1	1			1	1
18	TIMES	LMR240-06-NMSM	SMA(M) TO N(M) COAXIAL CABLE 6'	9	1	1		1	1	1	1	1	1			1	1
19	LAIRD	OC69271-FNM	CELLULAR OMNI ANTENNA 3.5DB N(F)	9	1	1		1	1	1	1	1	1			1	1
20	TIMES	LMR600	COAX CABLE W/ N(M) ENDS	21	1	1		1	1	1	1	1	11	1	1	2	1
21			CAT 6 PATCH CABLES (LENGTH VARIES)	29	3	3		3	3	3	3	3	3	2	2	2	1
PLC PANEL EQUIPMENT																	
101	PHOENIX	2905228	120VAC 20A IN-LINE SPD	12	1	1	1	1	1	1	1	1	1	1	1		1
102	PHOENIX	2904601	24VDC POWER SUPPLY 10A OUTPUT	23	2	2	2	2	2	2	2	2	2	2	2	2	1
103	PHOENIX	2907719	24VDC REDUNDANCY MODULE	14	1	1	1	1	1	1	1	1	3	1	1	1	1
104	PHOENIX	2320270	120VAC 5A AC UPS	11	1	1	1	1	1	1	1	1	1		1	1	1
105	PHOENIX	2320319	120VAC BATTERY PACK 7.2AH	11	1	1	1	1	1	1	1	1	1		1	1	1
106	PHOENIX	2924249	2-CHANNEL DIGITAL SIGNAL CONDITIONER	10	1	1	1	1	1	1	1	1	1				1
109	IDEC	RJ1S-CL-D24	SINGLE POLE RELAY 24VDC COIL WITH LIGHT	76	8	8	8	8	8	8	8	8	8				4
110	IDEC	SJ1S-05BW	RELAY SOCKET	72	8	8	8	8	8	8	8	8	8				0
111	IDEC	GT3F-1EAD24	DELAY TIMERS	10	1	1	1	1	1	1	1	1	1				1
112	IDEC	SR3P-06	11 PIN RELAY BASE	9	1	1	1	1	1	1	1	1	1				0
113	IDEC	RH4B-UDC24V	24VDC OPERATED RELAY	33	3	3	3	3	3	5	3	3	5				2
114	IDEC	SH4B-05	RELAY BASE	31	3	3	3	3	3	5	3	3	5				0
119			TERMINAL BLOCKS AS REQUIRED	9	1	1	1	1	1	1	1	1	1				0
122			DIN RAIL AS REQUIRED	9	1	1	1	1	1	1	1	1	1				0
124			WIRE GUTTER AS REQUIRED	9	1	1	1	1	1	1	1	1	1				0

BILL OF MATERIAL



TYPICAL PANEL LAYOUT

EACH PANEL WILL BE BASED UPON PLC PANEL LAYOUT OF SPECIFIC LIFT STATION SITE

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE, 1/2" = HALF SCALE

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

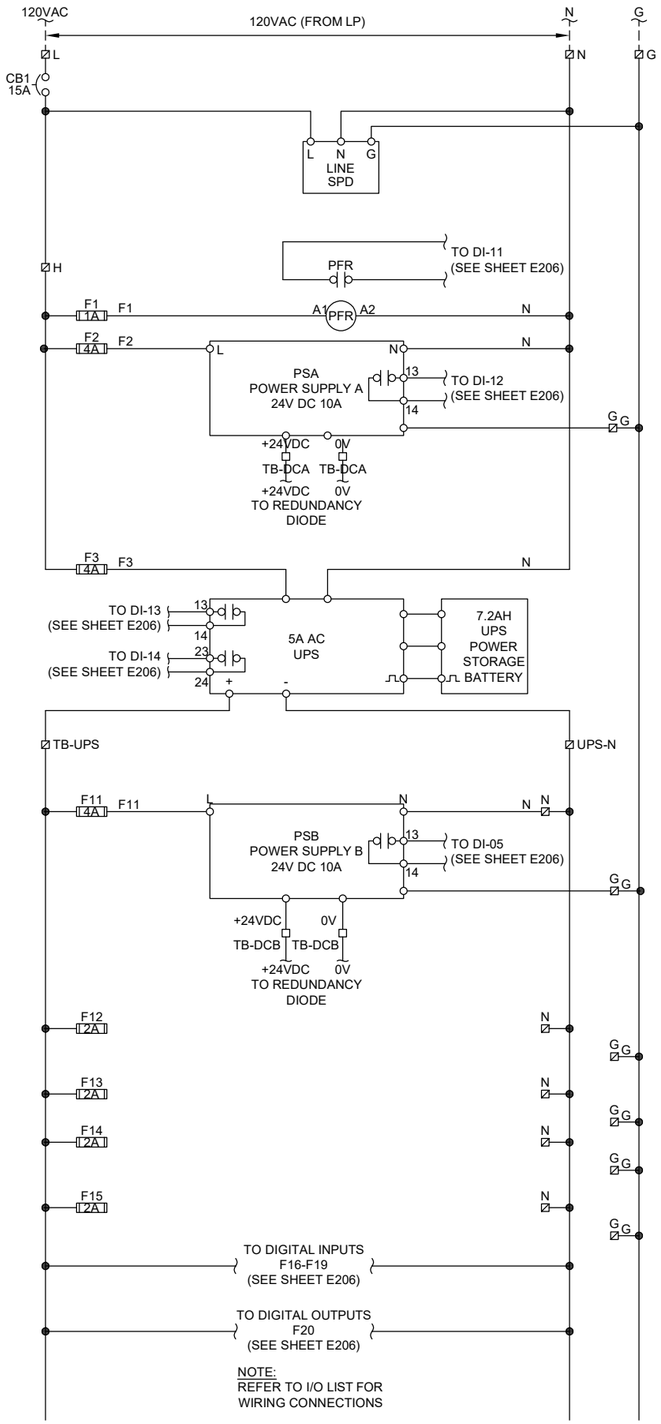
SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
TYPICAL PANEL LAYOUT AND BILL OF MATERIALS

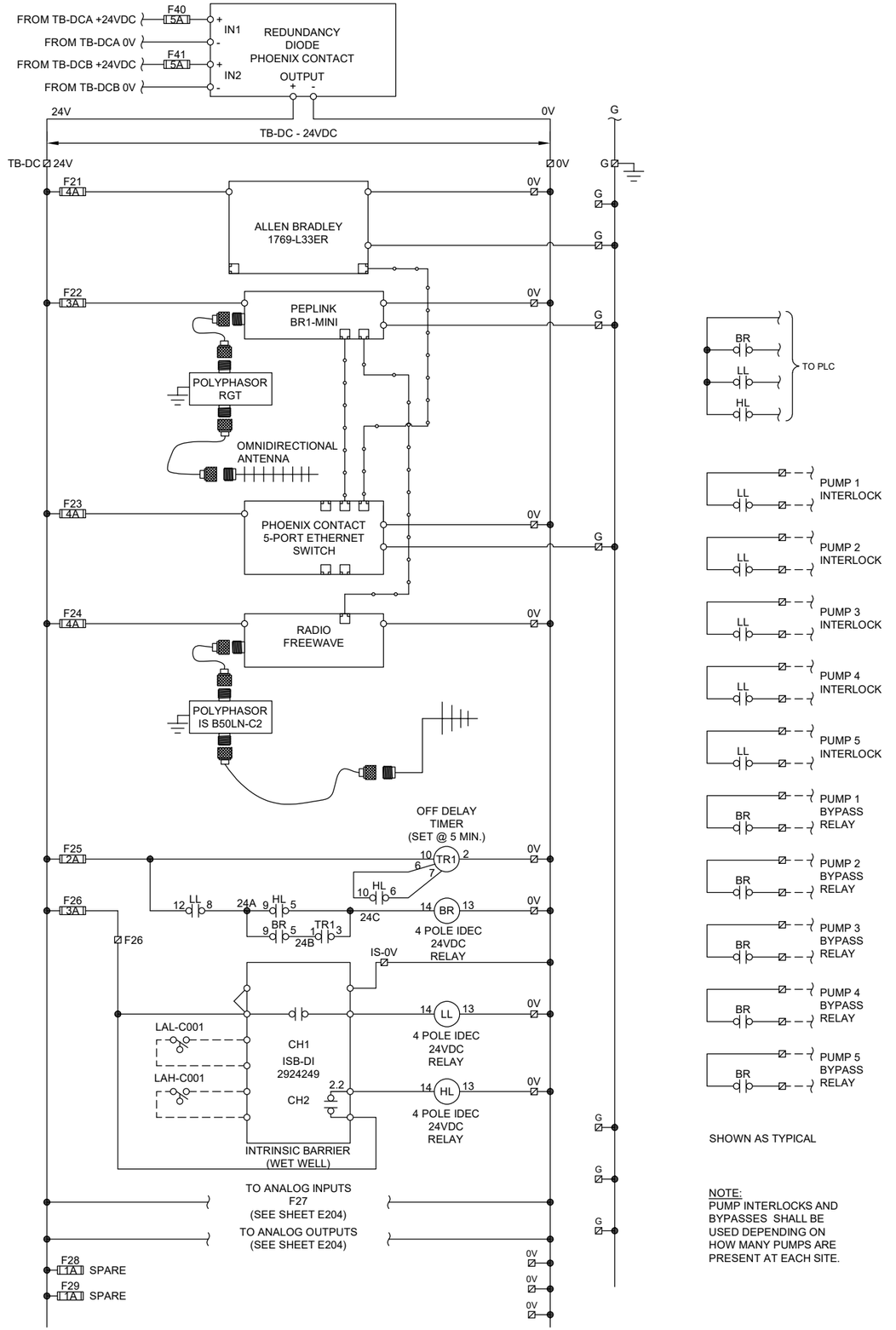
skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E202

SHEET 3 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\099 ELECTRICAL\999-E202.DWG





REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE
0 1/2 1

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

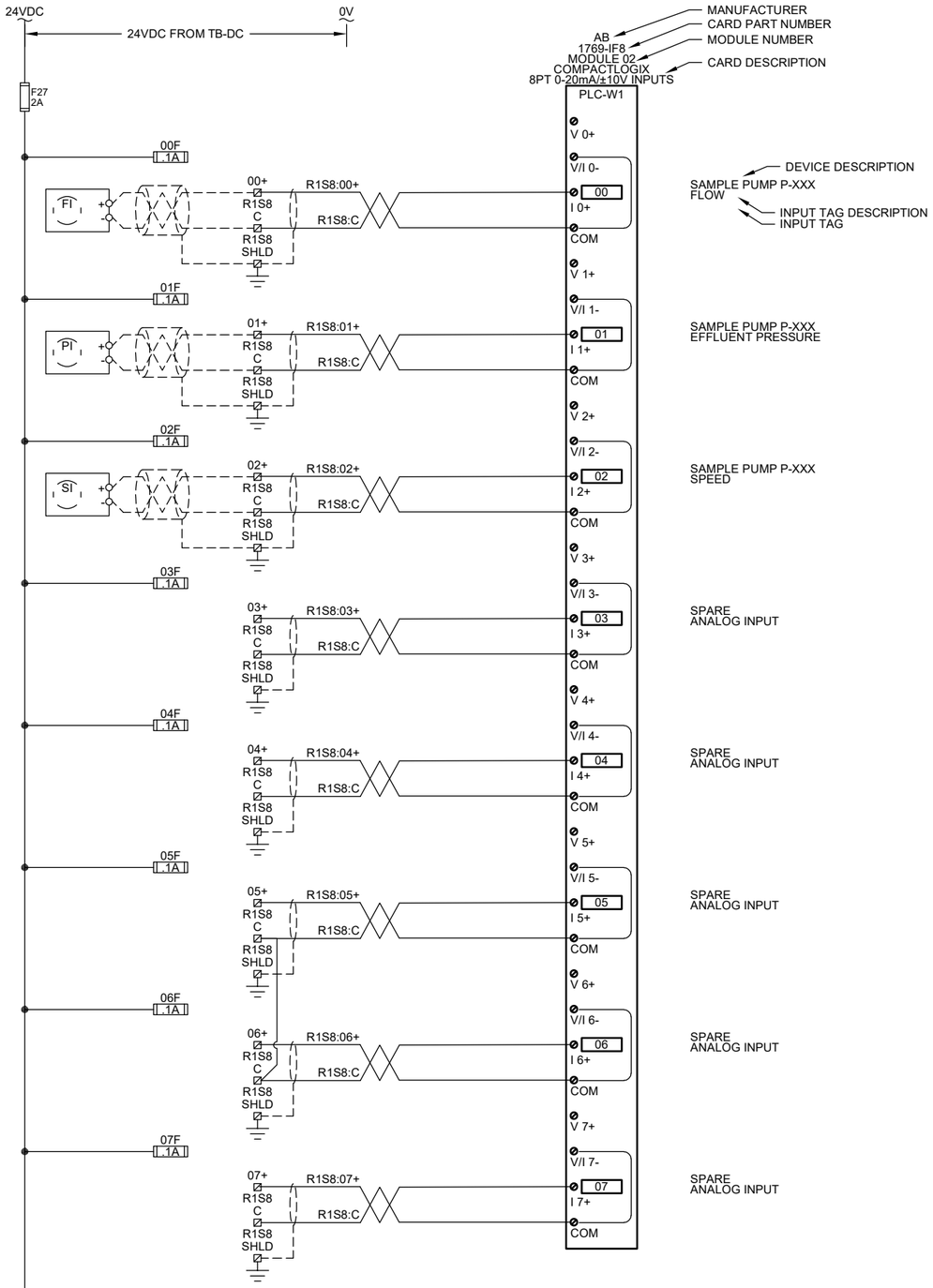
SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
PANEL WIRING DIAGRAM

