INVITATION FOR BIDS

City of Santa Rosa

FOR CONSTRUCTING

FIRE-RELATED REPAIRS OF UTILITY STATIONS

CITY CONTRACT NUMBER
C02208

Disaster No.: DR-4344
Federal Project No's.: 36373/36375/37303

ISSUED BY

CAPITAL PROJECTS ENGINEERING DIVISION

CITY OF SANTA ROSA, CALIFORNIA

2020

A T T E N T I O N
Prebid Conference
See Page 1

City of Santa Rosa

STATE OF CALIFORNIA

INVITATION FOR BIDS

CONTAINING:

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CONTRACT

FOR

FIRE-RELATED REPAIRS OF UTILITY STATIONS

City Contract No. C02208

Disaster No.: DR-4344
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FIRE-RELATED REPAIRS OF UTILITY STATIONS

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CITY OF SANTA ROSA
STATE OF CALIFORNIA

NOTICE TO BIDDERS

➢	For technical questions regarding this project, contact Eric Frye at (707) 543-3858.
➢	For direct access to plans, specifications and plan holders' lists, go to **www.srcity.org/bids** and click on Bid/Proposal Opportunities or call (707) 543-3800.
➢	For direct access to bid results, go to **www.srcity.org/bids**. Under Link to Capital Projects, click on Capital Projects Contracts or call (707) 543-3835.

- IMPORTANT -

Bid Acceptance Deadline

Sealed bids will be accepted at the Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, California 95401 until 2:00 p.m., March 17, 2020, for Fire-Related Repairs of Utility Stations, Contract No. C02208 (Engineer's Estimate: $1,334,161.50).

Bids tendered after this deadline will not be accepted. The official time clock for accepting bids will be an electric date and time stamping clock, located in the Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, California. In order to be accepted, bids must be received prior to 2:00 p.m. Therefore, a bid stamped in at 1:59 p.m. will be accepted, but one delivered at or after 2:00 p.m. is late and will not be accepted.

Pre-Bid Meeting

Prospective bidders, subcontractors, and material suppliers are invited to attend a pre-bid meeting scheduled to be held at 10:00 a.m., March 11, 2020, in the Transportation and Public Works Department located at 69 Stony Circle, Santa Rosa, California.

Federal Requirements

The work to be performed under this Contract will be funded by the Federal Emergency Management Agency (FEMA). Contractor will be required to comply with all Federal Requirements set forth in the Special Provisions. Notwithstanding Section 5-1.02 of the Special Provisions, in the event of a conflict between any Federal Requirement and any other provision in the Contract Documents (as defined below), the more stringent provision shall control and prevail.

Subcontractor Information; Department of Industrial Relations Registration

Bidders shall provide the names, business addresses and license numbers of all subcontractors listed on bidder's List of Subcontractors. No contractor or subcontractor may be listed on a bid for this public works project unless registered with the Department of Industrial Relations (DIR) pursuant to Labor Code section 1725.5. No contractor or subcontractor may be awarded a contract for this public works project unless registered with the DIR pursuant to Labor Code section 1725.5. This public works project is subject to compliance monitoring and enforcement by the DIR.

Contract Award

This Contract will be awarded to the lowest responsible and responsive contractor possessing the ability to successfully perform under the terms and conditions of the proposed contract, considering such matters as contractor integrity, compliance with public policy, record of past performance and financial and technical resources.

Firms or individuals that develop or draft specifications, requirements, statements of work, or invitations for bids or requests for proposals or quotes may not compete in this procurement.

Project Description/Scope of Work

Several potable water stations, reservoirs and sewer lift stations sustained damage during the Tubbs Fire. This project will undertake rehabilitation efforts at the affected sites.

Contract #: **C02208**

Project Title: **FIRE-RELATED REPAIRS OF UTILITY STATIONS**

Line #	Description	Units	Quantity
1	MOBILIZATION/DEMOBILIZATION	LS	1
2	WATER POLLUTION CONTROL	LS	1
3	DEMOLITION	LS	1
4	SITE PREPARATION	LS	1
5	FENCES AND GATES	LS	1
6	MISCELLANEOUS CLEANING AND REPAIRS	LS	1
7	IRRIGATION SYSTEM	LS	1
8	POTABLE WATER PUMP STATION 1 - RETAINING WALL DRAINAGE SYSTEM	LS	1
9	POTABLE WATER PUMP STATION 1 - ANTENNA REPLACEMENT	LS	1
10	SEWER LIFT STATION 5 - GENERATOR ENCLOSURE	LS	1
11	SEWER LIFT STATION 1 - GENERATOR REPLACEMENT	LS	1
12	SEWER LIFT STATION 1 - ATS REPLACEMENT	LS	1
13	SEWER LIFT STATION 1 - ELECTRICAL INSTALLATION	LS	1

The foregoing quantities are approximate only, being given as a basis for the comparison of bids, and the City of Santa Rosa does not expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, as may be deemed necessary or expedient by the Engineer.

Bids shall be made in accordance with the prevailing hourly rate of per diem wages for this locality and project as determined by the Director of the DIR pursuant to Labor Code sections 1770 *et seq*.

Contractor shall be responsible for compliance with the Immigration Reform Control Act of 1986.

If the project requires the employment of workers in any apprenticeable craft or trade, once awarded, Contractor and subcontractors must apply to the Joint Apprenticeship Council unless already covered by local apprentice standards (see Labor Code section 1777.5).

All bids are to be compared on the basis of the Engineer's estimate of the quantities of work to be performed. No bid will be awarded to a contractor who is not licensed in accordance with the provisions of Chapter 9 of Division 3 of the Business and Professions Code. Contractor must hold a Class A license for this project.

Project plans, bid and contract forms for C02208 Fire-Related Repairs of Utility Stations may be obtained through PlanetBids at **www.srcity.org/bids**. These documents can no longer be obtained at the Transportation and Public Works Department.

No bid will be accepted unless it is made on the contract bid forms furnished by the Transportation and Public Works Department through PlanetBids. The original of the completed bid forms bearing original signatures must be submitted. A bid will not be accepted unless the bidder registers as a vendor through PlanetBids at **www.srcity.org/bids**, downloads documents/attachments, and is added to the prospective bidders list for this project. If there is an addendum, bidders must log into PlanetBids and acknowledge the addendum to be eligible for bidding.

The successful bidder will be required to hold a current City of Santa Rosa business tax certificate issued pursuant to Chapter 6.04 of the Santa Rosa City Code before commencing work on this project. For information regarding the business tax, contact Revenue and Collections at (707) 543-3170.

For any moneys earned by Contractor and withheld by the City of Santa Rosa to ensure the performance of the Contract, Contractor may, at its request and expense, substitute securities equivalent to the amount withheld in the form and manner and subject to the conditions provided in Section 22300 of the California Public Contract Code.

The City of Santa Rosa reserves the right to reject any or all bids and the right to waive minor irregularities or informalities in any bid or bond.

MARK KASRAIE, PE
Supervising Engineer

02/11/2020
Date

SPECIAL PROVISIONS

General Specifications

CITY OF SANTA ROSA, CALIFORNIA

FIRE-RELATED REPAIRS OF UTILITY STATIONS

1 GENERAL

The work described herein shall be done in accordance with the "Contract Documents," which are the:

1. Special Provisions
2. Project Plans, consisting of 40 sheets entitled Fire-Related Repairs of Utility Stations, 2019-0034
3. City of Santa Rosa Design and Construction Standards (City Standards)
4. City of Santa Rosa Construction Specifications for Public improvements (City Specifications)
5. State of California Department of Transportation Standard Specifications 2015 and Revised Standard Specifications 2015 (collectively, Standard Specifications), and
6. State of California Department of Transportation Standard Plans 2015 and Revised Standard Plans 2015 (collectively, Standard Plans).

In the event of a conflict in any of these documents, the order of precedence shall be determined by Section 5-1.02 of these Special Provisions.

Whenever the Standard Specifications use the terms State of California, Department of Transportation, Director, Engineer, or Laboratory, the following terms shall be substituted therefor, and any reference to any of the foregoing terms shall be understood and interpreted to mean and refer to such substituted terms as follows:

For State of California - the City of Santa Rosa;

For Department - the City of Santa Rosa Department of Transportation and Public Works or the City of Santa Rosa Water Department;

For Director - the City Engineer of the City of Santa Rosa;

For Engineer - the City Engineer of the City of Santa Rosa or the City Engineer's authorized agents;

For Laboratory – Materials Engineering of the City of Santa Rosa Transportation and Public Works Department, or such other laboratory as may be authorized by the City.

Unless otherwise provided, whenever in these Special Provisions attention is directed to specific provisions in the Standard Specifications, such direction shall not be interpreted as excluding other applicable provisions of the Standard Specifications.

Unless otherwise provided, when sections and subsections of the Standard Specifications are used in these Special Provisions, such use is not exclusive and shall not be interpreted as excluding other applicable provisions of said sections and subsections but is only intended to add to or modify such sections or subsections.

Unless otherwise provided, full compensation for compliance with these Special Provisions is included in the contract price and no additional allowance will be made to Contractor therefor.
The Standard Specifications are hereby modified to delete any reference or incorporation of provisions providing for or requiring arbitration of claims and disputes arising under this Contract.

2 BIDDING

2-1.03 Registration with DIR: No contractor or subcontractor may be listed on a bid for this public works project unless registered with the Department of Industrial Relations (DIR) pursuant to Labor Code section 1725.5. No contractor or subcontractor may be awarded a contract for this public works project unless registered with the DIR pursuant to Labor Code section 1725.5. This public works project is subject to compliance monitoring and enforcement by the DIR.

2-1.06 Bid Documents: Prospective bidders will be furnished with an Invitation for Bids which will state the location and description of the contemplated public works project and will show the approximate estimate of the various quantities and kinds of work to be performed and materials to be furnished with a schedule of items for which unit prices are requested.

2-1.07 Examination of Project Plans, Specifications, City Standards, Invitation for Bids and Work Site: Prior to submitting a bid, the bidder shall carefully examine the Invitation for Bids, City Standards and the proposed work site. If any person contemplating submitting a bid for this public works project is in doubt as to the meaning of any part of the Contract Documents, or finds discrepancies in or omissions from the Contract Documents, he or she may submit a written request for interpretation or correction to the Engineer. The written request must be received by the Engineer a minimum of **48** hours prior to bid opening. Any interpretation or correction of the Contract Documents prior to bid opening will be made only by written addendum issued by the City. Notification of addenda will be made through PlanetBids. The listed primary contact will receive an e-mail generated by PlanetBids informing them of a recently uploaded addendum. The City will not be bound by any other explanations or interpretations of the Contract Documents.

2-1.08 Approximate Estimate: The quantities given in the Contract Documents are approximate only, being given as a basis for the comparison of bids, and the City does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or part of the work or to omit parts of the work, as may be deemed necessary or advisable by the Engineer.

2-1.10 Subcontractors: The Subletting and Subcontracting Fair Practices Act, Public Contract Code sections 4100-4113, inclusive (the "Act") shall apply to all subcontracts in excess of one-half of one percent of the total amount of a bid. The Act requires subcontractors, if used for such work, to be listed in the contractor's bid and prohibits the substitution of subcontractors, except as authorized by the Act. Each bidder shall, with respect to the work of any subcontractor in excess of one-half of one percent of the total amount of the bid, include as part of the bid on the bid form provided:

1. The name, business address and DIR registration number of each subcontractor who will perform work or labor or render services to the Contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the Contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the Project Plans or other Contract Documents in an amount in excess of one-half of one percent of the Contractor's total bid; and
2. The portion of the work that will be done by each subcontractor. Only one subcontractor shall be listed for each portion.

The purchase of sand, gravel, crushed rock, batched concrete, aggregate, ready-mixed concrete, and/or any other materials produced and furnished by established and recognized commercial plants, together with the delivery of such materials to the work site by the source of the materials or by recognized commercial hauling companies, is not considered as subcontracting under this section.

2-1.33 Bid Document Completion: Any references to Opt Out of Payment Adjustments for Price Index Fluctuations in the Standard Specifications are deleted in their entirety.

2-1.33A Bid Forms: All bids shall be made on bid forms obtained from PlanetBids at **www.srcity.org/bids**. The bidder shall submit its bid on the original bid forms furnished by the City. Bids submitted on forms other than the forms furnished to the bidder by the City will not be considered.

The bid forms to be submitted at the time of and with the bid are:

1. Unit Price Schedule
2. List of Subcontractors
3. List of Previous Similar Jobs
4. Noncollusion Declaration
5. Bid Bond Affidavit and Bidder's Signature Page
6. Bid Guaranty (Bid Bond or alternate security)
7. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
8. Certification Regarding Lobbying

All bids shall give the proposed prices and must bear the original signature of the bidder. Bidders shall fill in all blanks on the bid forms where required. A bid will not be accepted unless the bidder registers as a vendor through PlanetBids at **www.srcity.org/bids**, downloads documents/attachments, and is added to the prospective bidders list for this project. If there is an addendum, bidders must log into PlanetBids and acknowledge the addendum to be eligible for bidding.

2-1.33E Rejection of Bids Containing Alterations, Erasures or Irregularities: Bids may be rejected if they show any alterations of forms, additions not called for, conditional bids, incomplete bids, erasures or irregularities of any kind.

2-1.34 Bidders' Security: All bids shall be presented under sealed cover and shall be accompanied by cash, cashier's or certified check, or by a bidder's bond made payable to the City of Santa Rosa and executed as surety by a corporate surety authorized and admitted to transact a surety business in the State of California in an amount equal to ten percent of the amount of the bid. No bid shall be considered unless such cash, cashiers or certified check, or bidder's bond is enclosed with the bid. Any bidder's bond shall contain provisions for forfeiture consistent with California Public Contract Code section 20172.

2-1.40 Withdrawal of Bid: A bid may be withdrawn prior to, but not after, the hour fixed in the public notice for the opening of bids, provided that a written request to withdraw the bid, executed by the bidder or the bidder's authorized representative, is filed with the Engineer before this deadline. The withdrawal of a bid shall not prejudice the right of a bidder to submit a new bid.

2-1.43 Public Opening of Bids: Bids will be opened and read publicly at the time and place indicated in the Notice to Bidders. Bidders or their authorized agents are invited to be present.

2-1.46 Department's Decision on Bid: Serial bids from the same bidder will not be accepted. This section shall not be interpreted to mean that the same contractor may not be the contractor in one bid and listed as a subcontractor in another bid, provided that no collusion exists.

2-1.48 Competency of Bidders: No bid will be accepted from or contract awarded to a contractor that is not licensed in accordance with the law, that does not hold a license qualifying it to perform work under this contract, to whom a bid form has not been issued by the Engineer, or that has not successfully completed projects of similar character, scope and cost to the proposed project. Bidders will be required to provide a list of previous similar jobs with their bids.

3 CONTRACT AWARD AND EXECUTION

3-1.04 Contract Award: The City reserves the right to reject any or all bids. Bids are required for the entire work described herein. All bids will be compared with the Engineer's estimate of the quantities of work to be completed. Contract award, if any, will be made to the lowest responsible and responsive bidder within thirty days from the date bids are opened.

3-1.05 Contract Bonds: Within ten days after receipt of the Notice of Award, the successful bidder shall provide the following bonds to the City:

A BID BOND IS REQUIRED. REFER TO SECTION 2-1.34 OF THESE SPECIAL PROVISIONS.

a. Performance Bond: A performance bond to guarantee the faithful performance of the terms and conditions of the Contract by Contractor, which shall be executed in a sum of not less than 100% of the Contract price;

b. Labor and Materials Bond: A labor and materials bond (payment bond) in accordance with Part 6 of Division 4, sections 8000 *et seq*. of the California Civil Code, to guarantee against any and all claims of subcontractors or other third parties furnishing labor, materials, or supplies for the Contract, which shall be executed in a sum of 100% of the Contract price; and

c. Material Guaranty Bond: A material guaranty bond (warranty bond) to serve as surety for the guarantee requirements outlined in Section 6-3.01B, which shall be executed in a sum of not less than 50% of the Contract price.

The bond(s) shall be provided in a form acceptable to the City and issued by a corporate surety in good financial standing and authorized and admitted to transact a surety business in the state of California for the purposes and in the amount(s) stated above.

Whenever the financial or legal status of any surety on any such bond(s) is/are unacceptable to the City, it may make a demand to Contractor for further bond(s) or additional surety, not exceeding the sums originally required. Thereafter, no payment shall be made upon the Contract to Contractor or any assignees of Contractor until such bond(s) or additional surety has/have been provided to the City.

3-1.06 Contractor License: Contractor must be properly licensed as a contractor from Contract award through Contract acceptance (Pub Cont. Code § 10164).

3-1.07 Indemnification and Insurance: Indemnification: Contractor shall defend, hold harmless and indemnify City, its officers, agents and employees, and each and every one of them, from and against any and all actions, damages, costs, liabilities, claims, demands, losses, judgments, penalties, costs and expenses of every type and description, including, but not limited to, any fees and/or costs reasonably incurred by City's staff attorneys or outside attorneys and any fees and expenses incurred in enforcing this provision (hereafter collectively referred to as "Liabilities"), including but not limited to Liabilities arising from personal injury or death; damage to personal, real or intellectual property or the environment; contractual or other economic damages, or regulatory penalties, arising out of or in any way connected with the performance of or the failure to perform the Contract by Contractor, any subcontractor or agent, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, whether or not such Liabilities are caused in part by a party indemnified hereunder, or such Liabilities are litigated, settled or reduced to judgment; provided, that the foregoing indemnity does not apply to liability for any damage or expense for death or bodily injury to persons or damage to property to the extent arising from (i) the sole negligence, or willful misconduct of, or defects in design

furnished by City, its agents, servants, or independent contractors who are directly responsible to City (excluding Contractor), or (ii) the active negligence of City.

The existence of any of the insurance policies or coverages described in this Contract shall not affect or limit any of City's rights hereunder, nor shall the limits of such insurance limit Contractor's liability to the City hereunder. The provisions of this section shall survive any expiration or termination of the Contract.

Insurance: Contractor shall maintain in full force and effect all of the insurance coverage described in and in accordance with the insurance requirements set forth below. Maintenance of such insurance coverage during the entire performance of the Contract is a material element of the Contract. Failure by Contractor to (i) maintain or renew coverage, (ii) provide notice of any changes, modifications, or reductions in coverage, or (iii) provide evidence of renewal, if necessary, may be deemed a material breach of the Contract by Contractor, whereas the City shall be entitled to all rights and remedies at law or in equity. Notwithstanding the foregoing, any failure by Contractor to maintain required insurance coverage shall not excuse or alleviate Contractor from any of its other duties or obligations under the Contract. In the event Contractor retains or utilizes any subcontractors or sub-consultants in performance of the work, Contractor shall assure that any such subcontractor has first obtained, and shall maintain, all of the insurance coverage requirements herein set forth below.

Insurance Requirements:

A. Insurance Policies: Contractor shall maintain and keep in full force and effect, the following policies of insurance with minimum coverage as indicated below and issued by insurers with an AM Best rating of no less than A-:VI or a rating otherwise acceptable to the City.

	Insurance	Minimum Coverage Limits	Additional Coverage Requirements
1.	Commercial general liability	$5 million per occurrence $5 million aggregate	Coverage must be at least as broad as ISO CG 00 01 and must include products liability and completed operations coverage which shall continue for a period of three years after acceptance of the work by the City. If insurance applies separately to a project/location, aggregate may be equal to per occurrence amount. Coverage may be met by a combination of primary and umbrella or excess insurance but umbrella and excess shall provide coverage at least as broad as specified for underlying coverage. Completed Operations Coverage can be provided in the form of an endorsement to Contractor's insurance (at least as broad as ISO Form CG 20 37 04 13. See endorsements below for other Additional Insured Requirements. Coverage shall not exclude subsidence.
2.	Business auto coverage	$3 million	Coverage at least as broad as ISO Form Number CA 00 01 covering any auto (Code 1). Insurance shall cover owned, non-owned and hired autos.

3.	Workers' compensation and Employer's Liability	$1 million	As required by the State of California, with Statutory Limits and Employer's Liability Insurance with limit of no less than $1 million per accident for bodily injury or disease. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the City for all work performed by Contractor, its employees, agents and subcontractors.
4.	Contractor's pollution legal liability and/or asbestos legal liability and/or errors and omission	$1 million per occurrence or claim $2 million aggregate	If the work involves lead-based paint or asbestos identification/remediation, the pollution liability policy must not contain lead-based paint or asbestos exclusions. If the work involves mold identification, the pollution liability policy must not contain a mold exclusion and a definition of "Pollution" in said policy shall include microbial matter including mold.
5.	Course of construction/ builders' risk	Amount of completed value of project without co-insurance provisions	Required for construction projects over $3 million. The City shall be named as loss payee.

B. Endorsements:

1. All policies shall provide or be endorsed to provide that coverage shall not be canceled by either party, except after prior written notice has been provided to the City in accordance with the policy provisions.
2. Liability policies shall provide or be endorsed to provide the following:
   a. For any claims related to this Contract, Contractor's insurance coverage shall be primary and any insurance or self-insurance maintained by City shall be in excess of Contractor's insurance and shall not contribute with it. Endorsements at least as broad as 20 01 04 13 or evidence of policy language will be required in non- ISO CGL policies.
   b. **The City of Santa Rosa, its officers, agents and employees are to be covered as additional insureds on the CGL policy**. Additional Insured Endorsements at least as broad as 20 10 04 13 or 20 38 04 13 are required.

C. Verification of Coverage and Certificates of Insurance: Contractor shall furnish City with original certificates and endorsements effecting coverage required above. Certificates and endorsements shall make reference to policy numbers. All certificates and endorsements are to be received and approved by the City before work commences and must be in effect for the duration of the Contract. The City reserves the right to require complete copies of all required policies and endorsements during the duration of the Contract and for a period of three years following City's acceptance of the work.

D. Other Insurance Provisions:

1. No policy required by this Contract shall prohibit Contractor from waiving any right of recovery prior to loss. Contractor hereby waives such right with regard to the indemnitees.
2. All insurance coverage amounts provided by Contractor and available or applicable to this Contract are intended to apply to the full extent of the policies. Nothing contained in this Contract limits the application of such insurance coverage. Coverage for an additional insured shall NOT be limited to the insured's

vicarious liability. Defense costs must be paid in addition to coverage amounts.

3. Self-insured retentions above $10,000 must be approved by the City. At the City's option, Contractor may be required to provide financial guarantees.
4. City reserves the right to modify these insurance requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other special circumstances.

3-1.18 Contract Execution: The fully executed Contract, original bonds and insurance certificates and endorsements required under the Contract shall be delivered to the City within ten calendar days of Contractor's receipt of the Notice of Award.

The Engineer will supply Contractor with up to ten sets of the Invitation for Bids and Project Plans. At least one complete set of the Invitation for Bids and Project Plans shall be kept at the construction site in good condition and made available to the Engineer at all times. Additional copies of the Invitation for Bids and Project Plans will be provided by the Engineer at Contractor's cost.