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

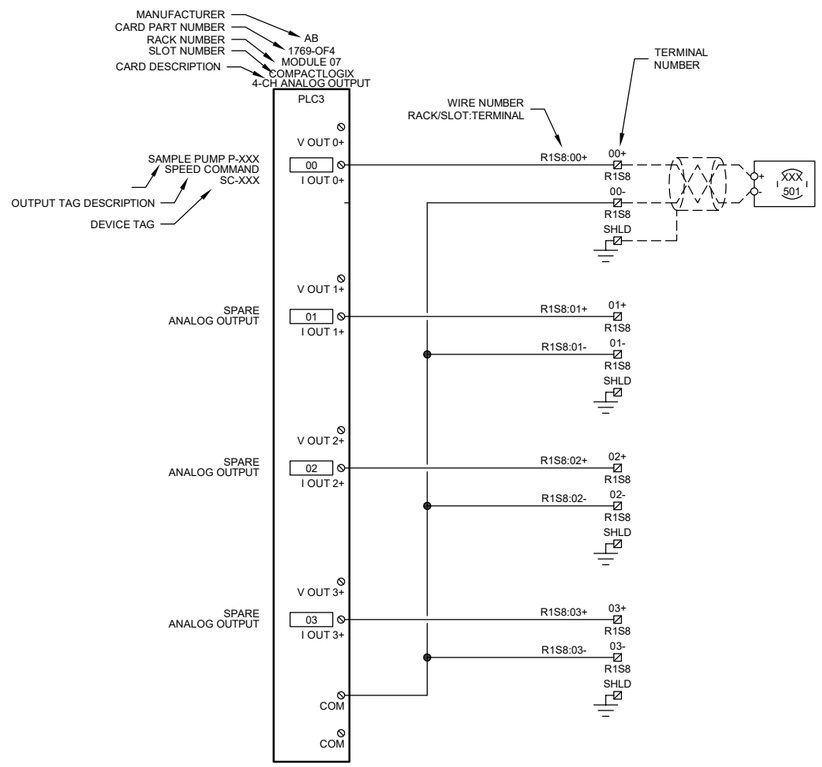
DRAWING NO.
E203

SHEET 4 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E203.DWG



I/V 8PT ANALOG INPUTS (CURRENT SHOWN)



I/V 4PT ANALOG OUTPUTS (CURRENT SHOWN)

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC

533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010

BEAUMONT LIFT STATIONS CONTROLS UPGRADE

ELECTRICAL - LAYOUT

ANALOG WIRING DIAGRAM

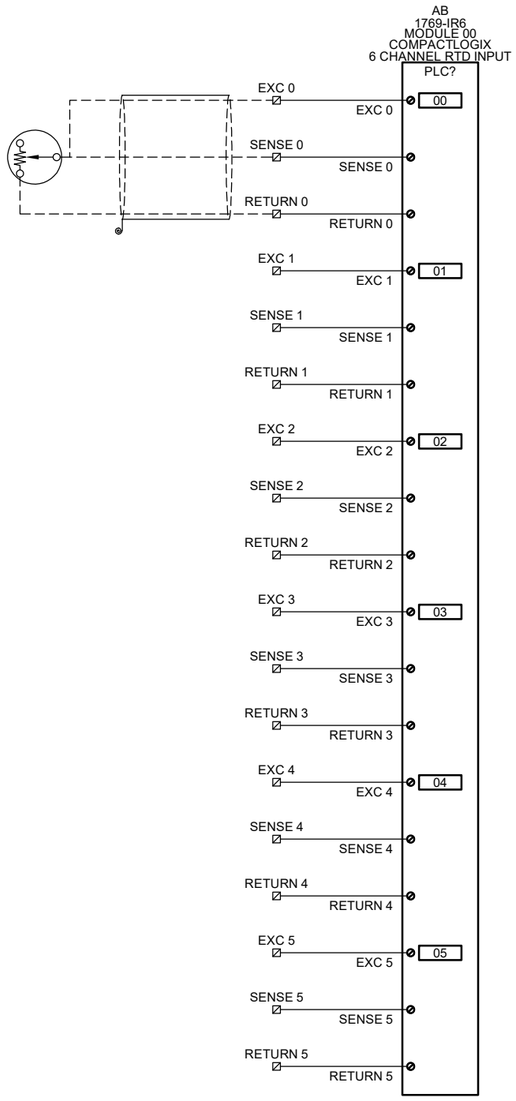
skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

DRAWING NO.

E204

SHEET 5 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\090 DRAFTING\999 ELECTRICAL\999-E204.DWG



RTD/RESISTANCE INPUT MODULE

DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE
0 1/2 1

ORIGINAL

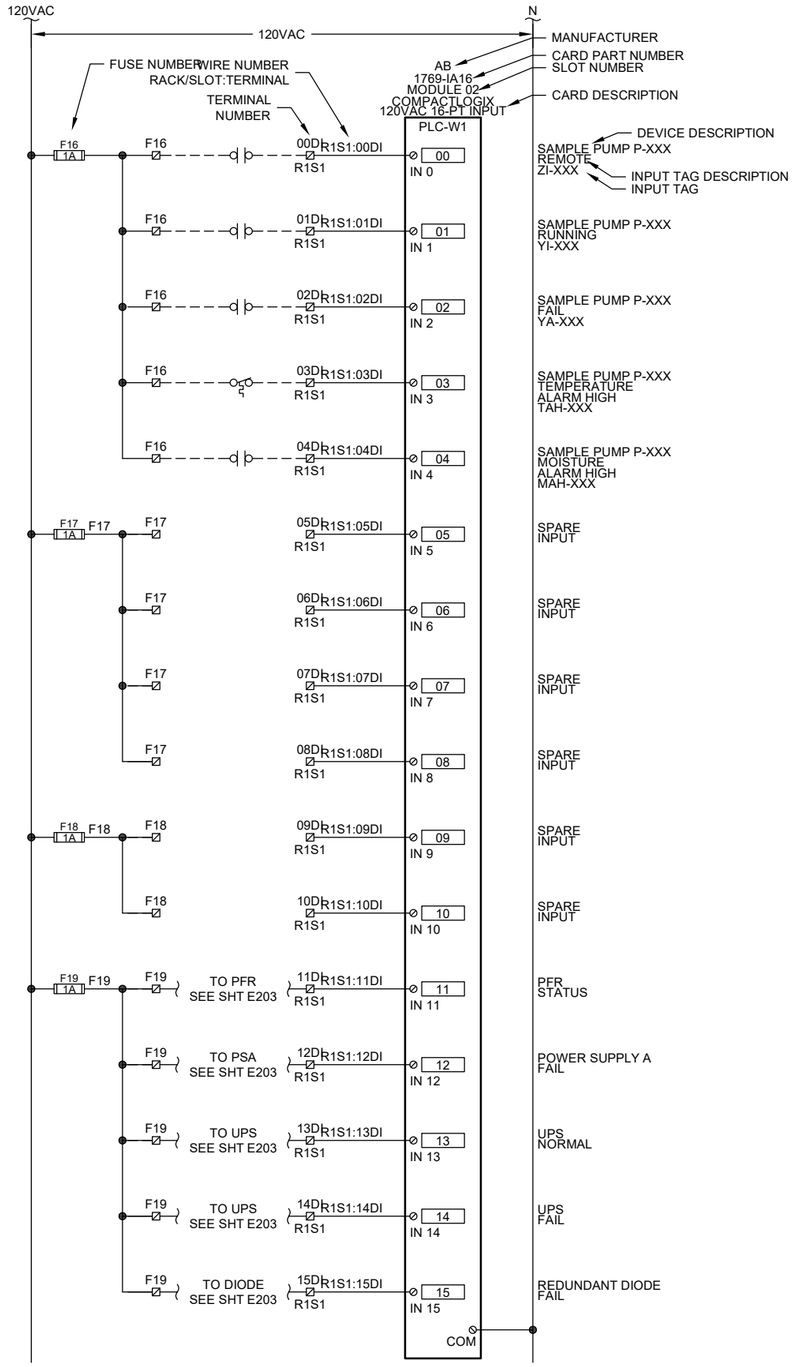
NO.	DATE	DESIGN	DRAWN	CHECKED
A	07/31/2020	MPJ	BB	MPJ

REVISIONS

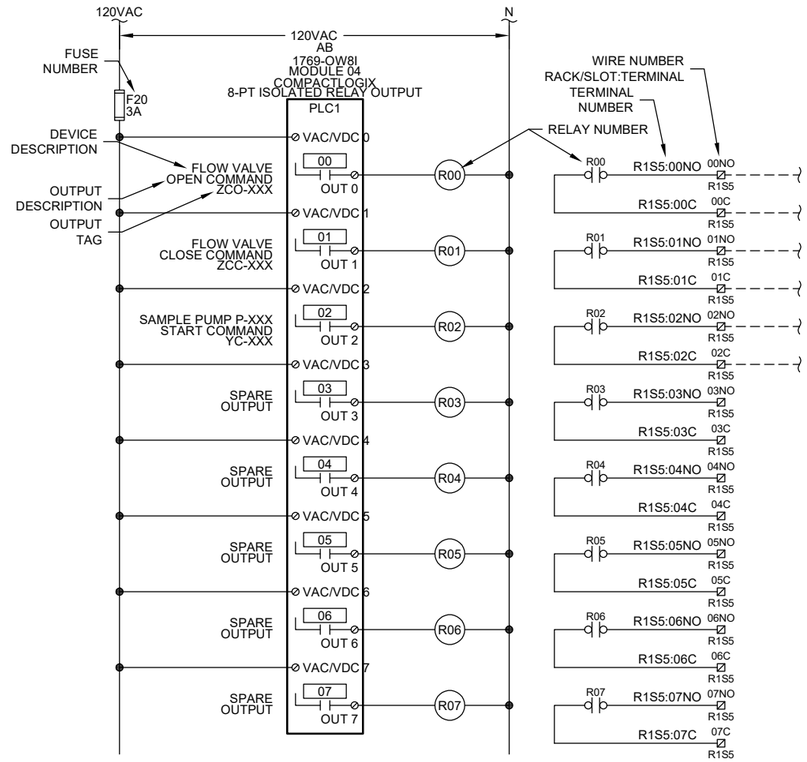
SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
RTD WIRING DIAGRAM

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

DRAWING NO.
E205
SHEET 6 OF 20



120VAC 16-PT INPUT



8-PT ISOLATED RELAY OUTPUT

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE, 1/2" = HALF SCALE

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC

533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010

BEAUMONT LIFT STATIONS CONTROLS UPGRADE

ELECTRICAL - LAYOUT

TYPICAL DIGITAL IO WIRING DIAGRAMS

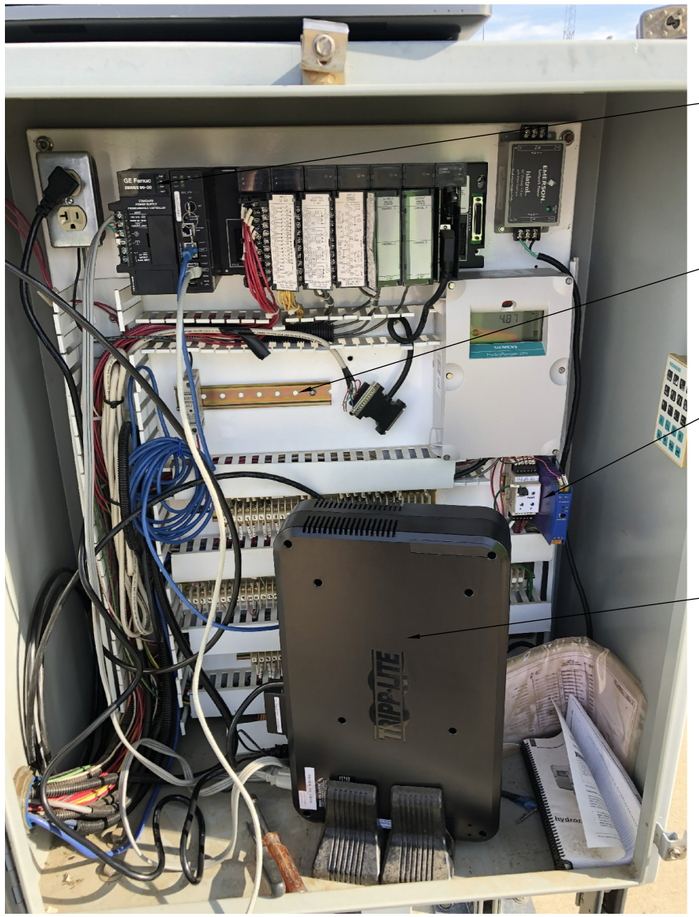
skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.

E206

SHEET 7 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E206.DWG



GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL AND CONNECT TO EXISTING COMPONENTS.

INSTALL A PHOENIX 2320270 AC UPS AND 7.2AH BATTERY PACK TO PROVIDE BACKUP POWER FOR THE SYSTEM.

ALL POWER SUPPLIES, UPS'S, NETWORK SWITCHES, RADIOS, RELAYS AND TERMINAL BLOCKS SHALL BE REPLACED WITH NEW COMPONENTS SUPPLIED WITH THE NEW BACK PANEL.

REMOVE TRIPP-LITE UPS FROM CABINET AS IT HAS BEEN REPLACED BY PHOENIX UPS.

COOPERS CREEK PANEL

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	6:01	WET WELL LEVEL	
AI	1:01	5:03	DISCHARGE FLOW (6")	
AI	1:02		SPARE	
AI	1:03	5:00	PUMP 1 SPEED	
AI	1:04	5:01	PUMP 2 SPEED	
AI	1:05	5:02	PUMP 3 SPEED (FUTURE)	
AI	1:06		SPARE	
AI	1:07		SPARE	
AO	2:00	7:00	PUMP 1 SPEED CMD	
AO	2:01	7:01	PUMP 2 SPEED CMD	
AO	2:02	8:00	PUMP 3 SPEED CMD (FUTURE)	
AO	2:03		SPARE	
DI	3:00		BYPASS RELAY	NEW POINT
DI	3:01		LOW LEVEL FLOAT	UNKNOWN
DI	3:02		HIGH LEVEL FLOAT	UNKNOWN
DI	3:03		SPARE	
DI	3:04	3:09	POWER FAIL AT ATS	
DI	3:05	3:10	GENERATOR RUNNING	
DI	3:06	3:11	GENERATOR FAIL	
DI	3:07		SPARE	
DI	3:08		SPARE	
DI	3:09		SPARE	
DI	3:10		SPARE	
DI	3:11		SPARE	
DI	3:12		DCPSA FAIL	NEW POINT
DI	3:13		DCPSB FAIL	NEW POINT
DI	3:14		UPS FAIL	NEW POINT
DI	3:15		POWER FAULT RELAY	NEW POINT
DI	4:00		PUMP 1 AUTO	NEW POINT
DI	4:01	3:00	PUMP 1 RUN	
DI	4:02	3:01	PUMP 1 VFD FAIL	
DI	4:03	3:13	PUMP 1 E-STOP	
DI	4:04		PUMP 1 HIGH TEMP	NEW POINT
DI	4:05	3:02	PUMP 1 SEAL FAIL	
DI	4:06		SPARE	
DI	4:07		SPARE	
DI	4:08		PUMP 2 AUTO	NEW POINT
DI	4:09	3:03	PUMP 2 RUN	
DI	4:10	3:04	PUMP 2 VFD FAIL	
DI	4:11	3:14	PUMP 2 E-STOP	
DI	4:12		PUMP 2 HIGH TEMP	NEW POINT
DI	4:13	3:05	PUMP 2 SEAL FAIL	
DI	4:14		SPARE	
DI	4:15		SPARE	
DI	5:00		PUMP 3 AUTO	NEW POINT
DI	5:01	3:06	PUMP 3 RUN	
DI	5:02	3:07	PUMP 3 VFD FAIL	
DI	5:03	3:15	PUMP 3 E-STOP	
DI	5:04		PUMP 3 HIGH TEMP	NEW POINT
DI	5:05	3:08	PUMP 3 SEAL FAIL	
DI	5:06		SPARE	
DI	5:07		SPARE	
DI	5:08		SPARE	
DI	5:09		SPARE	
DI	5:10		SPARE	
DI	5:11		SPARE	
DI	5:12		SPARE	
DI	5:13		SPARE	
DI	5:14		SPARE	
DI	5:15		SPARE	
DO	6:00	4:00	PUMP 1 START CMD	
DO	6:01	4:04	PUMP 2 START CMD	
DO	6:02	4:08	PUMP 3 START CMD	
DO	6:03		SPARE	
DO	6:04		SPARE	
DO	6:05		SPARE	
DO	6:06		SPARE	
DO	6:07		SPARE	

COOPERS CREEK I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. 8627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

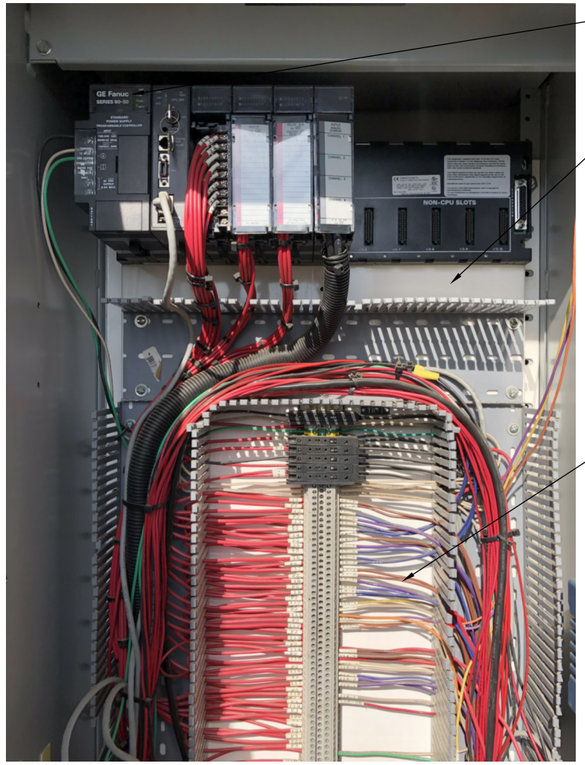
SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
COOPERS CREEK PANEL

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

DRAWING NO.
E207

SHEET 8 OF 20

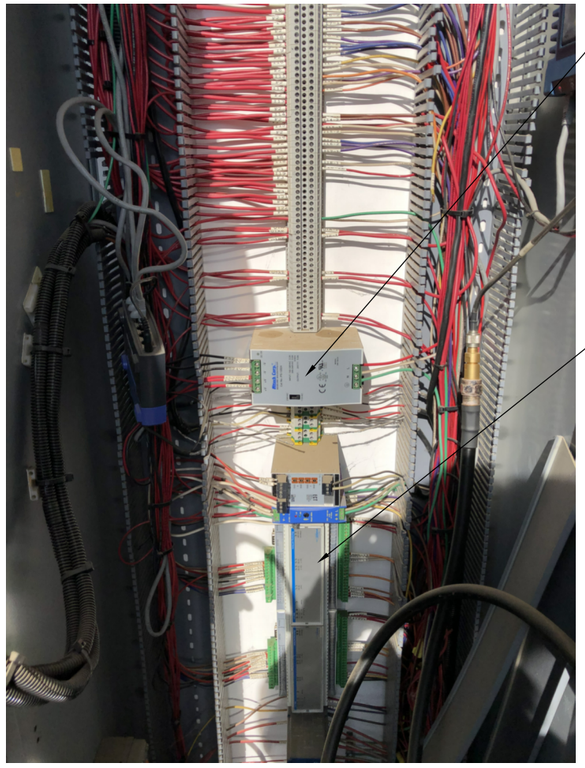
11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E207.DWG



GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REMOVE AND REPLACE EXISTING BACK PANEL WITH A NEW BACK PANEL AS SHOWN IN THE TYPICAL DRAWINGS AND BASED UPON THE IO LIST PROVIDED. CAREFULLY REMOVE EACH FIELD WIRE AND RE-TERMINATE ON THE NEW BACK PANEL. COORDINATE THE CUTOVER WITH THE OWNER AND THE OWNER'S SYSTEMS INTEGRATOR. CONTRACTOR SHALL FIELD VERIFY THE BACK PANEL DIMENSIONS AND PURCHASE OR FABRICATE A BACK PANEL WITH THE SAME DIMENSIONS AND HOLES.

REFER TO I/O WIRING DIAGRAMS.

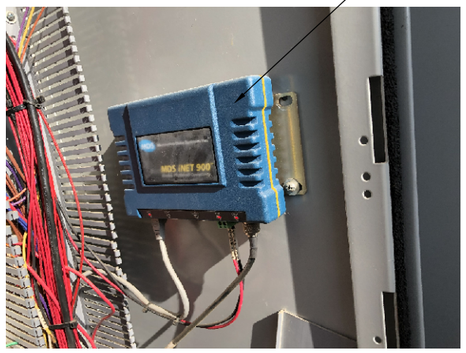


ALL POWER SUPPLIES, UPS'S, NETWORK SWITCHES, RADIOS, RELAYS AND TERMINAL BLOCKS SHALL BE REPLACED WITH NEW COMPONENTS SUPPLIED WITH THE NEW BACK PANEL.

PUMP SEAL AND TEMPERATURE DETECTORS SHALL BE RELOCATED BY THE CONTRACTOR TO THE MCC BUCKET FOR THAT PUMP.

TOUCH SCREEN SHALL BE REMOVED FROM THE DOOR OF THE PANEL. INSTALL A STEEL PAINTED COVER IN ITS PLACE.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO



TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	5:02	WET WELL LEVEL	
AI	1:01	5:00	FLOW 1 (8")	
AI	1:02	5:01	FLOW 2 (14")	
AI	1:03		SPARE	
AI	1:04		SPARE	
AI	1:05		SPARE	
AI	1:06		SPARE	
AI	1:07		SPARE	
DI	2:00		BYPASS RELAY	NEW POINT
DI	2:01	3:00	LOW LEVEL FLOAT	
DI	2:02	3:01	HIGH LEVEL FLOAT	
DI	2:03		SPARE	
DI	2:04	2:09	POWER FAIL AT ATS	
DI	2:05	2:10	GENERATOR RUNNING	
DI	2:06	2:11	GENERATOR FAIL	
DI	2:07		SPARE	
DI	2:08		SPARE	
DI	2:09		SPARE	
DI	2:10		SPARE	
DI	2:11		SPARE	
DI	2:12		DCPSA FAIL	NEW POINT
DI	2:13		DCPSB FAIL	NEW POINT
DI	2:14		UPS FAIL	NEW POINT
DI	2:15		POWER FAULT RELAY	NEW POINT
DI	3:00		PUMP 1 AUTO	NEW POINT
DI	3:01	2:00	PUMP 1 RUN	
DI	3:02	2:01	PUMP 1 FAIL	
DI	3:03	2:13	PUMP 1 E-STOP	
DI	3:04		PUMP 1 HIGH TEMP	NEW POINT
DI	3:05	2:02	PUMP 1 SEAL FAIL	
DI	3:06		SPARE	
DI	3:07		SPARE	
DI	3:08		PUMP 2 AUTO	NEW POINT
DI	3:09	2:03	PUMP 2 RUN	
DI	3:10	2:04	PUMP 2 RVSS FAIL	
DI	3:11	2:14	PUMP 2 E-STOP	
DI	3:12		PUMP 2 HIGH TEMP	NEW POINT
DI	3:13	2:05	PUMP 2 SEAL FAIL	
DI	3:14		SPARE	
DI	3:15		SPARE	
DI	4:00		PUMP 3 AUTO	NEW POINT
DI	4:01	2:06	PUMP 3 RUN	
DI	4:02	2:07	PUMP 3 RVSS FAIL	
DI	4:03	2:15	PUMP 3 E-STOP	
DI	4:04		PUMP 3 HIGH TEMP	NEW POINT
DI	4:05	2:08	PUMP 3 SEAL FAIL	
DI	4:06		SPARE	
DI	4:07		SPARE	
DI	4:08		SPARE	
DI	4:09		SPARE	
DI	4:10		SPARE	
DI	4:11		SPARE	
DI	4:12		SPARE	
DI	4:13		SPARE	
DI	4:14		SPARE	
DI	4:15		SPARE	
DO	5:00	4:00	PUMP 1 START CMD	
DO	5:01	4:04	PUMP 2 START CMD	
DO	5:02	4:08	PUMP 3 START CMD	
DO	5:03		SPARE	
DO	5:04		SPARE	
DO	5:05		SPARE	
DO	5:06		SPARE	
DO	5:07		SPARE	

FOUR SEASONS I/O LIST

FOUR SEASONS PANEL

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
FOUR SEASONS PANEL

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

DRAWING NO.
E208

SHEET 9 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E208.DWG

INSTALL A NEW BACK PANEL AS SHOWN IN THE TYPICAL DRAWINGS AND BASED UPON THE IO LIST PROVIDED. CAREFULLY REMOVE EACH FIELD WIRE AND RE-TERMINATE ON THE NEW BACK PANEL. COORDINATE THE CUTOVER WITH THE OWNER AND THE OWNER'S SYSTEMS INTEGRATOR. CONTRACTOR SHALL FIELD VERIFY THE BACK PANEL DIMENSIONS AND PURCHASE OR FABRICATE A BACK PANEL MADE TO FIT THIS PANEL.

INSTALL A PHOENIX 2320270 AC UPS AND 7.2AH BATTERY PACK TO PROVIDE BACKUP POWER FOR THE SYSTEM.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REFER TO I/O WIRING DIAGRAMS.

REMOVE TRIPP-LITE UPS FROM CABINET AS IT HAS BEEN REPLACED BY PHOENIX UPS.