3-1.19 Bidders' Securities: Within ten days after the opening of bids, the City will return the bid guarantees to all bidders except the three lowest responsible bidders. The bid guarantees of the three lowest responsible bidders will be retained until the Contract has been fully executed. In the event all bids are rejected, all bid guarantees will be returned to the respective bidders.

3-1.20 Failure to Execute Contract: Contractor's failure to deliver to the City the fully executed Contract within ten calendar days of Contractor's receipt of the Notice of Award shall be cause for the cancellation of the award and the forfeiture of the bid guaranty to the City. If the successful bidder refuses or fails to execute the Contract, the City may award the Contract to the second lowest responsible bidder. If the second lowest responsible bidder refuses or fails to execute the Contract, the City may award the Contract to the third lowest responsible bidder. The refusal or failure by the second or third lowest responsible bidder to deliver to the City the fully executed Contract within ten calendar days of receipt of the Notice of Award to the respective bidder shall likewise be cause for the cancellation of the award and the forfeiture of the bid guaranty of the respective bidder. In its discretion, the City may then re-advertise the project or construct it by day labor.

3-1.22 Subcontractors: The successful bidder shall furnish a list of all subcontractors as required under Sections 2-1.10. The list shall include the name, business address, DIR registration number and the state contractor's license number of each subcontractor on the list and the names of the responsible managing employees whose names appear on the subcontractors' licenses.

4 SCOPE OF WORK

4-1.05 Changes and Extra Work: All changes to the Contract shall be made by written change order only.

All extra work shall be recorded by Contractor on a daily report signed by both the City and Contractor. The "daily reports" shall thereafter be considered the true record of extra work performed. A copy of the daily reports will be furnished to Contractor. Contractor is directed to Section 9-1.04 of this Invitation for Bids.

4-1.05C Compensation for Altered Quantities: Payment and compensation for altered quantities shall not conform to the provisions of Section 9-1.06 of the Standard Specifications, except as modified herein.

4-1.07 Value Engineering

4-1.07B Value Engineering Change Proposal (VECP):

Contractor may submit a VECP to reduce any of the following:
1. Total cost of construction
2. Construction activity duration
3. Traffic congestion

Before preparing a VECP, meet with the Engineer to discuss:
1. Proposal concept
2. Permit issues
3. Impact on other projects
4. Project impacts, including traffic, schedule, and later stages
5. Peer reviews
6. Overall proposal merits
7. Review times required by the Department and other agencies

The VECP must not impair the project's essential functions or characteristics, including:
1. Service life
2. Operation economy
3. Maintenance ease
4. Desired appearance
5. Design and safety

The VECP must include:
1. Description of the Contract specifications and drawing details for performing the work and the proposed changes
2. Itemization of Contract specifications and plan details that would be changed
3. Detailed cost estimate for performing the work under the existing Contract and under the proposed change; Determine the estimates under section 9-1.04 of the Standard Specifications
4. Deadline for the Engineer to decide on the changes
5. Bid items affected and resulting quantity changes

The Department is not required to consider a VECP. If a VECP is similar to a change in the Project Plans or City Specifications being considered by the Department at the time the proposal is submitted or if the proposal is based on or similar to plans or City Specifications adopted by the Department before Contract award, the Department does not accept the VECP and may make these changes without VECP payments.

If the Department does not approve a Change Order before the deadline stated in the VECP or other date Contractor subsequently stated in writing, the VECP is rejected. The Department does not adjust time or payment for a rejected VECP.

The Department decides whether to accept a VECP and the estimated net construction-cost savings from adopting the VECP or parts of it.

The Department may require Contractor to accept a share of the investigation cost as a condition of reviewing a VECP. After written acceptance, the Department considers the VECP and deducts the agreed cost.

If the Department accepts the VECP or parts of it, the Department issues a Change Order that:

1. Incorporates changes in the Contract necessary to implement the VECP or the parts adopted
2. Includes the Department's acceptance conditions
3. States the estimated net construction-cost savings resulting from the VECP
4. Obligates the Department to pay Contractor 50 percent of the estimated net savings.

In determining the estimated net construction-cost savings, the Department excludes Contractor’s VECP preparation cost and the Department's VECP investigation cost, including parts paid by Contractor. If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from the Contract time.

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department pays 60 percent of the estimated net savings in construction costs attributable to the VECP. Submit detailed traffic handling comparisons between the existing Contract and the proposed change, including estimates of the traffic volumes and congestion.

The Department may apply an accepted VECP for general use on other contracts.

If an accepted VECP is adopted for general use, the Department pays only the contractor who first submitted the VECP and only for the contracts awarded to that contractor before the submission of the accepted VECP.

If the Department does not adopt a general-use VECP, an identical or similar submitted proposal is eligible for acceptance.

5 CONTROL OF WORK

5-1.02 Contract Documents: In the event of a conflict in any of the Contract Documents, the order of precedence from highest to lowest shall be as follows:

1. Special Provisions
2. Project Plans, consisting of 40 sheets entitled Fire-Related Repairs of Utility Stations, 2019-0034
3. City Standards
4. City Specifications
5. Standard Specifications
6. Standard Plans;

provided, that in the event of a conflict between any Federal Requirement in Section 10 of these Special Provisions and any other provision in the Contract Documents, the more stringent provision shall control and prevail.

5-1.05 Order of Work: The work as shown on the Project Plans and as specified in the Invitation for Bids shall be constructed in a sequence that is satisfactory to and approved by the Engineer.

Contractor shall prepare a work schedule per Section 8-1.02 of the Standard Specifications.

With the exception of trenching, all existing street, street light base, curb and gutter, storm drain, water line, and sewer line work shall be completed before any existing street paving is removed.

Full compensation for the conformance to the requirements of this section is included in the Contract price and no additional allowance will be made to Contractor for this work.

5-1.17 Character of Workers: Attention is directed to Section 5-1.17 of the Standard Specifications which states:

"If a worker appears to the Engineer to be incompetent or acts disorderly or improperly, discharge the worker immediately upon request. Do not employ that worker again on the work."

No additional compensation shall be granted to Contractor in the event City exercises any part of its rights under this section and any and all costs related to such exercise shall be borne by Contractor.

5-1.20 Cooperation with Other Entities: Attention is directed to Section 5-1.20 of the Standard Specifications.

Other construction including but not limited to utility, power, and pipe line relocation, may be in progress by other forces within and adjacent to the project area at the same time work is being performed under this Contract by Contractor. Contractor shall coordinate and cooperate with the forces performing other work, to the end that such forces may conduct their operations with as little inconvenience and delay as possible.

Each contractor or other entity performing work at or near the job or material site is responsible to the other for damage to work, persons, or property and for costs due to unnecessary delays.

5-1.20B(4)(a) Offsite Staging Areas and Construction Yards: Attention is directed to Santa Rosa City Code section 20-52.040, Temporary Use Permit.

A Temporary Use Permit shall be obtained for any offsite construction yard on private property to be used for any of the following:

1. Stockpiling of equipment and/or materials;
2. Staging of construction;

3. Placement of work trailers or mobile offices;
4. Storage of trench spoils; or
5. Other construction related activities not specifically enumerated above.

5-1.26 Construction Surveys: Contractor shall carefully preserve all benchmarks, grade stakes, and all other survey markers. In the case of willful or careless destruction, Contractor shall bear the cost of replacing the markers.

Contractor shall contact the Engineer directly for coordination of survey staking. Written staking requests must be submitted at least two working days in advance of the date and time stakes are needed.

5-1.27A Examination and Audit: Pursuant to California Government Code section 8546.7, any contract with the City involving expenditures in excess of $10,000 shall be subject to the examination and audit of the California State Auditor for a period of three years after final payment is made to Contractor by City under this Contract. Any such examination and audit will be confined to those matters connected with the performance of this Contract.

5-1.30A Inspection: Contractor shall bear all costs associated with the re-inspection of any defective, rejected or unauthorized work as determined by the Engineer in Engineer's sole discretion. Such costs of re-inspection, including any costs incurred by the City for additional staff time or fees for third-party consultant inspectors, will be deducted from one or more progress payments hereunder.

5-1.36D(a) Property and Facility Preservation: Attention is directed to Section 5-1.36 of the Standard Specifications.

At Contractor's sole expense, all fences, gates, landscaping, drainage ditches, sidewalks, irrigation systems, storm drains and any other facilities that are damaged, removed or destroyed because of Contractor's operations, shall be replaced in accordance with City Standards at a minimum and restored to the same or better condition. Concrete surface treatment and score marks shall match adjacent existing concrete improvements.

5-1.36E Obstructions: Attention is directed to Section 5-1.36 of the Standard Specifications and to the possible existence of underground gas mains, high voltage lines, telephone ducts, storm drains and water and sewers systems, the locations of which are not shown on the Project Plans. The determination of the location of these facilities and the cost of repair or replacement in the event of damage to such facilities are the sole responsibility of Contractor.

Should Contractor alter any public utility or private improvements to facilitate its operations or for its sole benefit, which alteration would not be otherwise required, Contractor shall make whatever arrangements are necessary with the owner or controlling authorities and shall bear all expenses in connection therewith. Any damages to any public utility or private improvement caused by Contractor shall be repaired by Contractor at its sole expense and to the full satisfaction of the Engineer or the controlling authority.

Any subsurface information and data furnished under any part of this Contract are not intended as a representation or warranty but are furnished for information only. It is expressly understood that the City will not be responsible for the accuracy thereof or for any deduction, interpretation or conclusion drawn therefrom by Contractor. The information is made available so that Contractor may have ready access to the same information available to the City and is not part of this Contract.

PRIOR TO STARTING ANY EXCAVATION, CONTRACTOR SHALL (AT LEAST TWO WORKING DAYS IN ADVANCE) CALL UNDERGROUND SERVICE ALERT (USA) toll free at (800) 227-2600 and provide USA with all necessary data relative to the proposed excavation. USA will accept calls and process information to participating agencies who have underground facilities in the area between the hours of 7:30 a.m. and 5:00 p.m. daily, except Saturdays, Sundays, and holidays. Between the hours of 5:00 p.m. and 7:30 a.m., calls will be recorded and then processed after

7:30 a.m. For emergency situations, after hours, and on Saturdays, Sundays and holidays, Contractor shall contact the owner of the affected facility.

Contractor shall coordinate all work with the appropriate City field personnel. When City work forces are required at the job site to perform Contract items of work, Contractor shall give a minimum of two working days advanced notification to the appropriate field office:

Water Division:	(707) 543-4200
Sewer Division:	(707) 543-4200
Street Division:	(707) 543-3880
Survey Division:	(707) 543-3834

5-1.43 Potential Claims and Dispute Resolution: "Claim" means a separate demand by Contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following: (A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by the City under the Contract; (B) Payment by the City of money or damages arising from work done by, or on behalf of, Contractor pursuant to the Contract and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled; or (C) Payment of an amount that is disputed by the City.

Upon receipt of a Claim, the City shall conduct a reasonable review of the Claim and, within a period not to exceed 45 days, shall provide Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed, provided, the parties may extend the 45 day time period by mutual agreement.

If the City needs approval from the City Council to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the Claim, and the Council does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a Claim, the City shall have up to three days following the next duly publicly noticed meeting of the City Council after the 45-day period, or extension expires to provide Contractor a written statement identifying the disputed portion and the undisputed portion.

Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the City issues its written statement. If the City fails to issue a written statement, the Claim shall be deemed rejected in its entirety.