REPLACE LINKSYS ROUTER WITH PHOENIX 5-PORT ETHERNET SWITCH

LITTLE LOWER PANEL

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00		WET WELL LEVEL	UNKNOWN
AI	1:01		DISCHARGE FLOW (10")	UNKNOWN
AI	1:02		DISHCARGE FLOW (12")	UNKNOWN
AI	1:03		PUMP 1 SPEED	UNKNOWN
AI	1:04		PUMP 2 SPEED	UNKNOWN
AI	1:05		PUMP 3 SPEED (FUTURE)	UNKNOWN
AI	1:06		SPARE	
AI	1:07		SPARE	
AO	2:00		PUMP 1 SPEED CMD	UNKNOWN
AO	2:01		PUMP 2 SPEED CMD	UNKNOWN
AO	2:02		PUMP 3 SPEED CMD (FUTURE)	UNKNOWN
AO	2:03		SPARE	
DI	3:00		BYPASS RELAY	NEW POINT
DI	3:01		LOW LEVEL FLOAT	UNKNOWN
DI	3:02		HIGH LEVEL FLOAT	UNKNOWN
DI	3:03		SPARE	
DI	3:04		POWER FAIL AT ATS	UNKNOWN
DI	3:05		GENERATOR RUNNING	UNKNOWN
DI	3:06		GENERATOR FAIL	UNKNOWN
DI	3:07		SPARE	
DI	3:08		SPARE	
DI	3:09		SPARE	
DI	3:10		SPARE	
DI	3:11		SPARE	
DI	3:12		DCPSA FAIL	NEW POINT
DI	3:13		DCPSB FAIL	NEW POINT
DI	3:14		UPS FAIL	NEW POINT
DI	3:15		POWER FAULT RELAY	NEW POINT
DI	4:00		PUMP 1 AUTO	NEW POINT
DI	4:01		PUMP 1 RUN	UNKNOWN
DI	4:02		PUMP 1 FAIL	UNKNOWN
DI	4:03		PUMP 1 E-STOP	UNKNOWN
DI	4:04		PUMP 1 HIGH TEMP	NEW POINT
DI	4:05		PUMP 1 SEAL FAIL	UNKNOWN
DI	4:06		SPARE	
DI	4:07		SPARE	
DI	4:08		PUMP 2 AUTO	NEW POINT
DI	4:09		PUMP 2 RUN	UNKNOWN
DI	4:10		PUMP 2 FAIL	UNKNOWN
DI	4:11		PUMP 2 E-STOP	UNKNOWN
DI	4:12		PUMP 2 HIGH TEMP	NEW POINT
DI	4:13		PUMP 2 SEAL FAIL	UNKNOWN
DI	4:14		SPARE	
DI	4:15		SPARE	
DI	5:00		PUMP 3 AUTO	NEW POINT
DI	5:01		PUMP 3 RUN	UNKNOWN
DI	5:02		PUMP 3 FAIL	UNKNOWN
DI	5:03		PUMP 3 E-STOP	UNKNOWN
DI	5:04		PUMP 3 HIGH TEMP	NEW POINT
DI	5:05		PUMP 3 SEAL FAIL	UNKNOWN
DI	5:06		SPARE	
DI	5:07		SPARE	
DI	5:08		SPARE	
DI	5:09		SPARE	
DI	5:10		SPARE	
DI	5:11		SPARE	
DI	5:12		SPARE	
DI	5:13		SPARE	
DI	5:14		SPARE	
DI	5:15		SPARE	
DO	6:00		PUMP 1 START CMD	UNKNOWN
DO	6:01		PUMP 2 START CMD	UNKNOWN
DO	6:02		PUMP 3 START CMD (FUTURE)	UNKNOWN
DO	6:03		SPARE	
DO	6:04		SPARE	
DO	6:05		SPARE	
DO	6:06		SPARE	
DO	6:07		SPARE	

LITTLE LOWER I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
LITTLE LOWER PANEL

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

DRAWING NO.
E209

SHEET 10 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E209.DWG

GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REMOVE AND REPLACE EXISTING BACK PANEL WITH A NEW BACK PANEL AS SHOWN IN THE TYPICAL DRAWINGS AND BASED UPON THE IO LIST PROVIDED. CAREFULLY REMOVE EACH FIELD WIRE AND RE-TERMINATE ON THE NEW BACK PANEL. COORDINATE THE CUTOVER WITH THE OWNER AND THE OWNER'S SYSTEMS INTEGRATOR. CONTRACTOR SHALL FIELD VERIFY THE BACK PANEL DIMENSIONS AND PURCHASE OR FABRICATE A BACK PANEL WITH THE SAME DIMENSIONS AND HOLES.

REPLACE D-LINK ROUTER WITH PHOENIX 5-PORT ETHERNET SWITCH

REFER TO I/O WIRING DIAGRAMS.

RELOCATE AND POWER EACH PUMP MOTOR MOISTURE / TEMPERATURE RELAYS TO THE RESPECTIVE PUMP BUCKET AND RELOCATE THE FIELD WIRING FROM THE PUMP AS WELL.

ALL POWER SUPPLIES, UPS'S, NETWORK SWITCHES, RADIOS, RELAYS AND TERMINAL BLOCKS SHALL BE REPLACED WITH NEW COMPONENTS SUPPLIED WITH THE NEW BACK PANEL.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

TOUCH SCREEN SHALL BE REMOVED FROM THE DOOR OF THE PANEL. INSTALL A STEEL PAINTED COVER IN ITS PLACE.

LOWER OAK PANEL

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	5:02	WET WELL LEVEL	
AI	1:01	5:00	DISCHARGE FLOW (8")	
AI	1:02	5:01	DISCHARGE FLOW (10")	
AI	1:03		SPARE	
AI	1:04		SPARE	
AI	1:05		SPARE	
AI	1:06		SPARE	
AI	1:07		SPARE	
DI	2:00		BYPASS RELAY	NEW POINT
DI	2:01	3:00	LOW LEVEL FLOAT	
DI	2:02	3:01	HIGH LEVEL FLOAT	
DI	2:03		SPARE	
DI	2:04	2:09	POWER FAIL AT ATS	
DI	2:05	2:10	GENERATOR RUNNING	
DI	2:06	2:11	GENERATOR FAIL	
DI	2:07		SPARE	
DI	2:08		SPARE	
DI	2:09		SPARE	
DI	2:10		SPARE	
DI	2:11		SPARE	
DI	2:12		DCPSA FAIL	NEW POINT
DI	2:13		DCPSB FAIL	NEW POINT
DI	2:14		UPS FAIL	NEW POINT
DI	2:15		POWER FAULT RELAY	NEW POINT
DI	3:00		PUMP 1 AUTO	NEW POINT
DI	3:01	2:00	PUMP 1 RUN	
DI	3:02	2:01	PUMP 1 RVSS FAIL	
DI	3:03	2:13	PUMP 1 E-STOP	
DI	3:04		PUMP 1 HIGH TEMP	NEW POINT
DI	3:05	2:02	PUMP 1 SEAL FAIL	
DI	3:06		SPARE	
DI	3:07		SPARE	
DI	3:08		PUMP 2 AUTO	NEW POINT
DI	3:09	2:03	PUMP 2 RUN	
DI	3:10	2:04	PUMP 2 RVSS FAIL	
DI	3:11	2:14	PUMP 2 E-STOP	
DI	3:12		PUMP 2 HIGH TEMP	NEW POINT
DI	3:13	2:05	PUMP 2 SEAL FAIL	
DI	3:14		SPARE	
DI	3:15		SPARE	
DI	4:00		PUMP 3 AUTO	NEW POINT
DI	4:01	2:06	PUMP 3 RUN	
DI	4:02	2:07	PUMP 3 RVSS FAIL	
DI	4:03	2:15	PUMP 3 E-STOP	
DI	4:04		PUMP 3 HIGH TEMP	NEW POINT
DI	4:05	2:08	PUMP 3 SEAL FAIL	
DI	4:06		SPARE	
DI	4:07		SPARE	
DI	4:08		SPARE	
DI	4:09		SPARE	
DI	4:10		SPARE	
DI	4:11		SPARE	
DI	4:12		SPARE	
DI	4:13		SPARE	
DI	4:14		SPARE	
DI	4:15		SPARE	
DO	5:00	4:00	PUMP 1 START CMD	
DO	5:01	4:04	PUMP 2 START CMD	
DO	5:02	4:08	PUMP 3 START CMD	
DO	5:03		SPARE	
DO	5:04		SPARE	
DO	5:05		SPARE	
DO	5:06		SPARE	
DO	5:07		SPARE	

LOWER OAK I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE
0 1/2 1

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
LOWER OAK PANEL

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E210

SHEET 11 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E210.DWG

MARSHALL CREEK PANEL

GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

REMOVE AND REPLACE EXISTING BACK PANEL WITH A NEW BACK PANEL AS SHOWN IN THE TYPICAL DRAWINGS AND BASED UPON THE IO LIST PROVIDED. CAREFULLY REMOVE EACH FIELD WIRE AND RE-TERMINATE ON THE NEW BACK PANEL. COORDINATE THE CUTOVER WITH THE OWNER AND THE OWNER'S SYSTEMS INTEGRATOR. CONTRACTOR SHALL FIELD VERIFY THE BACK PANEL DIMENSIONS AND PURCHASE OR FABRICATE A BACK PANEL WITH THE SAME DIMENSIONS AND HOLES.

REFER TO I/O WIRING DIAGRAMS.

TOUCH SCREEN SHALL BE REMOVED FROM THE DOOR OF THE PANEL. INSTALL A STEEL PAINTED COVER IN ITS PLACE.

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	6:01	WET WELL LEVEL	
AI	1:01	5:03	DISCHARGE FLOW (10")	
AI	1:02	6:00	DISCHARGE FLOW (12")	
AI	1:03	5:00	PUMP 1 SPEED	
AI	1:04	5:01	PUMP 2 SPEED	
AI	1:05	5:02	PUMP 3 SPEED (FUTURE)	
AI	1:06		SPARE	
AI	1:07		SPARE	
AO	2:00	7:00	PUMP 1 SPEED CMD	
AO	2:01	7:01	PUMP 2 SPEED CMD	
AO	2:02	8:00	PUMP 3 SPEED CMD (FUTURE)	
AO	2:03		SPARE	
DI	3:00		BYPASS RELAY	NEW POINT
DI	3:01	9:00	LOW LEVEL FLOAT	
DI	3:02	9:01	HIGH LEVEL FLOAT	
DI	3:03		SPARE	
DI	3:04	3:09	POWER FAIL AT ATS	
DI	3:05	3:10	GENERATOR RUNNING	
DI	3:06	3:11	GENERATOR FAIL	
DI	3:07		SPARE	
DI	3:08		SPARE	
DI	3:09		SPARE	
DI	3:10		SPARE	
DI	3:11		SPARE	
DI	3:12		DCPSA FAIL	NEW POINT
DI	3:13		DCPSB FAIL	NEW POINT
DI	3:14		UPS FAIL	NEW POINT
DI	3:15		POWER FAULT RELAY	NEW POINT
DI	4:00		PUMP 1 AUTO	NEW POINT
DI	4:01	3:00	PUMP 1 RUN	
DI	4:02	3:01	PUMP 1 VFD FAIL	
DI	4:03	3:13	PUMP 1 E-STOP	
DI	4:04		PUMP 1 HIGH TEMP	NEW POINT
DI	4:05	3:02	PUMP 1 SEAL FAIL	
DI	4:06		SPARE	
DI	4:07		SPARE	
DI	4:08		PUMP 2 AUTO	NEW POINT
DI	4:09	3:03	PUMP 2 RUN	
DI	4:10	3:04	PUMP 2 VFD FAIL	
DI	4:11	3:14	PUMP 2 E-STOP	
DI	4:12		PUMP 2 HIGH TEMP	NEW POINT
DI	4:13	3:05	PUMP 2 SEAL FAIL	
DI	4:14		SPARE	
DI	4:15		SPARE	
DI	5:00		PUMP 3 AUTO	NEW POINT
DI	5:01	3:06	PUMP 3 RUN	
DI	5:02	3:07	PUMP 3 VFD FAIL	
DI	5:03	3:15	PUMP 3 E-STOP	
DI	5:04		PUMP 3 HIGH TEMP	NEW POINT
DI	5:05	3:08	PUMP 3 SEAL FAIL	
DI	5:06		SPARE	
DI	5:07		SPARE	
DI	5:08		SPARE	
DI	5:09		SPARE	
DI	5:10		SPARE	
DI	5:11		SPARE	
DI	5:12		SPARE	
DI	5:13		SPARE	
DI	5:14		SPARE	
DI	5:15		SPARE	
DO	6:00	4:00	PUMP 1 START CMD	
DO	6:01	4:04	PUMP 2 START CMD	
DO	6:02	4:08	PUMP 3 START CMD	
DO	6:03		SPARE	
DO	6:04		SPARE	
DO	6:05		SPARE	
DO	6:06		SPARE	
DO	6:07		SPARE	

MARSHALL CREEK I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE, 1/2" = HALF SCALE

NO.	DATE	ORIGINAL / REVISIONS	DESIGN	DRAWN	CHECKED
A	07/31/2020	REVISIONS	MPJ	BB	MPJ

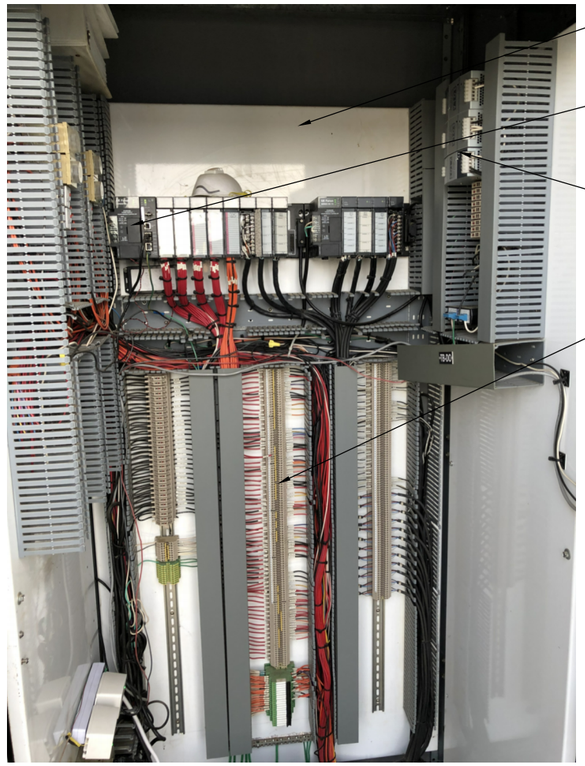
SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
MARSHALL CREEK PANEL

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E211

SHEET 12 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E211.DWG

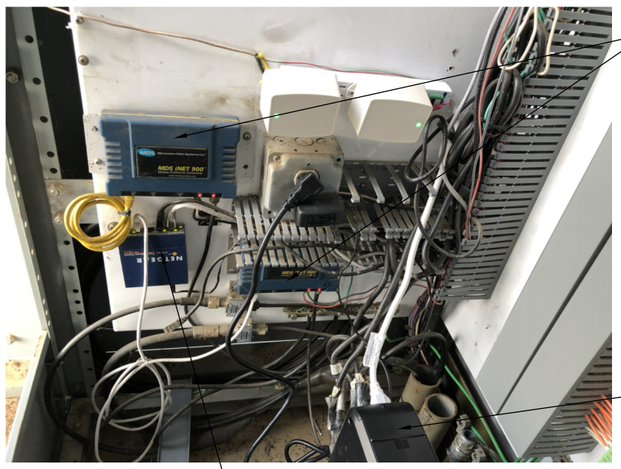


INSTALL A PHOENIX 2320270 AC UPS AND 7.2AH BATTERY PACK TO PROVIDE BACKUP POWER FOR THE SYSTEM.

GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

ALL POWER SUPPLIES, UPS'S, NETWORK SWITCHES, RADIOS, RELAYS AND TERMINAL BLOCKS SHALL BE REPLACED WITH NEW COMPONENTS SUPPLIED WITH THE NEW BACK PANEL.

REFER TO I/O WIRING DIAGRAMS.



REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

REMOVE TRIPP-LITE UPS FROM CABINET AS IT HAS BEEN REPLACED BY PHOENIX UPS.

REPLACE NETGEAR ROUTER WITH PHOENIX 5-PORT ETHERNET SWITCH

MESA PANEL

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	6:00	WET WELL 1 LEVEL	
AI	1:01	7:00	WET WELL 2 LEVEL	
AI	1:02	6:01	DISCHARGE FLOW (10")	
AI	1:03	7:01	DISCHARGE FLOW (14")	
AI	1:04	8:00	DISCHARGE FLOW (10")	
AI	1:05	6:02	PUMP 1 SPEED	
AI	1:06		PUMP 2 SPEED	NEW POINT
AI	1:07		PUMP 3 SPEED	NEW POINT
AI	2:00	7:02	PUMP 4 SPEED	
AI	2:01		SPARE	
AI	2:02		SPARE	
AI	2:03		SPARE	
AI	2:04		SPARE	
AI	2:05		SPARE	
AI	2:06	6:03	WET WELL 1 %LEL	
AI	2:07	7:03	WET WELL 2 %LEL	
AO	3:00	9:00	PUMP 1 SPEED CMD	
AO	3:01		PUMP 2 SPEED CMD	NEW POINT
AO	3:02		PUMP 3 SPEED CMD	NEW POINT
AO	3:03	9:01	PUMP 4 SPEED CMD	
DI	4:00		BYPASS RELAY	NEW POINT
DI	4:01		LOW LEVEL FLOAT	NEW POINT
DI	4:02	2:01	HIGH LEVEL FLOAT	
DI	4:03		SPARE	
DI	4:04	2:02	POWER FAIL AT ATS	
DI	4:05	4:03	GENERATOR RUNNING	
DI	4:06	4:04	GENERATOR FAIL	
DI	4:07		SPARE	
DI	4:08		SPARE	
DI	4:09		SPARE	
DI	4:10		SPARE	
DI	4:11		SPARE	
DI	4:12		DCPSA FAIL	NEW POINT
DI	4:13		DCPSB FAIL	NEW POINT
DI	4:14		UPS FAIL	NEW POINT
DI	4:15		POWER FAULT RELAY	NEW POINT
DI	5:00		PUMP 1 AUTO	NEW POINT
DI	5:01	2:00	PUMP 1 RUN	
DI	5:02	2:01	PUMP 1 VFD FAIL	
DI	5:03	2:03	PUMP 1 E-STOP	
DI	5:04		PUMP 1 HIGH TEMP	NEW POINT
DI	5:05	2:02	PUMP 1 SEAL FAIL	
DI	5:06	2:04	PUMP 1 LEVEL LO LO	
DI	5:07		SPARE	
DI	5:08		PUMP 2 AUTO	NEW POINT
DI	5:09	2:05	PUMP 2 RUN	
DI	5:10	2:06	PUMP 2 RVSS FAIL	
DI	5:11	2:08	PUMP 2 E-STOP	
DI	5:12		PUMP 2 HIGH TEMP	NEW POINT
DI	5:13	2:07	PUMP 2 SEAL FAIL	
DI	5:14	2:09	PUMP 2 LEVEL LO LO	
DI	5:15	2:13	WET WELL 1 HI-HI LEVEL	
DI	6:00		PUMP 3 AUTO	NEW POINT
DI	6:01	3:00	PUMP 3 RUN	
DI	6:02	3:01	PUMP 3 RVSS FAIL	
DI	6:03	3:03	PUMP 3 E-STOP	
DI	6:04		PUMP 3 HIGH TEMP	NEW POINT
DI	6:05	3:02	PUMP 3 SEAL FAIL	
DI	6:06	3:04	PUMP 3 LEVEL LO LO	
DI	6:07		SPARE	
DI	6:08		PUMP 4 AUTO	NEW POINT
DI	6:09	3:08	PUMP 4 RUN	
DI	6:10	3:09	PUMP 4 VFD FAIL	
DI	6:11	3:11	PUMP 4 E-STOP	
DI	6:12		PUMP 4 HIGH TEMP	NEW POINT
DI	6:13	3:10	PUMP 4 SEAL FAIL	
DI	6:14	3:12	PUMP 4 LO LO	
DI	6:15	3:13	WET WELL 2 HI-HI LEVEL	
DI	7:00	4:00	INSTRUSION ALARM ACTIVATED	
DI	7:01	4:01	INTRUSION BYPASS KEY ON BYPASS	
DI	7:02	4:02	GENERATOR NOT ON AUTO	
DI	7:03		SPARE	
DI	7:04		SPARE	
DI	7:05	4:05	DC POWER SUPPLY TROUBLE	
DI	7:06	4:06	ATS NORMAL	
DI	7:07	4:07	ATS ON EMERGENCY GENERATOR	
DI	7:08	4:08	AC POWER FAIL	
DI	7:09	2:10	MIXER 1 RUN	
DI	7:10	2:11	MIXER 1 FAIL	
DI	7:11	2:12	MIXER 1 E-STOP	
DI	7:12	3:05	MIXER 2 RUN	
DI	7:13	3:06	MIXER 2 FAIL	
DI	7:14	3:07	MIXER 2 E-STOP	
DI	7:15		SPARE	
AI-RTD	8:00		PUMP 1 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	8:01		PUMP 1 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	8:02		PUMP 1 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	8:03		PUMP 2 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	8:04		PUMP 2 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	8:05		PUMP 2 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	9:00		PUMP 3 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	9:01		PUMP 3 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	9:02		PUMP 3 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	9:03		PUMP 4 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	9:04		PUMP 4 MOTOR WIRING TEMP	UNKNOWN
AI-RTD	9:05		PUMP 4 MOTOR WIRING TEMP	UNKNOWN
DO	10:00	5:00	PUMP 1 START CMD	
DO	10:01	5:04	PUMP 2 START CMD	
DO	10:02	5:08	PUMP 3 START CMD	
DO	10:03	5:12	PUMP 4 START CMD	
DO	10:04	5:02	WET WELL 1 %LEL HI-HI STROBE LIGHT	
DO	10:05	5:14	WET WELL 2 %LEL HI-HI STROBE LIGHT	
DO	10:06	5:05	MIXER 1 RUN	
DO	10:07	5:09	MIXER 2 RUN	

MESA I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. 8627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE, 1/2" = HALF SCALE

NO.	DATE	DESIGN	DRAWN	CHECKED
	ORIGINAL			
A	07/31/2020	MPJ	BB	MPJ
	REVISIONS			

SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
MESA PANEL

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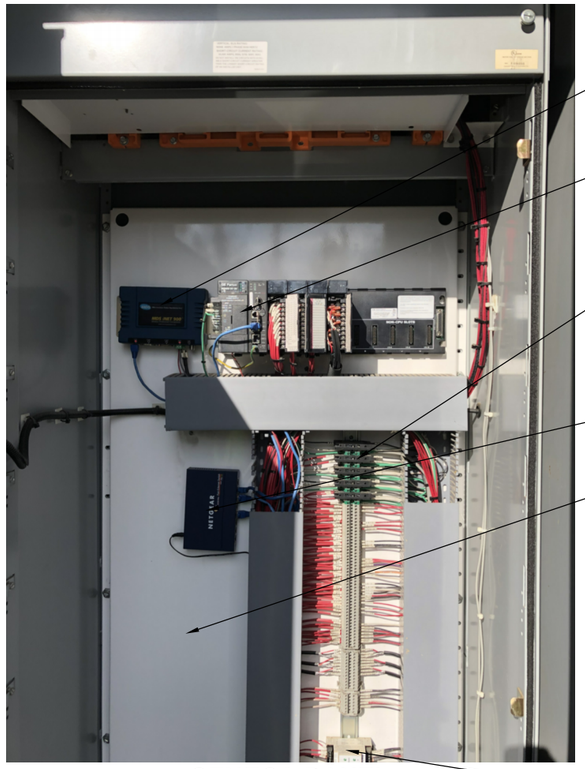
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E212

SHEET 13 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E212.DWG



REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REFER TO I/O WIRING DIAGRAMS.

REPLACE NETGEAR ROUTER WITH PHOENIX 5-PORT ETHERNET SWITCH

REMOVE AND REPLACE EXISTING BACK PANEL WITH A NEW BACK PANEL AS SHOWN IN THE TYPICAL DRAWINGS AND BASED UPON THE IO LIST PROVIDED. CAREFULLY REMOVE EACH FIELD WIRE AND RE-TERMINATE ON THE NEW BACK PANEL. COORDINATE THE CUTOVER WITH THE OWNER AND THE OWNER'S SYSTEMS INTEGRATOR. CONTRACTOR SHALL FIELD VERIFY THE BACK PANEL DIMENSIONS AND PURCHASE OR FABRICATE A BACK PANEL WITH THE SAME DIMENSIONS AND HOLES.

ALL POWER SUPPLIES, UPS'S, NETWORK SWITCHES, RADIOS, RELAYS AND TERMINAL BLOCKS SHALL BE REPLACED WITH NEW COMPONENTS SUPPLIED WITH THE NEW BACK PANEL.

SENECA PANEL

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	5:02	WET WELL LEVEL	
AI	1:01	5:00	FLOW 1 (8")	
AI	1:02	5:01	FLOW 2 (8")	
AI	1:03		SPARE	
AI	1:04		SPARE	
AI	1:05		SPARE	
AI	1:06		SPARE	
AI	1:07		SPARE	
DI	2:00		BYPASS RELAY	NEW POINT
DI	2:01	3:00	LOW LEVEL FLOAT	
DI	2:02	3:01	HIGH LEVEL FLOAT	
DI	2:03		SPARE	
DI	2:04	2:09	POWER FAIL AT ATS	
DI	2:05	2:10	GENERATOR RUNNING	
DI	2:06	2:11	GENERATOR FAIL	
DI	2:07		SPARE	
DI	2:08		SPARE	
DI	2:09		SPARE	
DI	2:10		SPARE	
DI	2:11		SPARE	
DI	2:12		DCPSA FAIL	NEW POINT
DI	2:13		DCPSB FAIL	NEW POINT
DI	2:14		UPS FAIL	NEW POINT
DI	2:15		POWER FAULT RELAY	NEW POINT
DI	3:00		PUMP 1 AUTO	NEW POINT
DI	3:01	2:00	PUMP 1 RUN	
DI	3:02	2:01	PUMP 1 RVSS FAIL	
DI	3:03	2:13	PUMP 1 E-STOP	
DI	3:04		PUMP 1 HIGH TEMP	NEW POINT
DI	3:05	2:02	PUMP 1 SEAL FAIL	
DI	3:06		SPARE	
DI	3:07		SPARE	
DI	3:08		PUMP 2 AUTO	NEW POINT
DI	3:09	2:03	PUMP 2 RUN	
DI	3:10	2:04	PUMP 2 RVSS FAIL	
DI	3:11	2:14	PUMP 2 E-STOP	
DI	3:12		PUMP 2 HIGH TEMP	NEW POINT
DI	3:13	2:05	PUMP 2 SEAL FAIL	
DI	3:14		SPARE	
DI	3:15		SPARE	
DI	4:00		PUMP 3 AUTO	NEW POINT
DI	4:01	2:06	PUMP 3 RUN	
DI	4:02	2:07	PUMP 3 RVSS FAIL	
DI	4:03	2:15	PUMP 3 E-STOP	
DI	4:04		PUMP 3 HIGH TEMP	NEW POINT
DI	4:05	2:08	PUMP 3 SEAL FAIL	
DI	4:06		SPARE	
DI	4:07		SPARE	
DI	4:08		SPARE	
DI	4:09		SPARE	
DI	4:10		SPARE	
DI	4:11		SPARE	
DI	4:12		SPARE	
DI	4:13		SPARE	
DI	4:14		SPARE	
DI	4:15		SPARE	
DO	5:00	4:00	PUMP 1 START CMD	
DO	5:01	4:04	PUMP 2 START CMD	
DO	5:02	4:08	PUMP 3 START CMD	
DO	5:03		SPARE	
DO	5:04		SPARE	
DO	5:05		SPARE	
DO	5:06		SPARE	
DO	5:07		SPARE	

SENECA I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E 8627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE
0 1/2 1

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC

533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010

BEAUMONT LIFT STATIONS CONTROLS UPGRADE

ELECTRICAL - LAYOUT

SENECA PANEL

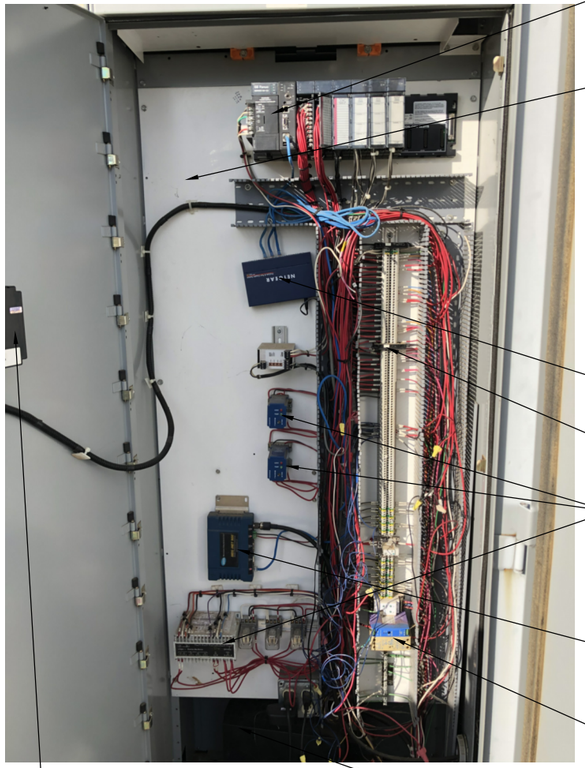
skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.