If Contractor disputes the City's written response, or if the City fails to respond to a Claim within the time prescribed, Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the City shall conduct a meet and confer conference within 30 days for settlement of the dispute. Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the City shall provide Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the City issues its written statement. Any disputed portion of the Claim, as identified by Contractor in writing, shall be submitted to nonbinding mediation, with the City and Contractor sharing the associated costs equally. The City and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.

6 CONTROL OF MATERIALS

6-2.01G Source of Supply and Quality of Materials: All materials required to complete the work under the Contract shall be furnished by Contractor and shall be free of hazardous substances.

6-2.01H General: Statistical means will not be used by the City for determination of Standard Specification compliance. Whenever both operating range test results and Contract compliance requirements are specified in these special provisions, the operating range requirements shall apply to the individual test results.

6-2.01I Material Submittals: Upon award of the Contract by City, Contractor shall submit to the Engineer a list of all materials proposed to be used on this project and any supporting documentation and/or samples required and source of supply.

For material listed on the "Engineer's List of Approved Items" which is located in the Sewer and Water sections only of the City Standards, the Engineer shall be provided with the name of the manufacturer and model/part number for all material proposed for this project, unless that item has been replaced as shown on the Project Plans or in the Invitation for Bids.

For all other materials used on this project, regardless of the type of work, Contractor shall provide to the Engineer the name of the manufacturer and model/part number along with supporting documentation and/or samples that will allow the Engineer to determine the material's acceptability.

The Engineer reserves the right to reject any proposed material, whether on the City's "Engineer's List of Approved Items" or not. If the City obtains information indicating that a listed item is not performing satisfactorily or is found to be defective, that item will be rejected and Contractor shall submit a replacement for review at no additional cost to the City.

6-3.01B Material Guarantee: Before any contract is awarded, the bidder may be required to furnish samples of materials and detailed descriptions of equipment to be used in the construction of the project. The materials samples may be subjected to the tests provided for in the Standard Specifications or in this Invitation for Bids to determine their quality and fitness for the project. The successful bidder shall unconditionally guarantee project materials and workmanship for a period of one year from the date of recording of the Notice of Completion. The guarantee shall cover 100% of all costs of repairs within the one-year period, including all costs of labor, materials, equipment, and incidentals. Except as may be otherwise provided in Section 3-1.05, the successful bidder shall provide a surety bond executed by a corporate surety authorized and admitted to transact a surety business in the state of California in the minimum amount of one-half of the Contract price to cover this guarantee.

6-2.03D Quality Assurance: California Test 216 (Relative Compaction) testing will be modified as follows: A mechanical compactor (Ploog Engineering Co. Model M 100 or equivalent) with 10-pound hammer and split compaction molds shall be used in lieu of the specified manual compaction equipment.

California Test 231 (Nuclear Gage Determination of In-Place Density) will be modified as follows: In-place density and relative compaction may be determined on the basis of individual test sites in lieu of the area concept, at the discretion of the Engineer.

6-4 Water Utility

6-4.01A Construction Water: All water required for the performance of the work shall be provided by Contractor. Prior to obtaining water from the City's water system, Contractor shall obtain a Water

Use Permit from the City of Santa Rosa Water Department and rent a hydrant or bridge meter. Contractor is responsible for the cost of all water and the cost of all deposits, permits and fees.

Contractor is prohibited from operating gate valves or fire hydrants on the City system.

The acquisition of water from the City's water system through un-metered hydrants or other facilities is a violation of City ordinance and State law. The use of water from sources other than the City's water system must be approved by the Engineer in advance of the use.

Citations and fines will be levied for violation of these and other utility regulations and deductions will be made from payments consistent with Section 7-1.02A (1) of the Standard Specifications.

6-4.01B Water Utility Notification: Contractors or parties requiring work of any kind by the City of Santa Rosa Water Department forces shall request such services a minimum of 48 hours in advance of the time such services are desired. Work requests which will involve the City of Santa Rosa Water Department forces for more than eight hours or an extensive number of City parts shall be requested a minimum of seven calendar days in advance.

If it is necessary to terminate or disrupt utility service to any customer, Contractor shall make the request for such work by City forces an additional 72 hours (three additional working days for a total of five working days advance notice) in advance of the time such services are desired to allow affected customers a minimum of 72 hours' notice. Contractors who fail to keep field appointments will be billed for scheduled City of Santa Rosa Water Department crew standby time which was used and the Contractor shall bear the costs incurred by the City of Santa Rosa's Water Department for re-notification of customers.

City of Santa Rosa Water Department crews work a 9/80 schedule. This schedule may prohibit shutdowns for tie-ins on alternating Fridays. After hours work or weekend work may be performed if prior authorization from the Engineer is obtained.

Other than the hours specified in this Invitation for Bids, requests by Contractor for after hours or weekend work is to be avoided whenever possible. Any overtime costs incurred by City for such work shall be borne by Contractor.

Interruption of utilities service to commercial customers shall be coordinated with the customer to minimize disruption to the enterprise to the greatest extent practicable. After notification by the Contractor of the need, the City of Santa Rosa Water Department will contact all commercial customers and inform Contractor accordingly.

6-4.01C Water Facility Damage: All damage caused to the City's water system shall be immediately reported to the Engineer.

Damage caused to the City's water system by Contractor's operations shall be repaired by the Contractor at Contractor's sole expense in a manner satisfactory to the City of Santa Rosa Water Department. Such repairs shall not be charged to the City or any City project. All repair work shall be witnessed and approved by the City of Santa Rosa Water Department prior to backfilling the excavation. The City will require re-excavation if backfilling occurs prior to inspection, which costs shall be borne by Contractor.

Contractor is responsible for, at its sole cost and expense, the repair and remediation of damage to property and facilities caused by any of the following circumstances:

1. Contractor fails to make a written request for a markout or begins excavation without providing the City of Santa Rosa Water Department a reasonable opportunity to mark facilities;

2. Contractor destroys markouts;
3. Contractor fails to perform hand digging or probing for utilities near markouts; or
4. Contractor fails to use reasonable caution, regardless of whether markouts are present or clear. Reasonable caution includes any efforts to avoid damaging existing facilities, such as when excavating in the vicinity of water mains.

City may, in its discretion, opt to make the repairs for which Contractor is responsible with its own forces. In such cases, the repairs will be made at Contractor's expense in accordance with the emergency repair rate schedule of the City of Santa Rosa Water Department. The City may make repairs whenever restoration of service requires extraordinary speed or special equipment. Contractor will be billed accordingly, and City shall have the right and option to withhold payment hereunder, or a portion thereof, for any such costs billed but not promptly paid by Contractor.

6-4.02 Salvage: All valves, hydrants, and other appurtenances of the water system that are the property of City and removed by Contractor shall be delivered to the City's Municipal Services Center (55 Stony Point Road) unless Contractor has obtained specific written approval from the City of Santa Rosa Water Department to otherwise dispose of the materials.

6-4.03 Trade Names and Alternatives: Material and equipment specifications that identify a particular patent, trade name or manufacturer, may be satisfied through substitute materials and equipment accepted by the City. Contractor may offer substitute materials and equipment of equal or better quality to the City. Any such offer shall be made in writing to the Engineer at least four weeks in advance of the time Contractor wishes to order the materials or equipment. Contractor shall include sufficient data which, together with any other information the Engineer may require, will enable the Engineer to determine the acceptability of the materials and equipment. When the substitute materials or equipment necessitate changes to any part of the work, the information shall include drawings and details showing all such changes and Contractor shall perform these changes as a part of any acceptance of substitute materials or equipment. The use of substituted materials and equipment will be permitted only after written acceptance of the materials and equipment by the Engineer. Such acceptance shall not relieve the Contractor from full responsibility for the sufficiency, quality and performance of the substitute materials and equipment.

7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

7-1.02A (1) Forfeitures for Health and Safety Violations: Contractor shall comply with all applicable provisions of the Santa Rosa City Code and any failure to do so shall constitute a breach of the Contract. In the event of any violation of the Santa Rosa City Code that may impact public health and safety, including, but not limited to Chapter 17-12, "Storm Water" and Chapter 13-04, "Street Encroachments," City shall have the right to impose a charge against Contractor in an amount equal to $500.00 per violation per day. Prior to the imposition of any charge hereunder, City shall first provide a written notice to Contractor of the violation and setting forth a reasonable period of time for Contractor to cure the violation(s). In the event Contractor fails to cure any such violation within the time provided, City shall have the right, in addition to all other rights and remedies available to City, to deduct and withhold as a permanent forfeiture by Contractor the appropriate amounts from any payment otherwise due Contractor under this Contract.

7-1.02K (2) Wages: Pursuant to Labor Code sections 1770 *et seq*., each laborer or mechanic of Contractor or any subcontractor engaged in work on the project under this Contract shall be paid not less than the hourly wage rate of per diem wages set forth in the prevailing wage rate schedule published by the Director of Industrial Relations, regardless of any contractual relationship which may be alleged to exist between Contractor or any subcontractor and such laborers and mechanics. A copy of the schedule of prevailing wage rates can be obtained online at www.dir.ca.gov or from the Department of Transportation and Public Works at 69 Stony Circle, Santa Rosa.

Any laborer or mechanic employed to perform work on the public works project under this Contract, which work is not covered by any of the foregoing classifications, shall be paid not less than the prevailing wage rate of per diem wages specified herein for the classification which most nearly corresponds to the work to be performed by the worker.

The foregoing specified prevailing wage rates are minimum rates only, and Contractor may pay any wage rate in excess of the applicable rate.

Pursuant to Labor Code Section 1775, Contractor as a penalty to the owner shall forfeit not more than $200.00 for each calendar day, or a portion thereof, for each worker paid less than the prevailing wage rate established by the Department of Industrial Relations for such work or craft in which such worker is employed. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which the worker was paid less than the prevailing wage rate shall be paid to each worker by Contractor.

Contractor shall only provide prevailing wage reports upon written request from City.

7-1.02K (4) Apprentices: Contractor agrees to comply with Chapter 1, Part 7, Division 2, sections 1777.5 *et seq*. of the California Labor Code. These sections require contractors and subcontractors to employ apprentices in apprenticeable occupations in a ratio of not less than one hour of apprentice work for each five hours of journeyman work (unless an exception is granted in accordance with Section 1777.5), and the contractors and subcontractors shall not discriminate among otherwise qualified employees as apprentices solely on the ground of sex, race, religion, creed, national origin, ancestry, or color. Only apprentices as defined in Labor Code section 3077, who are in training under apprenticeship standards and who have written apprentice agreements will be employed on public works in apprenticeable occupations. The responsibility for compliance with these provisions is fixed with the prime contractor for all apprenticeable occupations.

7-1.02K(6)(a)(1) Notice to Vendors: Attention is directed to the current OSHA Standards. All equipment, tools and materials which are furnished and/or installed as part of this Contract shall meet or exceed the aforementioned standards in order to be considered acceptable.

7-1.02K(6)(b) Excavation Safety: When the digging or excavation occurs during project construction, Contractor shall:

1. Promptly notify City in writing of the following conditions before any such conditions are disturbed:

    a. Material that Contractor believes may be hazardous waste as defined in Health and Safety Code section 25117 that is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law;
    b. Subsurface or latent physical conditions at the site differing from those indicated in the Invitation for Bids; and
    c. Physical conditions at the site of any unusual nature, materially different from those ordinarily encountered and generally recognized as inherent in the type of work under the Contract.

2. The City will investigate the conditions and will issue a change order under the terms of the Contract if it finds that the conditions warrant it.

3. If a dispute arises between City and Contractor as to whether a change order is warranted, Contractor shall not be excused from any scheduled completion date provided for in the Contract but shall proceed with all work to be performed under the Contract.

7-1.02K(6)(b)(1) Trench Excavation Safety Plans: When the estimated cost for the excavation of any trench or trenches five feet or more in depth will exceed $25,000.00, Contractor shall submit to the Engineer 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 such trench or trenches. If such plan varies from the shoring system standards established by the construction safety orders, or if the trench is anticipated to be greater than 20 feet, the plan shall be prepared by a registered civil or structural engineer.

A permit to do the above described work shall be obtained from the State of California, Division of Industrial Safety. Proof of such permit shall be submitted to the Engineer prior to starting the trench work.

Full compensation for complying with the provisions of this section shall be considered as included in the Contract price and no additional allowance will be made for the work.

7-1.02K(6)(d) Confined Space Safety: Any confined space entry for this project, including but not limited to manhole or water storage tank entry, will require a confined space entry permit pursuant to Cal/OSHA regulations as set forth in title 8 California Code of Regulations (CCR) sections 5157 or 5158. Confined space entry shall have the meaning ascribed in title 8 CCR sections 5157 and 5158. For any confined space entry for construction operations regulated by title 8 CCR section 1502, Contractor shall comply with title 8 CCR section 5158, “Other Confined Space Operations.” For any other confined space operations, Contractor shall comply with title 8 CCR section 5157, “Permit-Required Confined Spaces.”

Attention is directed to the technical specifications in the Special Provisions for information regarding entry to any City maintained confined space. Pursuant to title 8 CCR section 5157, Contractor is required to obtain any available information regarding hazards and operations for any City maintained confined spaces. The City maintained Confined Space Entry Manual is available

for viewing at the City of Santa Rosa Water Department or Transportation and Public Works Department office at 69 Stony Circle, Santa Rosa.

Contractor shall immediately inform the Engineer of any previously unidentified hazards confronted or created during confined space entry.

7-1.02L (3) Patents and Royalties: All fees, royalties, or claims for any patented invention, article, process or method that may be used upon or in any manner connected with the work under this Contract shall be paid by Contractor. Contractor and its sureties shall protect and hold harmless City and its officers, agents, and employees from any and all demands made for such fees royalties or claims brought or made by any third party, and before the final payment is made on the account of the Contract, Contractor shall, if requested by City, furnish acceptable proof of a proper release from all such claims and liabilities.

Should Contractor, its officers, agents, or employees, or any one of them be enjoined from furnishing or using any invention, article, material, or plans supplied or required to be supplied or used under the Contract, Contractor shall promptly substitute other articles, materials, or appliances in lieu thereof of equal efficiency, quality, finish, suitability, and market value, and satisfactory in all respects to the Engineer. In the event that the Engineer elects, in lieu of such substitution, to have supplied and to retain and use any such invention, article, materials, or plans as may be required to be supplied by the Contract, Contractor shall pay such royalties and secure such valid licenses as may be requisite and necessary for City, its officers, agents, and employees, or any one of them to use such invention, article, materials, or appliance without being disturbed or in any way interfered with by any proceeding in law of equity on account thereof. Should Contractor neglect or refuse to make the substitution promptly or to pay such royalties and secure such licenses as may be necessary, then in that event the Engineer shall have the right to make such substitutions or City may pay such royalties and secure such licenses and charge Contractor even though final payment under the Contract may have been made.

7-1.02M (3) Mined Materials: California Public Contract Code section 20676 prohibits surface mining operators which are subject to the Surface Mining and Reclamation Act of 1975 (SMARA) from selling California mined construction material to the City unless the operator is identified in a list referred as the **3098 List**. The List, which is maintained by the Department of Conservation's Office of Mine Reclamation (OMR), changes throughout the year and can be viewed at the OMR website: http://www.consrv.ca.gov/OMR/ab_3098_list/index.htm. To confirm whether or not a specific operator is on the List at any given time, Contractor shall call the OMR at (916)323-9198.

7-1.03A Maintaining Traffic: Attention is directed to Sections 7-1.04 of the Standard Specifications and to the following modifications thereof.

If construction is within City owned right-of-way, provisions shall be made for the safe passage of public traffic through the work site at all times consistent with the requirements of Santa Rosa City Code Chapter 13-04.

Except for projects to be performed under a minor contract, Contractor shall install and maintain project identification signs at each end of the project or as directed by the Engineer two weeks prior to any construction activity. City shall furnish the appropriate sign panels upon request from Contractor. To mount the sign panels, Contractor shall furnish and install 4" X 4" posts or mount by other appropriate methods as approved by the Engineer. These sign panels shall be returned to the City Corporation Yard at 55 Stony Point Road after completion of the project.

Two weeks prior to any construction activity, advance notice signs for road closures shall be furnished and installed by Contractor at each end of the project and shall remain in place throughout the duration of the subject closure. Details of panel construction and lettering shall be approved by the Engineer.

Contractor shall furnish, install, and maintain at its expense all barricades, signs, lights, and other devices necessary to adequately warn of any obstructions to the traveled and pedestrian way and provide flaggers as necessary for the safety of public traffic and pedestrians and to provide access to property adjacent to the work site and Contractor shall comply with the Americans with Disabilities Act of 1990 (42 U.S.C. 12101, *et seq*.) (ADA) and any regulations and guidelines issued pursuant to the ADA.

Contractor shall comply with the current edition of the California Manual of Uniform Traffic Control Devices (CA MUTCD) for all items related to traffic within the work site.

Rain and other occurrences that may cause the suspension or delay of the work shall in no way relieve Contractor of its responsibility to provide traffic control and public access through the work site as specified herein. At all times, Contractor shall keep at the work site such materials, forces and equipment as may be necessary to keep roads, streets, and driveways within the work site open to traffic and in good repair and shall expedite the passage of such traffic, using such forces and equipment as may be necessary.

Should Contractor fail, in the opinion of the Engineer, to provide all the materials, forces and equipment necessary to maintain traffic through the work site as set forth herein, City may take steps necessary to remedy any such failure, including but not limited to causing such work to be performed and/or suspending any further work under the Contract. Any such remedial cost and expense incurred by the City, plus an administrative charge of 15%, shall be immediately due and payable by Contractor and may be deducted from any amounts owed to Contractor hereunder. In the event there are insufficient sums owed to Contractor hereunder to cover the foregoing costs and charges, City shall have the right to pursue any other remedy to recover the same, including but not limited to, proceeding against any surety or bond in favor of City. City's rights under Section 7-1.02 are intended to be in addition to and not in lieu of any charges imposed by City against Contractor under Section 7-1.02A (1) above for violations of the Santa Rosa City Code.

Contractor shall be responsible for informing emergency response agencies operating within the area of the work of obstructions to either public or private roads caused by reason of Contractor's operations hereunder.

Contractor shall make provisions for the safe passage of pedestrians around the project work site at all times.

8 PROSECUTION AND PROGRESS

8-1.01A Assignments: Once awarded, this Contract shall not be transferred, assigned, or sub-contracted, except as herein expressly provided without the prior written consent of the City in the City's sole and absolute discretion. See Section 5-1.12 of the Standard Specifications.

8-1.04B Standard Start: Contractor shall begin work within ten calendar days after the date authorized in the Notice to Proceed and shall diligently prosecute the Contract to completion before the expiration of:

180 WORKING DAYS

8-1.05 Time of Completion: Working days will be counted beginning with the day the Contractor begins work or with the tenth day after the date authorized in the Notice to Proceed, whichever occurs first.

Unless otherwise directed by Engineer, Contractor shall not conduct any activities that generate noise earlier than 7:00 a.m. or later than 7:00 p.m.

8-1.10 Liquidated Damages: Contractor hereby agrees that Contractor shall pay to the City liquidated damages for each and every calendar day delay over and above the number of working days prescribed above for finishing the work in the amount shown in Section 8-1.10 of the Standard Specifications.

8-1.13 Contractor's Control Termination: Attention is directed to Section 8-1.13 of the Standard Specifications. City may terminate Contractor's control of the work for failure to include the Federal Requirements in Contractor's subcontracts.

8-1.14. Contract Termination: Attention is directed to Section 8-1.14 of the Standard Specifications.

9 MEASUREMENT AND PAYMENT

9-1.04 Force Account Work: All work done on a force account basis shall be recorded daily on report sheets prepared by Contractor and signed by both the Engineer and Contractor. Such reports shall thereafter be considered the true record of force account work performed during the project. Such reports shall be furnished to the Engineer and a copy retained by Contractor.

All extensions of labor, equipment, and material costs shall be completed by Contractor and submitted to the Engineer within 30 days of the completion of the extra work. Completed and extended extra work reports received later than the times herein prescribed may be deemed invalid and rejected without payment at the discretion of the Engineer.

9-1.07 Payment Adjustments for Price Index Fluctuations: Any references to Opt Out of Payment Adjustments for Price Index Fluctuations in the Standard Specifications are deleted in their entirety.

9-1.16 Progress Payments: Once each month for progress pay purposes, the City will prepare a written estimate of the total amount of completed work and accepted materials purchased by Contractor but not installed. The City shall retain five percent of such estimated value of the completed work and the unused materials and pay Contractor the balance after deducting all previous payments and all sums to be retained under the provisions of the Contract. No such estimate or payment shall be required to be made when, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the Contract or when, in the Engineer's judgment, the total value of the completed work since the last estimate is less than $500.00. No such estimate or payment shall be construed to be an acceptance of any defective work or improper materials.

After Contract acceptance, the Engineer will prepare a written proposed final estimate of the proposed final quantities of work completed under the Contract and the value of such work and will submit such estimate to Contractor. The City shall retain five percent of such estimated value of the work done and shall pay to Contractor the balance after deducting all amounts to be retained under the provisions of the Contract.

The City may, at its option and at any time, retain out of any amounts due Contractor sums sufficient to cover any unpaid claims of City or others, provided that sworn statements of all non-City claims shall have been filed with the Director of Finance.

9-1.16E(6) Substitution of Securities for Withheld Amounts: Pursuant to Public Contract Code section 22300, securities may be substituted for any moneys withheld by City to ensure performance under this Contract, provided that substitution of securities provisions shall not be required in contracts in which there will be financing provided by the Farmer's Home Administration of the United States Department of Agriculture pursuant to the Consolidated Farm and Rural Development Act (7 USC sections 1921 *et seq*.), and where federal regulations or policies or both do not allow the substitution of securities. At the request and expense of Contractor, securities equivalent to the amount withheld shall be deposited with the City, or with a state or federally chartered bank as the escrow agent, which shall then pay such moneys to Contractor. The Director of Finance is authorized to execute substitution of securities agreements on behalf of the City. The City will return the securities to Contractor upon satisfactory completion of the Contract as determined by City in its sole discretion and the resolution of all outstanding claims against the securities. Contractor shall be the beneficial owner of any securities substituted for moneys withheld and shall receive any interest thereon.

Securities eligible for investment under this section shall include those listed in Government Code section 16430, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit or any other security mutually agreed to by Contractor and the City, provided that the substituted security is equal to or not less than five percent of the Contract amount.

Security substitutions must be submitted by Contractor and approved by City prior to the time of the first progress payment to be made under the Contract. No other method of substituting securities for retention will be accepted. The security substitution shall be done only upon execution of an agreement satisfactory to City which includes the following provisions:

a. The amount of securities to be deposited;
b. The terms and conditions of conversion to cash in case of the default of Contractor; and
c. The procedure for return of securities upon completion of the Contract.

9-1.17D Final Payment and Claims: The processing of payment of the final estimate shall not be commenced less than 35 days after the date of recording of the Notice of Completion with the County Recorder's Office. Contractor is advised that it takes approximately ten days for a check to be issued following a request for payment.