E213

SHEET 14 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E213.DWG



GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REMOVE AND REPLACE EXISTING BACK PANEL WITH A NEW BACK PANEL AS SHOWN IN THE TYPICAL DRAWINGS AND BASED UPON THE IO LIST PROVIDED. CAREFULLY REMOVE EACH FIELD WIRE AND RE-TERMINATE ON THE NEW BACK PANEL. COORDINATE THE CUTOVER WITH THE OWNER AND THE OWNER'S SYSTEMS INTEGRATOR. CONTRACTOR SHALL FIELD VERIFY THE BACK PANEL DIMENSIONS AND PURCHASE OR FABRICATE A BACK PANEL WITH THE SAME DIMENSIONS AND HOLES.

REPLACE NETGEAR ROUTER WITH PHOENIX 5-PORT ETHERNET SWITCH

REFER TO I/O WIRING DIAGRAMS.

RELOCATE AND POWER EACH PUMP MOTOR MOISTURE / TEMPERATURE RELAYS TO THE RESPECTIVE PUMP BUCKET AND RELOCATE THE FIELD WIRING FROM THE PUMP AS WELL.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

ALL POWER SUPPLIES, UPS'S, NETWORK SWITCHES, RADIOS, RELAYS AND TERMINAL BLOCKS SHALL BE REPLACED WITH NEW COMPONENTS SUPPLIED WITH THE NEW BACK PANEL.

REMOVE TRIPP-LITE UPS FROM CABINET AS IT HAS BEEN REPLACED BY PHOENIX UPS.

TOUCH SCREEN SHALL BE REMOVED FROM THE DOOR OF THE PANEL. INSTALL A STEEL PAINTED COVER IN ITS PLACE.

UPPER OAK PANEL

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	6:01	WET WELL LEVEL	
AI	1:01	5:03	FLOW 1 (8")	
AI	1:02	6:00	FLOW 2 (14")	
AI	1:03	5:00	PUMP 1 SPEED	
AI	1:04		PUMP 2 SPEED	NEW POINT
AI	1:05		PUMP 3 SPEED (FUTURE)	NEW POINT
AI	1:06		PUMP 4 SPEED (FUTURE)	NEW POINT
AI	1:07	5:01	PUMP 5 SPEED	
AI	2:00		SPARE	
AI	2:01		SPARE	
AI	2:02		SPARE	
AI	2:03		SPARE	
AI	2:04		SPARE	
AI	2:05		SPARE	
AI	2:06		SPARE	
AI	2:07		SPARE	
AO	3:00	7:00	PUMP 1 SPEED CMD	
AO	3:01		PUMP 2 SPEED CMD	NEW POINT
AO	3:02		PUMP 3 SPEED CMD (FUTURE)	NEW POINT
AO	3:03		PUMP 4 SPEED CMD (FUTURE)	NEW POINT
AO	4:00	7:01	PUMP 5 SPEED	
AO	4:01		SPARE	
AO	4:02		SPARE	
AO	4:03		SPARE	
DI	5:00		BYPASS RELAY	NEW POINT
DI	5:01		LOW LEVEL FLOAT	NEW POINT
DI	5:02	3:01	HIGH LEVEL FLOAT	
DI	5:03		SPARE	
DI	5:04	3:02	POWER FAIL AT ATS	
DI	5:05	3:03	GENERATOR RUNNING	
DI	5:06	3:04	GENERATOR FAIL	
DI	5:07		SPARE	
DI	5:08		SPARE	
DI	5:09		SPARE	
DI	5:10		SPARE	
DI	5:11		SPARE	
DI	5:12		DCPSA FAIL	NEW POINT
DI	5:13		DCPSB FAIL	NEW POINT
DI	5:14		UPS FAIL	NEW POINT
DI	5:15		POWER FAULT RELAY	NEW POINT
DI	6:00		PUMP 1 AUTO	NEW POINT
DI	6:01	2:00	PUMP 1 RUN	
DI	6:02	2:01	PUMP 1 VFD FAIL	
DI	6:03	3:05	PUMP 1 E-STOP	
DI	6:04		PUMP 1 HIGH TEMP	NEW POINT
DI	6:05	2:02	PUMP 1 SEAL FAIL	
DI	6:06	3:00	PUMP 1 VFD START	
DI	6:07		SPARE	
DI	6:08		PUMP 2 AUTO	NEW POINT
DI	6:09	2:03	PUMP 2 RUN	
DI	6:10	2:04	PUMP 2 RVSS FAIL	
DI	6:11	3:06	PUMP 2 E-STOP	
DI	6:12		PUMP 2 HIGH TEMP	NEW POINT
DI	6:13	2:05	PUMP 2 SEAL FAIL	
DI	6:14		SPARE	
DI	6:15		SPARE	
DI	7:00		PUMP 3 AUTO (FUTURE)	NEW POINT
DI	7:01	2:06	PUMP 3 RUN	
DI	7:02	2:07	PUMP 3 RVSS FAIL	
DI	7:03	3:07	PUMP 3 E-STOP	
DI	7:04		PUMP 3 HIGH TEMP	NEW POINT
DI	7:05	2:08	PUMP 3 SEAL FAIL	
DI	7:06		SPARE	
DI	7:07		SPARE	
DI	7:08		PUMP 4 AUTO (FUTURE)	NEW POINT
DI	7:09	2:09	PUMP 4 RUN	
DI	7:10	2:10	PUMP 4 RVSS FAIL	
DI	7:11	3:08	PUMP 4 E-STOP	
DI	7:12		PUMP 4 HIGH TEMP	NEW POINT
DI	7:13	2:11	PUMP 4 SEAL FAIL	
DI	7:14		SPARE	
DI	7:15		SPARE	
DI	8:00		PUMP 5 AUTO	NEW POINT
DI	8:01	2:12	PUMP 5 RUN	
DI	8:02	2:13	PUMP 5 VFD FAIL	
DI	8:03	3:09	PUMP 5 E-STOP	
DI	8:04		PUMP 5 HIGH TEMP	NEW POINT
DI	8:05	2:14	PUMP 5 SEAL FAIL	
DI	8:06		SPARE	
DI	8:07		SPARE	
DI	8:08		SPARE	
DI	8:09		SPARE	
DI	8:10		SPARE	
DI	8:11		SPARE	
DI	8:12		SPARE	
DI	8:13		SPARE	
DI	8:14		SPARE	
DI	8:15		SPARE	
DO	9:00	4:00	PUMP 1 START CMD	
DO	9:01	4:04	PUMP 2 START CMD	
DO	9:02	4:05	PUMP 3 START CMD (FUTURE)	
DO	9:03	4:06	PUMP 4 START CMD (FUTURE)	
DO	9:04	4:08	PUMP 5 START CMD	
DO	9:05		SPARE	
DO	9:06		SPARE	
DO	9:07		SPARE	

UPPER OAK I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E178627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE
0 1/2 1

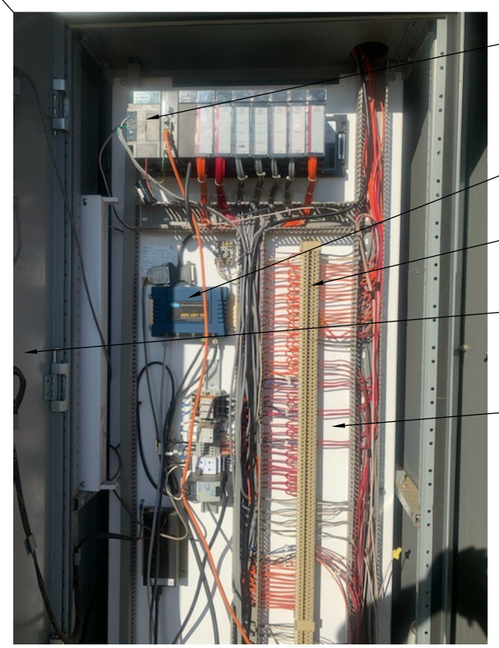
NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
UPPER OAK PANEL

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E214
SHEET 15 OF 20

C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E214.DWG
11/3/2020



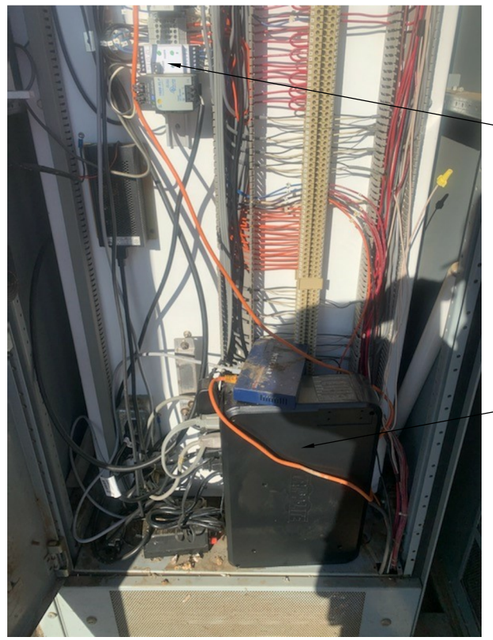
GE PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

REFER TO I/O WIRING DIAGRAMS.

TOUCH SCREEN SHALL BE REMOVED FROM THE DOOR OF THE PANEL. INSTALL A STEEL PAINTED COVER IN ITS PLACE.

REMOVE AND REPLACE EXISTING BACK PANEL WITH A NEW BACK PANEL AS SHOWN IN THE TYPICAL DRAWINGS AND BASED UPON THE IO LIST PROVIDED. CAREFULLY REMOVE EACH FIELD WIRE AND RE-TERMINATE ON THE NEW BACK PANEL. COORDINATE THE CUTOVER WITH THE OWNER AND THE OWNER'S SYSTEMS INTEGRATOR. CONTRACTOR SHALL FIELD VERIFY THE BACK PANEL DIMENSIONS AND PURCHASE OR FABRICATE A BACK PANEL WITH THE SAME DIMENSIONS AND HOLES.



ALL POWER SUPPLIES, UPS'S, NETWORK SWITCHES, RADIOS, RELAYS AND TERMINAL BLOCKS SHALL BE REPLACED WITH NEW COMPONENTS SUPPLIED WITH THE NEW BACK PANEL.

REMOVE TRIPP-LITE UPS FROM CABINET AS IT HAS BEEN REPLACED BY PHOENIX UPS.