Contractor shall submit its written statement of all claims for additional compensation under the Contract to the Engineer within 15 days after submission to Contractor of the proposed final estimate.

If Contractor does not file a claim within the 15-day period, or upon Contractor's approval, the Engineer will issue a final written estimate and the City shall pay to Contractor the entire sum due after deducting all previous payments, if any, and all amounts to be retained under the provisions of the Contract.

If Contractor files a claim within the 15-day period, the Engineer will furnish a semi-final estimate and pay the amount due under the semi-final estimate within 30 days. The semi-final estimate is conclusive as to the amount payable except as may be affected by claims and any amount retained. The Engineer shall then consider and investigate such claim and shall make such revision in the final quantities as the Engineer may find to be due and shall then make and issue a final written estimate. The City will pay the amount due, after deducting all previous payments, if any, and amounts to be retained under the provisions of the Contract.

Any and all prior partial estimates and payments shall be subject to correction in the final estimate and payment.

The final estimate shall be conclusive and binding against both parties to the Contract on all questions relating to the performance of the Contract and the amount of work done thereunder and compensation therefor, except in the case of gross error.

9-1.17D (3) Final Determination of Claims: Claims filed by Contractor shall be in sufficient detail to enable the Engineer to determine the basis and amount of the Claims. Contractor shall also furnish reasonable documentation to the City to support Claims. If additional information is required by the Engineer, Contractor shall provide such information to the Engineer no later than the 15th day after receipt of the written request from the Engineer. If the 15th day falls on a weekend, holiday, or day City offices are closed, then the information shall be provided to the Engineer no later than close of the next business day. Failure to submit the requested information to the Engineer within the time specified will be sufficient cause for denying the Claim.

Contractor shall keep full and complete records of the costs and additional time incurred for any work for which a claim for additional compensation is made. The Engineer or any designated Claim investigator or auditor shall have access to those records and any other records as may be reasonably required by the Engineer to determine the facts or contentions in each Claim. Failure to grant access to such records shall be sufficient cause for denying the Claims.

9-1.22 Arbitration: Any references to Arbitration in the Standard Specifications are deleted in their entirety.

Claims submitted by Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code sections 12650 *et seq*., and the United States False Claims Act, title 31, United States Code sections 3729 *et seq*., the undersigned,

_____,
(Name)

_____ of
(Title)

_____
(Contractor)

hereby certifies that the claim for additional compensation made herein is supported by a true statement of the actual costs incurred and time expended on this project and is fully documented by records maintained by Contractor.

Dated _____

/s/_____

Subscribed and sworn before me this _____ day of

_____

_____
Notary Public

My Commission Expires _____

Failure to submit the notarized certificate will be sufficient cause for denying the claim.

Any claim for overhead expenses, in addition to being certified as stated above, shall be supported by an audit report of an independent Certified Public Accountant. Any such overhead claim shall also be subject to audit by the City at its discretion.

Any costs or expenses incurred by the City in reviewing or auditing any claims that are not supported by Contractor's cost accounting or other records shall be deemed to be damages incurred by the City within the meaning of the California False Claims Act and the United States False Claims Act.

10 FEDERAL REQUIREMENTS

A. Definitions

1. Government means the United States of America and any executive department or agency thereof.

2. FEMA means the Federal Emergency Management Agency.

3. Third Party Subcontract means a subcontract at any tier entered into by Contractor or subcontractor, financed in whole or in part with Federal assistance originally derived from the Federal Emergency Management Agency.

B. Federal Changes

1. Contractor shall at all times comply with all applicable regulations, policies, procedures, and FEMA Directives as they may be amended or promulgated from time to time during the term of this Contract, included but not limited to the requirements of 2 C.F.R. §§ 200.317 through 200.326 and more fully set forth in Appendix II to Part 200 – Contract Provisions for Non-Federal Entity Contracts Under Federal Awards, which is included herein by this reference. Contractor's failure to so comply shall constitute a material breach of this Contract.

2. Contractor agrees to include the above clause in each third-party subcontract financed in whole or in part with Federal assistance provided by FEMA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

C. Compliance with the Contract Work Hours and Safety Standards Act.

Pursuant to section 3701 of title 40 of the United States Code, this Section C shall apply to Contractor in the event the amount payable under this Contract exceeds $100,000 and may involve the employment of mechanics or laborers.

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

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this section Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

3. Withholding for unpaid wages and liquidated damages. City shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by Contractor or subcontractor under any such contract or any other Federal contract with the same prime

contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

4. Subcontracts. Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section.

D. Clean Air Act and Federal Water Pollution Control Act

This Section D shall apply in the event the amount payable under this Contract exceeds $150,000.

Clean Air Act

1. Contractor agrees to comply with all applicable standards, orders and regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 *et seq*.

2. Contractor agrees to report each violation to City and understands and agrees that City will, in turn, report each violation as required to assure notification to the State of California, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

3. Contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

Federal Water Pollution Control Act

1. Contractor agrees to comply with all applicable standards, orders and regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. §§ 1251 *et seq.*

2. Contractor agrees to report each violation to City and understands and agrees that City will, in turn, report each violation as required to assure notification to the State of California, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

3. Contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

E. Suspension and Debarment

1. This Contract is a covered transaction for purposes of title 2 Code of Federal Regulations parts 180 and 3000. As such, Contractor is required to verify that none of Contractor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R.§ 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

2. Contractor represents and warrants that it is not debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549 “Debarment and Suspension.” Contractor agrees that neither Contractor nor any of its third-party subcontractors shall enter into any third-party subcontracts for any of the work under this Contract with a third-party subcontractor that is debarred, suspended, or otherwise excluded for or ineligible for participation in Federal assistance programs under executive Order 12549.
3. Contractor must comply with title 2 Code of Federal Regulations, part 180, subpart C and title 2 Code of Federal Regulations, part 3000, subpart C and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

4. This certification is a material representation of fact relied upon by City. If it is later determined that Contractor did not comply with title 2 Code of Federal Regulations, part 180, subpart C or title 2 Code of Federal Regulations, part 3000, subpart C, in addition to remedies available to the State of California and the City of Santa Rosa, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

F. Procurement of Recovered Materials

1. In the performance of this Contract, Contractor shall make maximum use of products containing recovered materials that are EPA- designated items unless the product cannot be acquired—

    a. Competitively within a timeframe providing for compliance with the Contract performance schedule;
    b. Meeting Contract performance requirements; or
    c. At a reasonable price.

2. Information about this requirement, along with the list of EPA- designate items, is available at EPA's Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.

G. Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended)

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

H. MBE/WBE Requirements

1. Contractor shall take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible through the "Good Faith Effort" process in 2 C.F.R. § 200.321. Contractor shall document and report its Good Faith Effort processes. Contractor shall also ensure that all of its subcontractors take the affirmative steps required under 2 C.F.R. § 200.321. Affirmative steps shall include:

    a. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
    b. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
    c. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
    d. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
    e. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and
    f. Requiring all subcontractors to take the affirmative steps listed in paragraphs (a) through (e) above.

I. MISCELLANEOUS PROVISIONS

1. DHS Seal. Contractor shall not use the Department of Homeland Security ("DHS") seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FEMA pre- approval.

2. FEMA Assistance. Contractor acknowledges that FEMA financial assistance will be used to fund this Contract only. Contractor shall comply will all applicable federal laws, regulations, executive orders, FEMA policies, procedures, and directives.

3. Federal Government Not Party. The Federal Government is not a party to this Contract and is not subject to any obligations or liabilities to City, Contractor, or any other party pertaining to any matter resulting from this Contract.

4. False Claims. Contractor acknowledges that Title 31 United States Code Chapter 38 (Administrative Remedies for False Claims and Statements) applies to Contractor's actions pertaining to this Contract.

J. Equal Employment Opportunity

During the performance of this Contract, Contractor agrees as follows:

1. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
2. Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.
3. Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
4. Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
5. Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
6. In the event of Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, Contractor may request the United States to enter into such litigation to protect the interests of the United States.

K. Records.

1. Contractor shall retain any and all records necessary to document the charges under this Contract and make such records available for inspection for a period of not less than four (4) years.

2. Contractor shall keep and maintain full and complete documentation and accounting records concerning all extra or special services performed by it that are compensable by other than an hourly or flat rate.

3. Contractor shall maintain the records and any and all other records pertinent to this Contract for a period of four (4) years after completion of all services hereunder.

4. Contractor agrees to provide City, the State of California, the Federal Emergency Management Agency ("FEMA") Administrator, the Comptroller General of the United States, and any or all of their authorized representatives, access to any books, documents, papers, and records of Contractor which are pertinent to this Contract for the purposes of making audits, examinations, excerpts, and transcriptions.

5. Contractor agrees to permit all or any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

6. Contractor agrees to provide the FEMA Administrator or his authorized representatives access to work sites pertaining to the services being performed under this Contract.

City of Santa Rosa

Special Provisions

For

Fire-Related Repairs of Utility Stations

2020

10/25/2019

10/25/2019

HydroScience

12 TEMPORARY TRAFFIC CONTROL

12-1 General

12-1.01 General: Construction area traffic control devices shall be installed and maintained at Sewer Lift Station 1 and Sewer Lift Station 3 for construction of new driveway/ gutter in accordance with the applicable sections of these Special Provisions, the Standard Specifications, the current Edition of the California Manual on Uniform Traffic Control Devices (CA MUTCD), the Americans with Disabilities Act (ADA) and as directed by the Engineer.

12-3 Traffic-Handling Equipment and Devices

12-3.01 General: Prior to commencing construction which will affect existing vehicular and pedestrian traffic, the Contractor shall submit for review by the Engineer, Traffic Control Plans on 11" x 17" sheets of paper which contains only information specifically related to work zone vehicular and pedestrian traffic control. If the Contractor proposes to use the current edition of the CA MUTCD published by Caltrans in lieu of a traffic control plan, in specific work operations, they shall submit in writing for consideration which Typical Application Diagram will be used and how it will be applied for each work operation. Traffic Control Plans or proposals shall be submitted for review at least two weeks prior to implementation.

Traffic Control Plans shall contain a title block which contains the Contractor's name, address, phone number, project superintendent's name, contract name, dates and hours traffic control will be in effect, and a space for review acknowledgment.

The content of the Traffic Control Plan shall include, but is not limited to, the following:

1. Show location and limits of the work zone.
2. Give dimensions of lanes affected by traffic control that will be open to traffic.
3. Indicate signing, cone placement, and other methods of delineation and reference to appropriate City or Caltrans Standards.
4. Dimension location of signs and cone tapers.
5. Identify side streets and driveways affected by construction and show how they will be handled.
6. Show how pedestrian traffic will be handled through the construction site. Pedestrian pathways through the work zone shall be in compliance with the requirements of ADA during and after work hours.
7. Identify message board locations. A minimum of 3 changeable message boards shall be required. Location to be determined by Engineer.
8. Demonstrate how two-way traffic will be maintained.

No work except for installation of project identification signs will be allowed to commence prior to approval of the Work Zone Traffic Control Plans.

12-4 Maintaining Traffic

12-4.01 Maintaining Traffic:

1. The full width of the traveled way shall be open for use by public traffic on Saturday, Sundays and designated legal holiday(s), after 4:00 p.m. on Fridays and the day preceding designated legal holidays, and when construction

operations are not actively in progress; unless work has specifically been authorized by the Engineer.

2. The location of traffic control signing, barricades, and other facilities shall be monitored frequently (four to five times per day) by the Contractor to verify their proper location. All traffic signal and other traffic control devices shall be maintained at all times.
3. The Contractor shall conduct his operations so as to cause the minimum obstruction and inconvenience to traffic and to places of business, multiple dwelling units and residences adjacent to the work. The Contractor shall notify the Engineer of his planned work and utility service interruption at least five working days in advance to allow time to notify residents and businesses.
4. When construction activities will prevent vehicle access to individual driveways the Contractor shall notify and receive permission from the affected businesses and residents. Attention is directed to Section 7-1.03, "Public Convenience". **Full access shall be provided to all driveways during non-working hours.**
5. At locations where traffic is routed perpendicular to trench excavation, the excavation shall be conducted in a manner to provide a surface reasonably satisfactory for traffic at all times. Substructure installation or construction shall be conducted on only one-half the width of the roadway at a time, and that portion of the roadway being used by traffic shall be kept open and unobstructed until the opposite side of the roadway is ready for use. Upon completion of the rough grading, the surface of the roadbed shall be brought to a smooth, even condition free from humps and depressions and made satisfactory for traffic.

12-4.01A Construction Traffic: The Contractor shall submit a trucking route along with the traffic controls plans for approval by the Engineer. The route must minimize traffic on residential streets that are not part of the project.

Existing pavement damaged by the Contractor's operations and not shown to be replaced shall be replaced at the Contractor's expense, per City Standards and to the satisfaction of the Engineer.

12-4.02 Closure Requirements: Attention is directed to Section 7-1.03, "Public Convenience", to Section 5-1.05, "Order of Work," of these Special Provisions.

Exact locations of Project Identification signs and Advance Notice signs (7-1.03, "Public Convenience") shall be determined in the field by the Engineer.

Lane closures will be permitted between the hours of 8:30 a.m. and 4:00 p.m. only. Only one lane at a time may be closed and no lanes shall be closed at any other hours unless specifically approved by the Engineer. The Contractor shall maintain vehicle access to homes and other properties at all times while work is in progress.

The Contractor shall not park construction vehicles, contractor employee vehicles, stage materials or stockpiles in front of any business or residential driveway access and the Contractor shall maintain access to private parking lots within the block where work is in progress. Construction vehicles shall not be left running for any length of time if parked in front of a business or residential unit.

The Contractor shall keep the City of Santa Rosa Fire Department informed regarding the closure of any traveled way. At a minimum, the Contractor shall call the Fire Department at 543-3535 **and** the Communications Center at 543-3666 **daily** to report any traveled way closure. This means immediately upon closure for that day and again immediately after removal of the closure. For closures over multiple days, the daily

notification still applies. This requirement does not apply for single lane closures on multiple lane streets.

The Contractor shall notify Sonoma County Transit at (707) 585-7516, Santa Rosa City Bus at (707) 543-3922, the local Postal Service at (707) 526-0113 and Recology at 1 (800) 243-0291 5 calendar days prior to any lane closures or restrictions in turning movements.
If the Contractor has been given an approved Traffic Control Plan that includes road closures, they shall maintain vehicular access to homes and other properties where work is in progress within the closure area.

Where necessary, and only after receiving written approval from the Engineer, the Contractor may temporarily suspend curb side parking in their immediate work zone. Notification to businesses and residents shall be hand delivered at least 72 hours prior to construction in the affected areas.

Notification shall be as follows:

1. A notice placed on the front door of each home or business where curb side parking will be suspended and attempt made to notify each business or resident verbally that work will be underway within the block and that curb side parking will be suspended during stated working hours and request that vehicles be parked out of the roadway by 8:00 a.m. Service of notice shall not bar use of cars within the block, as individual plans change and emergencies arise.

2. Type 1 barricades every 50 feet adjacent to the curb where parking will be suspended with a notice posted on the barricade stating specific dates and times that curb side parking will be temporarily suspended. If work will not take place in the posted area, then Contractor shall remove “No Parking” notices.

The Contractor shall maintain vehicle access to all homes and other properties along the work zone. During paving operations, the Contractor will be allowed to temporarily suspend vehicle access to a limited number of driveways when approved by the Engineer. When approved by the Engineer and at least 72 hours prior to suspending access to any driveway, the Contractor shall give both written and verbal notice to the affected businesses and residents and place barricades adjacent to the driveways with posted notices stating the specific dates and times of the suspension for that area. The notice shall also indicate an alternate parking location. Suspension of access to driveway will be permitted only as approved by the Engineer and only between the hours of 8:00 am and 4:30 pm.

Cross streets will require maintenance of at least one-half (1/2) width of each street for traffic purposes, unless a parallel route is approved by the Engineer. Flagging will only be allowed between the hours of 8:30 am and 4:00 pm.
Barricades and flaggers shall be positioned to allow safe turns at intersections and curves.

The Contractor shall maintain traffic control as necessary and as directed by the Engineer for "cat-tracking" operations by City Forces. Flaggers, barricades, signing, etc., shall remain in place for protection of City personnel until such time as all temporary lane delineation is complete.

12-7 Temporary Pedestrian Walkways

12-7.01 Pedestrian Traffic Control: The Contractor is directed to Chapter 6D, Pedestrian and Worker Safety, in the CA MUTCD, the improvement plans and these Special Provisions.

Pedestrians shall be provided with a safe convenient and accessible path that, at a minimum, replicates the most desirable characteristics of the existing sidewalk, path or footpath. At no point along the road shall the sidewalks on both sides of the road be closed at the same time.

The Contractor shall construct and maintain temporary pedestrian pathways through the work zone, where required, that shall be in compliance with the requirements of the Americans with Disabilities Act (ADA), and the CA MUTCD.

Pedestrian routes shall not be impacted for the purposes of any non-construction activities such as parking of vehicles or equipment, or stock piling of materials. Pedestrians shall not be led into conflicts with work site vehicles, equipment or operations.

Pedestrian routes shall be open and accessible at the end of the workday unless an alternate ADA compliant route has been approved by the Engineer. The construction of curb ramps and/or long sections of sidewalk do not alleviate the Contractor from this requirement.

12-9 Measurement and Payment

12-9.01 Payment: Full compensation for Traffic Control as specified herein shall be considered as included in the contract prices paid for various items of work, and no additional compensation will be allowed therefor. Such compensation shall include but not be limited to furnishing all labor, materials, tools and equipment, and doing all work involved in vehicular and pedestrian traffic control, including but not limited to, providing, placing, maintaining, and removal of temporary paths and/or ramps, temporary relocation of regulatory signs, changeable message boards, project and public notification signs, flagging, excavation, compaction, furnishing, and placement of asphalt concrete and/or PCC, barricades, toe-rails, hand rails, complying with CA MUTCD Standards for Pedestrian Safety, coordination efforts and any other items necessary for vehicle and pedestrian traffic control not specifically enumerated in the plans or these special provisions, and no additional allowance will be made therefor.

[Version: 08/16/18 CDA STD2010]

13 WATER POLLUTION CONTROL

13-1 General

13-1.01A: Water Pollution Control shall be performed in accordance with Section 13, Water Pollution Control, of the Standard Specifications and these special provisions. In addition, construction activities shall comply with:

1. The current California Water Quality Control Board, North Coast Region Order No. National Pollutant Discharge Elimination System Municipal Storm Water Permit, commonly referred to as the "Storm Water Permit". A copy of the Storm Water Permit is available for review at the City of Santa Rosa Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, CA, and at www.srcity.org/stormwaterpermit.

2. The California Stormwater Quality Association Storm Water BMP Handbook for Construction (CASQA Handbook). BMPs shall be selected, installed and maintained in accordance with the latest edition. A copy of the handbook can be viewed at the City of Santa Rosa Department of Transportation and Public Works office at 69 Stony Circle or downloaded from CASQA, http://www.casqa.org/.

In this technical specification the CASQA Handbook BMP numbers are appended to the associated Standard Specification sections. If a conflict occurs the CASQA Handbook BMP's shall govern.

13-2 Water Pollution Control Program

13-2.01B Submittals: The program to control water pollution required to be submitted under this section of the Standard Specifications shall include a spill contingency plan that establishes clean-up procedures that will be followed in the event of a spill of potentially hazardous, toxic, or polluting materials.

13-2.04 Payment: See Section 01010, Summary of Work for Bid Item descriptions, Summary of Work, Bid Item 2, Water Pollution Control

13-3 Storm Water Pollution Prevention Plan

13-3.01A Summary: This project is exempt from the State Water Resources Control Board General NPDES Permit for the Discharge of Storm Water related to Construction Activities (Construction General Permit), and not required to have a Storm Water Pollution Prevention Plan (SWPPP), therefore Section 13-3, Storm Water Pollution Prevention Plan, of the Standard Specifications does not apply to this project.

13-4 Job Site Management

13-4.03B: Spill Prevention and Control/CASQA Spill Prevention and Control (BMP WM-4):

If a spill occurs at the construction site and the contractor does not take immediate and adequate steps to contain and clean up the spill, especially if rain is threatening or if a discharge to a storm drain or creek could occur, the City shall have the right, in its sole and absolute discretion, to clean up the spill using City forces or an independent contractor. The cost of any such cleanup, in addition to recovery of any penalty or fine imposed upon the City, plus an administrative charge of fifteen percent (15%) of the

costs incurred by the City, shall be deducted from any amounts owed to Contractor hereunder.

In the event there are insufficient amounts owed to Contractor hereunder to cover the foregoing costs and charges, the City shall have the right to pursue any other remedy to recover same, including, but not limited to, proceeding against any surety or bond in favor of the City. The City's rights under this section are intended to be in addition to and not in lieu of any imposed by the City against Contractor for violations of City Code Chapter 17-12, "Storm Water".

13-4.03C(2): Material Storage/CASQA Material Delivery and Storage (BMP WM-1)

13-4.03C(3): Stockpile Management/CASQA Stockpile Management (BMP WM-3): Do not block storm water flows.

13-4.03D(1): Waste Management/CASQA Solid Waste Management (BMP WM-5): The Contractor shall dispose of all trash, rubbish, and waste materials of any kind generated by the contractor, subcontractor, or any company hired by the Contractor on a daily basis.

13-4.03D(3): Concrete Waste/CASQA Concrete Waste Management (BMP WM-8): Ensure the containment of concrete washout areas and other washout areas that may contain pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

13-4.03D(4): Sanitary and Septic Waste/CASQA Sanitary and Septic Waste Management (BMP WM-9): Sanitation facilities must be maintained periodically by a licensed service to keep them in good working order and prevent overflows. Portable toilets are required to have secondary containment.

13-4.03D(5): Liquid Waste: Liquid waste includes water generated from excavation dewatering. Minimize transfer piping by locating containers near the excavation to be dewatered while protecting the containers from moving vehicles and equipment.

13-4.03E(1): Water Control and Conservation/CASQA Water Conservation Practices (BMP NS-1 and NS-2)

13-4.03E(3): Vehicle and Equipment Cleaning/CASQA Vehicle and Equipment Cleaning (BMP NS-8)

13-4.03E(4): Vehicle and Equipment Fueling and Maintenance/CASQA Vehicle and Equipment Fueling (BMP NS-9), and CASQA Vehicle and Equipment Maintenance (BMP NS-10)

13-4.03E(7): Paving, Sealing, Sawcutting, Grooving, and Grinding Activities: As listed in Part 9, sections 4 and 5 of the Storm Water Permit, the following additional BMPs shall be implemented for paving, repaving, reconstruction, patching, digouts or resurfacing.