NOBLE CREEK PANEL

TYPE	"AB PLC (NEW) SLOT:POINT"	"GE PLC (OLD) SLOT:POINT"	INPUT/OUTPUT DESCRIPTION	NOTES
AI	1:00	6:00	WET WELL LEVEL	
AI	1:01		DISCHARGE FLOW (10")	NEW POINT
AI	1:02	5:03	DISCHARGE FLOW (12")	
AI	1:03	5:00	PUMP 1 SPEED	
AI	1:04	5:01	PUMP 2 SPEED	
AI	1:05	5:02	PUMP 3 SPEED (FUTURE)	
AI	1:06		SPARE	
AI	1:07		SPARE	
AO	2:00	7:00	PUMP 1 SPEED CMD	
AO	2:01	7:01	PUMP 2 SPEED CMD	
AO	2:02	8:00	PUMP 3 SPEED CMD (FUTURE)	
AO	2:03		SPARE	
DI	3:00		BYPASS RELAY	NEW POINT
DI	3:01	9:00	LOW LEVEL FLOAT	
DI	3:02	9:01	HIGH LEVEL FLOAT	
DI	3:03		SPARE	
DI	3:04	3:09	POWER FAIL AT ATS	
DI	3:05	3:10	GENERATOR RUNNING	
DI	3:06	3:11	GENERATOR FAIL	
DI	3:07		SPARE	
DI	3:08		SPARE	
DI	3:09		SPARE	
DI	3:10		SPARE	
DI	3:11		SPARE	
DI	3:12		DCPSA FAIL	NEW POINT
DI	3:13		DCPSB FAIL	NEW POINT
DI	3:14		UPS FAIL	NEW POINT
DI	3:15		POWER FAULT RELAY	NEW POINT
DI	4:00		PUMP 1 AUTO	NEW POINT
DI	4:01	3:00	PUMP 1 RUN	
DI	4:02	3:01	PUMP 1 VFD FAIL	
DI	4:03	3:13	PUMP 1 E-STOP	
DI	4:04		PUMP 1 HIGH TEMP	NEW POINT
DI	4:05	3:02	PUMP 1 SEAL FAIL	
DI	4:06		SPARE	
DI	4:07		SPARE	
DI	4:08		PUMP 2 AUTO	NEW POINT
DI	4:09	3:03	PUMP 2 RUN	
DI	4:10	3:04	PUMP 2 VFD FAIL	
DI	4:11	3:14	PUMP 2 E-STOP	
DI	4:12		PUMP 2 HIGH TEMP	NEW POINT
DI	4:13	3:05	PUMP 2 SEAL FAIL	
DI	4:14		SPARE	
DI	4:15		SPARE	
DI	5:00		PUMP 3 AUTO	NEW POINT
DI	5:01	3:06	PUMP 3 RUN	
DI	5:02	3:07	PUMP 3 VFD FAIL	
DI	5:03	3:15	PUMP 3 E-STOP	
DI	5:04		PUMP 3 HIGH TEMP	NEW POINT
DI	5:05	3:08	PUMP 3 SEAL FAIL	
DI	5:06		SPARE	
DI	5:07		SPARE	
DI	5:08		SPARE	
DI	5:09		SPARE	
DI	5:10		SPARE	
DI	5:11		SPARE	
DI	5:12		SPARE	
DI	5:13		SPARE	
DI	5:14		SPARE	
DI	5:15		SPARE	
DO	6:00	4:00	PUMP 1 START CMD	
DO	6:01	4:04	PUMP 2 START CMD	
DO	6:02	4:08	PUMP 3 START CMD	
DO	6:03		SPARE	
DO	6:04		SPARE	
DO	6:05		SPARE	
DO	6:06		SPARE	
DO	6:07		SPARE	

NOBLE CREEK I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. 813627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE

NO.	DATE	ORIGINAL DESIGN	ORIGINAL DRAWN	ORIGINAL CHECKED
A	07/31/2020	MPJ	BB	MPJ

REVISIONS

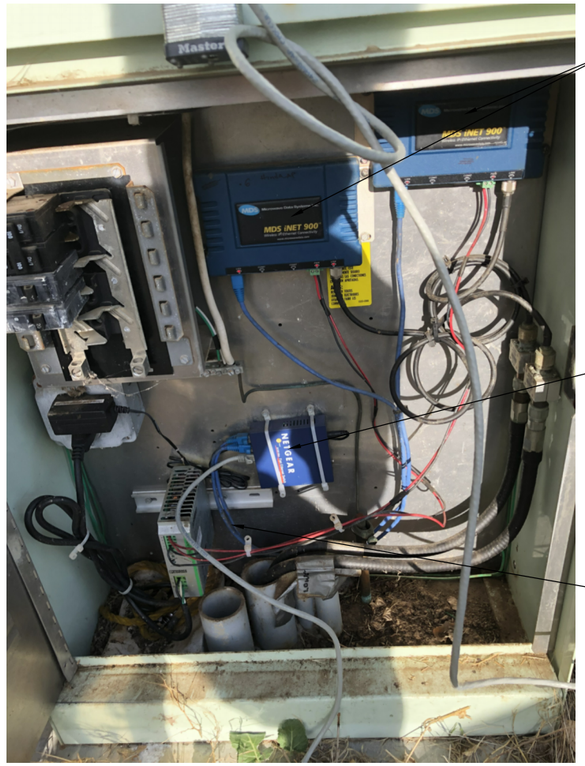
SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
NOBEL CREEK PANEL

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E215

SHEET 16 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E215.DWG



REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

REPLACE NETGEAR ROUTER WITH PHOENIX 5-PORT ETHERNET SWITCH

UPGRADE POWER DISTRIBUTION TO INCLUDE 120VAC SURGE PROTECTOR, AC UPS AND BATTERY PACK, REDUNDANT DC POWER SUPPLIES AND DIODE.

SAN TIMOTEO REPEATER SITE

REPLACE BACKPANEL WITH NEW ASSEMBLY TO ALLOW FOR ALL NEW COMPONENTS TO FIT IN THE EXISTING ENCLOSURE.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900 WIRELESS RADIO.

REPLACE NETGEAR ROUTER WITH PHOENIX 5-PORT ETHERNET SWITCH

UPGRADE POWER DISTRIBUTION TO INCLUDE 120VAC SURGE PROTECTOR, AC UPS AND BATTERY PACK, REDUNDANT DC POWER SUPPLIES AND DIODE.

CITY HALL

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA

11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE

0 1/2 1

NO.	DATE	DESIGN	DRAWN	CHECKED
ORIGINAL				
A	07/31/2020	MPJ	BB	MPJ
REVISIONS				

SKM ENGINEERING, LLC

533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010

BEAUMONT LIFT STATIONS CONTROLS UPGRADE

ELECTRICAL - LAYOUT

WWTP MASTER RADIO REPEATER-CITY HALL PANEL

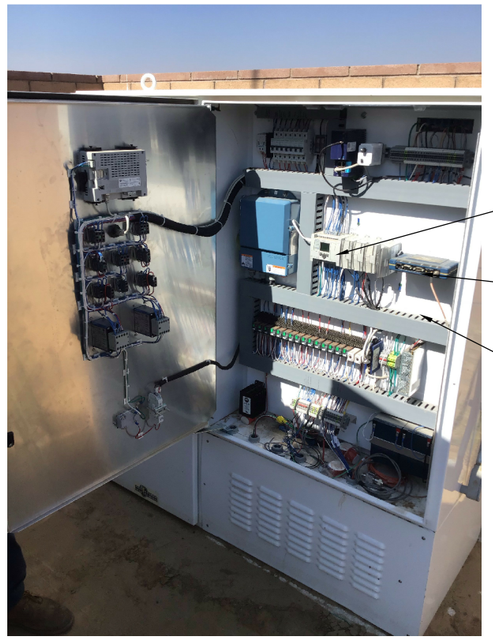
skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.

E216

SHEET 17 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E216.DWG



ALLEN BRADLEY MICROLOGIX PLC HARDWARE WILL BE REPLACED WITH ALLEN BRADLEY COMPACTLOGIX. REFER TO DRAWINGS AND IO TO PROPERLY INSTALL.

REPLACE MDS INET 900 TRANSCEIVER WITH FREEWAVE Z9-PE 900. RADIO WILL NEED TO BE MOUNTED VERTICALLY TO ALLOW AC UPS TO BE MOUNTED NEXT TO IT.

INSTALL A PHOENIX 2320270 AC UPS AND 7.2AH BATTERY PACK TO PROVIDE BACKUP POWER FOR THE SYSTEM.

OLIVEWOOD

TYPE	AB PLC (NEW) SLOT:POINT	AB MICRO PLC (OLD) SLOT:POINT	INPUT/OUTPUT DESCRIPTION	NOTES
DI	1:00	0:00	GENERATOR WARNING	
DI	1:01	0:01	GENERATOR RUNNING	
DI	1:02	0:02	ATS ENGAGED	
DI	1:03	0:03	PUMP 1 BACKUP COMMAND	
DI	1:04	0:04	PUMP 2 BACKUP COMMAND	
DI	1:05	0:05	PUMP 3 BACKUP COMMAND	
DI	1:06	0:06	POWER FAULT RELAY	
DI	1:07	0:07	INSTRUSION ALERT	
DI	1:08	0:08	FLOW PULSE	
DI	1:09	0:09	SYSTEM RESET	
DI	1:10		SPARE	
DI	1:11		SPARE	
DI	1:12		SPARE	
DI	1:13		DCPSA FAIL	NEW POINT
DI	1:14		DCPSB FAIL	NEW POINT
DI	1:15		UPS FAIL	NEW POINT
DI	2:00	1:00	PUMP 1 AUTO	
DI	2:01	1:01	PUMP 1 RUNNING	
DI	2:02	1:02	PUMP 1 FAULT	
DI	2:03	1:03	PUMP 1 SEAL FAIL	
DI	2:04	1:04	PUMP 2 AUTO	
DI	2:05	1:05	PUMP 2 RUNNING	
DI	2:06	1:06	PUMP 2 FAULT	
DI	2:07	1:07	PUMP 2 SEAL FAIL	
DI	2:08	1:08	PUMP 3 AUTO	
DI	2:09	1:09	PUMP 3 RUNNING	
DI	2:10	1:10	PUMP 3 FAULT	
DI	2:11	1:11	PUMP 3 SEAL FAIL	
DI	2:12	1:12	PUMP 1 ESTOP	
DI	2:13	1:13	PUMP 2 ESTOP	
DI	2:14	1:14	PUMP 3 ESTOP	
DI	2:15	1:15	HYDRORANGER FAULT	
DO	3:00	0:00	PUMP 1 START CMD	
DO	3:01	0:01	PUMP 2 START CMD	
DO	3:02	0:02	PUMP 3 START CMD	
DO	3:03	0:03	PUMP 1 RESET	
DO	3:04	0:04	PUMP 2 RESET	
DO	3:05	0:05	PUMP 3 RESET	
DO	3:06		SPARE	
DO	3:07		SPARE	
AI	1:00	3:00	PUMP 1 CURRENT	
AI	1:01	3:01	PUMP 2 CURRENT	
AI	1:02	3:02	SPARE	
AI	1:03	3:03	WET WELL LEVEL	
AI	1:04	4:00	PUMP FLOW	
AI	1:05	4:01	SPARE	
AI	1:06	4:02	SPARE	
AI	1:07	4:03	SPARE	

OLIVEWOOD I/O LIST

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

DRAWING IS TO SCALE IF BAR MEASURES: 1" = FULL SCALE 1/2" = HALF SCALE
0 1/2 1

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ORIGINAL				
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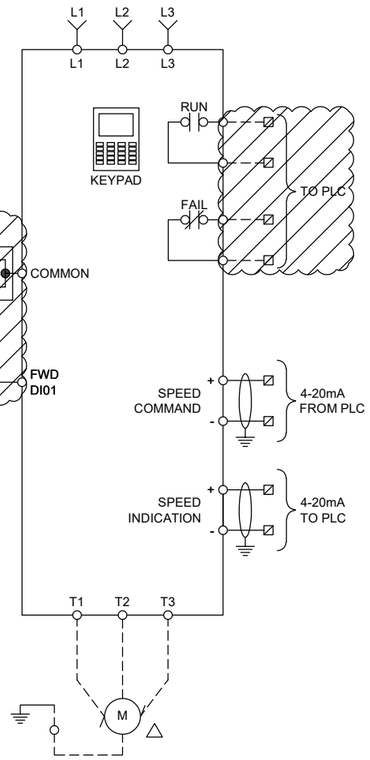
SKM ENGINEERING, LLC
533 W 2600 S, SUITE 25 BOUNTIFUL, UT 84010
BEAUMONT LIFT STATIONS CONTROLS UPGRADE
ELECTRICAL - LAYOUT
OLIVEWOOD PANEL

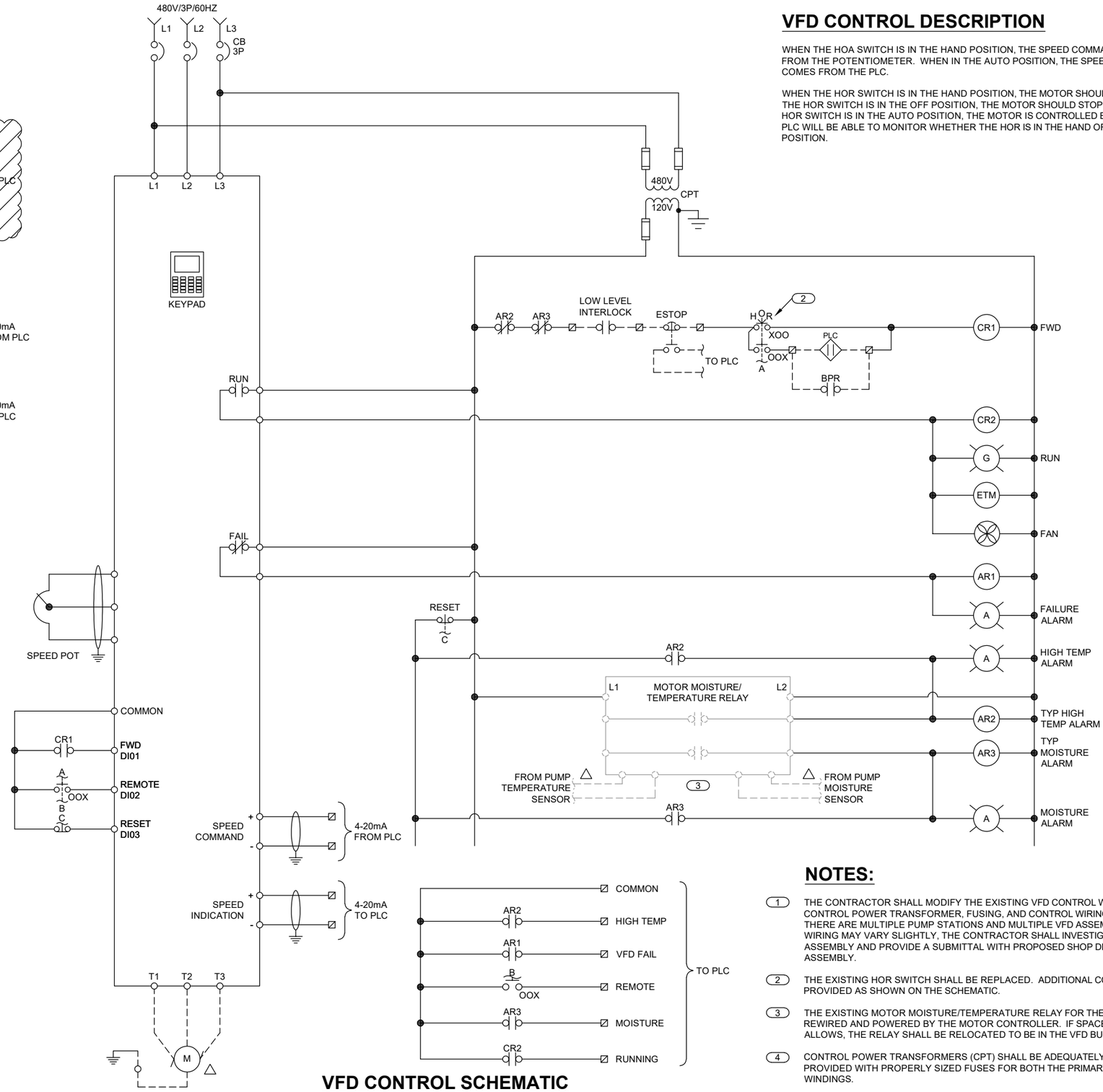
skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
wwwskmeng.com

DRAWING NO.
E217

SHEET 18 OF 20



VFD AS BUILT



VFD CONTROL SCHEMATIC

TYPICAL FOR: UPPER OAK P1 P5, MARSHALL CREEK P1 P2 P3, NOBLE CREEK P1 P2 P3 LOOPERS CREEK P1 P2 P3, MESA P1 P4

VFD CONTROL DESCRIPTION

WHEN THE HOA SWITCH IS IN THE HAND POSITION, THE SPEED COMMAND COMES FROM THE POTENTIOMETER. WHEN IN THE AUTO POSITION, THE SPEED COMMAND COMES FROM THE PLC.

WHEN THE HOR SWITCH IS IN THE HAND POSITION, THE MOTOR SHOULD RUN, WHEN THE HOR SWITCH IS IN THE OFF POSITION, THE MOTOR SHOULD STOP AND WHEN THE HOR SWITCH IS IN THE AUTO POSITION, THE MOTOR IS CONTROLLED BY THE PLC. THE PLC WILL BE ABLE TO MONITOR WHETHER THE HOR IS IN THE HAND OR AUTO POSITION.

NOTES:

1. THE CONTRACTOR SHALL MODIFY THE EXISTING VFD CONTROL WIRING BY ADDING A CONTROL POWER TRANSFORMER, FUSING, AND CONTROL WIRING AS SHOWN. AS THERE ARE MULTIPLE PUMP STATIONS AND MULTIPLE VFD ASSEMBLIES WHOSE WIRING MAY VARY SLIGHTLY, THE CONTRACTOR SHALL INVESTIGATE EACH VFD ASSEMBLY AND PROVIDE A SUBMITTAL WITH PROPOSED SHOP DRAWINGS FOR EACH ASSEMBLY.
2. THE EXISTING HOR SWITCH SHALL BE REPLACED. ADDITIONAL CONTACTS SHALL BE PROVIDED AS SHOWN ON THE SCHEMATIC.
3. THE EXISTING MOTOR MOISTURE/TEMPERATURE RELAY FOR THE PUMP SHALL BE REWIRED AND POWERED BY THE MOTOR CONTROLLER. IF SPACE AND WIRING ALLOWS, THE RELAY SHALL BE RELOCATED TO BE IN THE VFD BUCKET
4. CONTROL POWER TRANSFORMERS (CPT) SHALL BE ADEQUATELY SIZED AND SHALL BE PROVIDED WITH PROPERLY SIZED FUSES FOR BOTH THE PRIMARY AND SECONDARY WINDINGS.
5. CONTROL SWITCHES SHALL BE DOOR MOUNTED ON THEIR RESPECTIVE PANELS. DEVICES SHALL BE RATED FOR LINE VOLTAGE AND 125% OF LOAD CURRENT.

REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. ET8627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

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BEAUMONT LIFT STATIONS CONTROLS UPGRADE
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TYPICAL VFD SCHEMATIC

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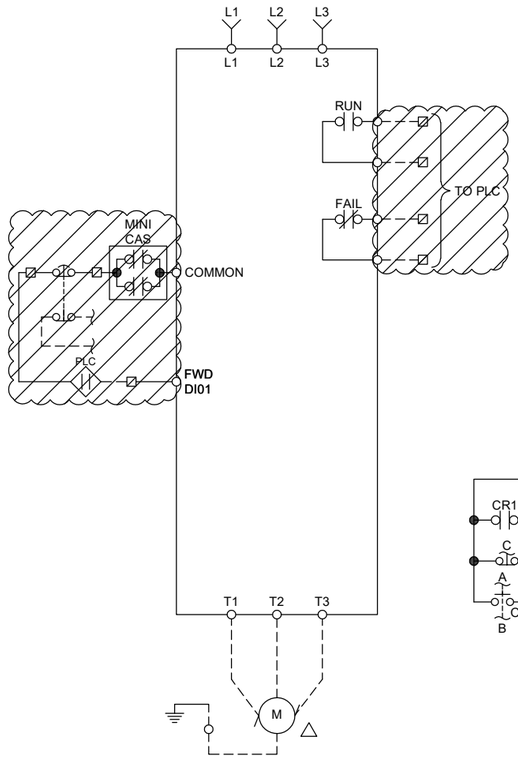
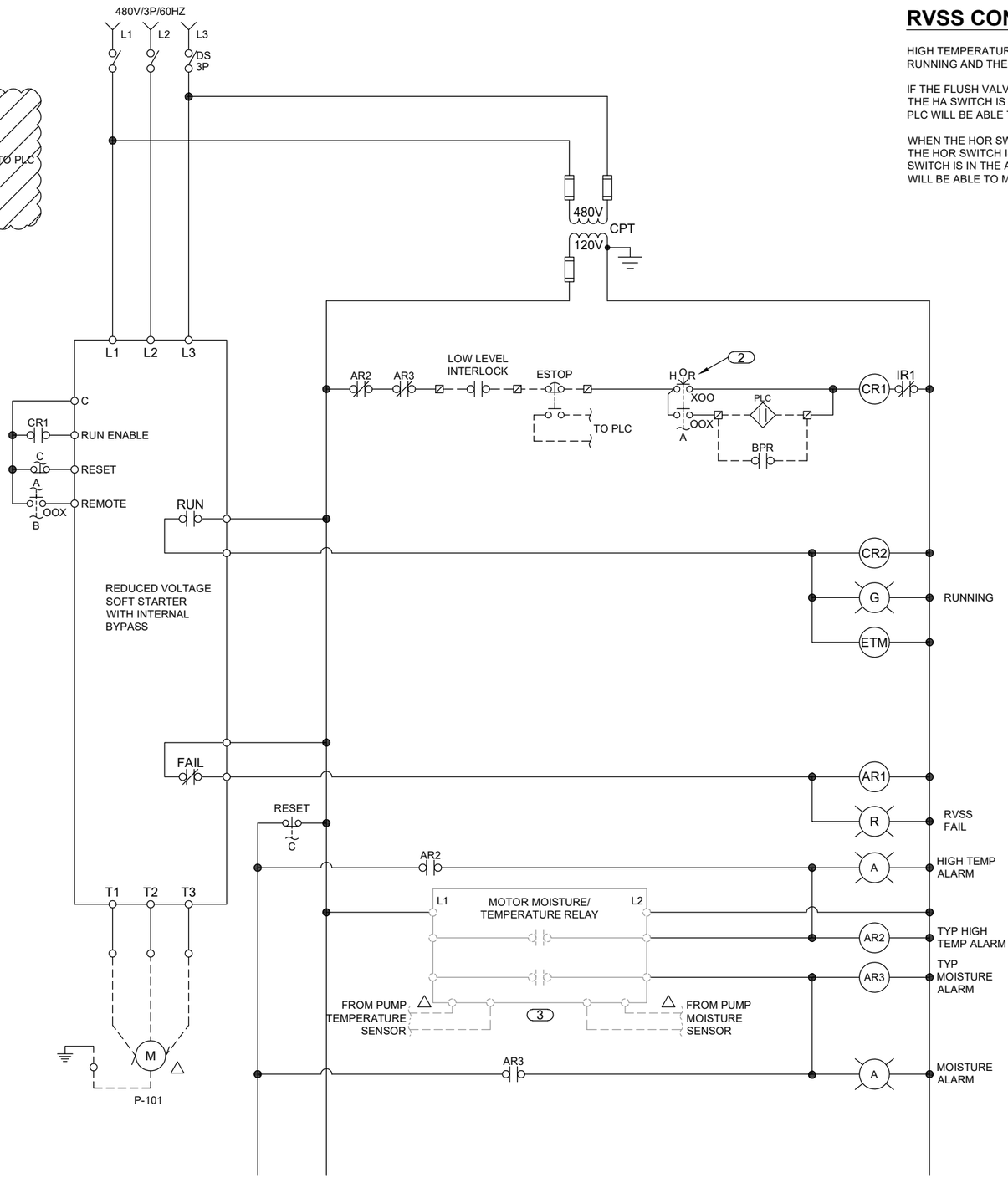
DRAWING NO.
E218

SHEET 19 OF 20

11/3/2020 C:\USERS\BRYCE.BENSON\AQUA ENGINEERING\BEAUMONT - 001730.D BEAUMONT LIFT STATIONS PLC UPGRADE\050 DRAFTING\999 ELECTRICAL\999-E218.DWG



RVSS AS-BUILT



RVSS CONTROL SCHEMATIC

TYPICAL FOR: FOUR SEASONS P2 P3, SENECA P1 P2 P3, LOWER OAK P1 P2 P3, UPPER OAK P2, P3 P4
MESA P2 P3

RVSS CONTROL DESCRIPTION

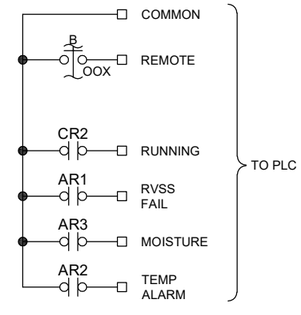
HIGH TEMPERATURE AND HIGH PRESSURE ALARMS SHALL PREVENT THE PUMP FROM RUNNING AND THE SIGNALS SHALL BE COMMUNICATED TO THE PLC.

IF THE FLUSH VALVE HA SWITCH IS IN THE HAND POSITION, THE VALVE SHALL OPEN. IF THE HA SWITCH IS IN THE AUTO POSITION, THE PLC WILL CONTROL THE VALVE. THE PLC WILL BE ABLE TO MONITOR WHEN THE HA IS IN THE HAND OR AUTO POSITION.

WHEN THE HOR SWITCH IS IN THE HAND POSITION, THE MOTOR SHOULD RUN. WHEN THE HOR SWITCH IS IN THE OFF POSITION, THE MOTOR SHOULD STOP. WHEN THE HOR SWITCH IS IN THE AUTO POSITION, THE MOTOR IS CONTROLLED BY THE PLC. THE PLC WILL BE ABLE TO MONITOR WHEN THE HOR IS IN THE HAND OR AUTO POSITION.

NOTES:

1. THE CONTRACTOR SHALL MODIFY THE EXISTING RVSS CONTROL WIRING BY ADDING A CONTROL POWER TRANSFORMER, FUSING, AND CONTROL WIRING AS SHOWN. AS THERE ARE MULTIPLE PUMP STATIONS AND MULTIPLE RVSS ASSEMBLIES WHOSE WIRING MAY VARY SLIGHTLY, THE CONTRACTOR SHALL INVESTIGATE EACH RVSS ASSEMBLY AND PROVIDE A SUBMITTAL WITH PROPOSED SHOP DRAWINGS FOR EACH ASSEMBLY.
2. THE EXISTING HOR SWITCH SHALL BE REPLACED. ADDITIONAL CONTACTS SHALL BE PROVIDED AS SHOWN ON THE SCHEMATIC.
3. THE EXISTING MOTOR MOISTURE/TEMPERATURE RELAY FOR THE PUMP SHALL BE REWIRED AND POWERED BY THE MOTOR CONTROLLER. IF SPACE AND WIRING ALLOWS, THE RELAY SHALL BE RELOCATED TO BE IN THE RVSS BUCKET
4. CONTROL POWER TRANSFORMERS (CPT) SHALL BE ADEQUATELY SIZED AND SHALL BE PROVIDED WITH PROPERLY SIZED FUSES FOR BOTH THE PRIMARY AND SECONDARY WINDINGS.
5. CONTROL SWITCHES SHALL BE DOOR MOUNTED ON THEIR RESPECTIVE PANELS. DEVICES SHALL BE RATED FOR LINE VOLTAGE AND 125% OF LOAD CURRENT.



REGISTERED PROFESSIONAL ENGINEER
MARK P JEPPSEN
NO. E13627
EXP. 12-31-20
ELECTRICAL
STATE OF CALIFORNIA
11/03/2020

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E219
SHEET 20 OF 20

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