1. Restrict paving and repaving activity to exclude periods of rainfall or predicted rainfall unless required by emergency conditions;
2. Install BMPs at all susceptible storm drain inlets and manholes to prevent paving products and tack coat from entering;
3. Prevent the discharge of release agents including soybean oil, other oils, or diesel to the storm water drainage system or watercourses;

4. Minimize non-storm water runoff from water use for the roller and for evaporative cooling of the asphalt;
5. Clean equipment over absorbent pads, drip pans, plastic sheeting or other material to capture all spillage and dispose of properly
6. Collect liquid waste in a container, with a secure lid, for transport to a maintenance facility to be reused, recycled, or disposed of properly **13-4.03D(5)**;
7. Collect solid waste by shoveling and vacuuming or sweeping and securing in an appropriate container for transport to a maintenance facility to be reused, recycled, or disposed of properly **13-4.03D(5)**;
8. Cover "cold-mix" asphalt (i.e., pre-mixed aggregate and asphalt binder) with protective sheeting during a rainstorm **13-4.03C(3)**;
9. Cover loads with tarp before haul-off to a storage site, ensuring that trucks are not overloaded;
10. Minimize airborne dust by using water spray during grinding **14-9.03**;
11. Protect stockpiles with a cover or sediment barriers during a rain event and;
12. Avoid stockpiling soil, sand, sediment, asphalt material and asphalt grindings materials or rubble in or near storm water drainage system or watercourses **13-4.03C(1)**,

13-4.03F: Sweeping/CASQA Street Sweeping and Vacuuming (BMP SE-7)

13-4.04 Payment: **Job Site Management** shall be paid for at the contract **lump sum** price for **Water Pollution Control**.

13-6 Temporary Sediment Control

13-6.03C: Temporary Drainage Inlet Protection/CASQA Storm Drain Inlet Protection (BMP SE-10)

13-6.04: Payment: See Section 01010, Summary of Work for Bid Item Descriptions, Bid Item 2, Water Pollution Control

[Revised: 12/15/16 CDA STD2010]

14 ENVIRONMENTAL STEWARDSHIP

14-9.03 Dust Control

14-9.03A General: Sweeping per section 14-9.03C shall also be performed to prevent and alleviate dust.

Sweeping, covering stockpiles, applying water, and/or dust palliative, to control dust caused by public traffic is not change order work.

14-9.03C Construction: All dust-producing work and unpaved construction sites shall require a minimum watering in the middle and ending of each workday. The frequency of watering shall increase if dust is airborne. Watering shall not produce runoff.

Contractor shall maintain dust control to the satisfaction of the Engineer, 7 days a week, 24 hours per day.

At the end of each work day the Contractor shall thoroughly sweep all streets in the work zone to minimize airborne dust.

At the end of each work week the Contractor shall sweep all streets in the work zone with a commercial street sweeping truck equipped with a rear pick up broom.

At the Engineer's discretion additional sweeping or watering may be required, including the use of a commercial street sweeping truck equipped with a rear pick up broom, at any time or place.

14-9.03D Payment: Full compensation for conforming to this section shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed.

14-10.01 General: The Contractor shall dispose of all portland cement concrete and asphalt concrete, generated from removal or demolition activities on the project, at a recycler for these materials. The Contractor shall provide receipts verifying delivery and approximate quantity (in tons) of the material delivered to a material recycler.

All other excess materials from the project shall become the property of the Contractor and shall be disposed of by him, at his expense.

14-10.02A(1) Submittals: Submit a Solid Waste Disposal and Recycling Report prior to final acceptance of work performed under the Contract. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project.

Submit a Solid Waste Disposal and Recycling Report prior to Contract acceptance. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project.

14-10.02D Payment: Full compensation for material recycling as specified herein shall be considered as included in the contract prices paid for various items of work, and no additional compensation will be allowed therefor.

[Revised: 01/08/18-CDA STD2010]

15 EXISTING FACILITIES

15-1.03A General: Existing facilities disturbed by construction shall conform to the applicable provisions of Section 5-1.36. All existing active utilities found to reside in excavated areas shall be supported in place with service maintained during construction. The Contractor shall be responsible for any damage caused by their operations and any needed repairs shall be completed to the Engineer's satisfaction.

Contractors attention is brought to protection of Monuments and more specifically property corners that could be encountered or damaged during fence removal and placement: The contractor shall be responsible for ensuring the preservation of monuments (which includes property corners, etc.) in accordance with Chapter 15 of the Business and Professions Code, (The Professional Land Surveyor's Act) Section 8771 (b), (c) & (d). The contractor shall immediately notify the City of any monuments that could be destroyed, damaged, covered, disturbed or otherwise obliterated, prior to the performance of any work that may affect said monuments. The City's Survey Section will be responsible for the survey actions necessary for the perpetuation of any monuments requiring such action and within a reasonable time to not create undue delay to the contractor. The Engineer shall be made aware of any circumstance where a monument may be found or damaged during construction.

Existing storm drains found to reside in excavated areas shall be supported, removed, or replaced at the Contractor's option and at no additional cost to the City. The Contractor shall be responsible for maintaining the existing line and grade of the storm drains. If the Contractor elects to remove and replace, it shall be done per applicable City Standards and Specifications.

Existing utility trenches and/or structures that are in close proximity to proposed trenches shall be safeguarded in an appropriate manner from damage.

15-1.04 Payment: Full compensation for supporting, removal and disposal of existing utilities and their appurtenances is considered as included in the contract prices paid for various contract items of work and no additional allowance will be made therefor.

15-2.08A General: Where required to remove and reset existing City facility boxes and lids to grade the Contractor shall replace existing boxes and lids to comply with current City Standards

15-3.03 Construction: All removed concrete shall become the property of the Contractor and shall be immediately off-hauled. None of the removed concrete shall be dumped or stockpiled on the work site. The Contractor shall dispose of all removed concrete at a recycler for this material. Burying of broken concrete within the limits of the project will not be allowed.

All concrete which is to be removed from sidewalk, curb, gutter and driveway areas shall be removed to the nearest score mark or construction joint as directed by the Engineer unless otherwise noted on Project Plans. The edge of existing concrete to remain shall be neat and free of defects. Saw cutting may be required to achieve this.

Reinforcing steel may be encountered in portions of concrete to be removed and no additional allowance will be made for the removal of such steel.

Irrigation facilities may be encountered during concrete removal and replacement. The Contractor shall exercise care in this area and repair any damage done by their operations at no additional cost to the City.

Landscaping and other surfaces or structures shall be restored to original condition at no additional cost to the City.

15-3.04 Utility Clearances: The Contractor shall investigate, confirm and/or determine the exact locations of existing underground facilities that may impact the progress of work. Any determination from these investigations that may conflict with the Project Plans shall be brought to the Engineer's attention immediately.

15-3.05 Payment: Full compensation for complying with all requirements of this section during any phase of the work shall be included in the prices paid for various contract items of work and no additional allowance will be made therefor.

15-3.05 Payment: See Section 01010, Summary of Work for various bid items for payment. Payment for saw cutting, removal and disposal of concrete sidewalk, curb and gutter, driveway areas, and existing City monuments shall be paid for at the contract **lump sum** price and included as part of **Demolition** at applicable sites. Full compensation for repair of existing irrigation facilities damaged during any phase of the work shall be included in the prices paid for various contract items of work and no additional allowance will be made therefor.

[Revised: 01/08/18-CDA STD2010]

16 CLEARING AND GRUBBING

16-1.01 General: Clearing, grubbing, and access shall be confined to the limits shown on the plans and shall not exceed the minimum necessary to complete operations. Clearing and grubbing shall be mostly limited to Well 6 site and at sites where clearing and grubbing is needed for fence construction and for providing access.

The Contractor shall not remove any trees, brush, shrubs, or other natural objects outside the limits of construction as shown on the plans, unless directed by the Engineer.

Any trees, brush, shrubs, or other natural objects not ordered removed by the Engineer which have been removed, altered, or damaged shall be replaced in kind by the Contractor before completion of the project.

All unsuitable material shall be disposed of away from the site by the Contractor. The Contractor shall make all necessary arrangements for disposal of material.

16-1.03 Construction: The area to be cleared and grubbed shall be the area within the right-of-way shown on the plans, unless otherwise specified in the Special Provisions.

All stumps, large roots and other objectionable material shall be removed to a depth of three feet below finished grade in the area of construction. The resulting spaces shall be backfilled with material suitable for the planned use. Such suitable material shall be placed and compacted in layers as specified in Section 19-6 "Embankment Construction" of the Standard Specifications.

16-1.06 Payment: See Section 01010 Summary of Work for Bid Item descriptions. **Clearing and Grubbing** shall be paid for at the contract **lump sum** price and included as part of any Bid Item that includes **Site Preparation** at applicable sites. Price shall include full compensation for furnishing all labor, materials tools and equipment, and doing all the work involved in clearing and grubbing as specified herein, and no additional allowance will be made therefor.

[Version: 10/21/14CDA STD2010]

19 EARTHWORK

19-1 General

19-1.01 General:

1. Non-contaminated site: See section 19-2.03B, Surplus Material, of these special provisions.

19-1.01A Summary:

Excavating for various resurfacing, minor irrigation system modification, and fence/wall posts.

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19-1.03B Unsuitable Material: Stabilization of unsuitable material shall comply with the following provisions:

A. Unsuitable material may be processed in place, may be excavated and placed on the grade or other locations suitable for further processing, or may be partially excavated and partially processed in place.
B. Processing may consist of drying to provide a stable replacement material or mixing with lime per Section 24.
C. Stabilized material shall be placed and compacted in layers as hereinafter specified for constructing embankments.

19-1.03B(1) Subgrade stabilization: Any area of the subgrade determined by the Engineer to be unsuitable shall be stabilized per 19-1.03B.

For roadway reconstruction per section 19-2.03A of these special provisions where processing of unsuitable subgrade material is not allowed, the areas to be stabilized will be marked in the field by the Engineer after pavement excavation of the area is complete. Use of a pavement grinder shall be considered an acceptable method of excavation of areas requiring subgrade stabilization.

19-1.03C Grade Tolerance: When aggregate subbase or aggregate base are to be placed on the grading plane, the grading plane shall not vary more than 0.05' above or 0.1' below the grade established by the Engineer.

19-1.04 Payment: See Section 01010 Summary of Work for Bid Item descriptions. **Subgrade Stabilization** shall be paid for at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites. Price shall include full compensation for stabilization fabric, asphalt concrete base, compaction, doing all work involved in stabilizing the subgrade as specified herein including labor, materials, tools and equipment, excavation, and no additional allowance will be made therefor.

In the event of an increase or a decrease in the amount of the engineer's estimated quantity of Subgrade Stabilization, such increase or decrease shall not be considered an alteration in excess of the 25 percent of the contract amount of such items under provisions of Section 4-1.05 of the Standard Specifications and no adjustment of the contract price for Subgrade Stabilization will be made.

No additional compensation will be made for excavation and stabilization beyond the limits of the areas marked by the Engineer or for excavation and stabilization of locations other than those marked by the Engineer. Any excavation for subgrade stabilization done by the Contractor to accommodate equipment width beyond the limits of the areas marked by the Engineer shall be at the Contractor's expense.

Quantities of Stabilization Fabric to be paid for shall be computed on the basis of the exact amount of area covered in the field.

The cost for the asphalt concrete base shall be included with the contract unit price for subgrade stabilization.

19-2 Pavement Excavation

19-2.03A General: The Contractor shall furnish an excavation and paving plan and a qualified grade setter to insure that the subgrade conforms to the lines and grades established by the Engineer.

For roadway reconstruction, Pavement excavation shall be performed with a pavement grinder. No other construction equipment including rubber-tired equipment shall be allowed on the subgrade.

The Contractor shall note that there are street trees near areas intended for pavement excavation. The Contractor's operation, including the size of the grinding equipment, shall be such, so as to insure that existing street trees are not damaged. Where limited clearance under the street trees prevents the use of a grinder, excavation shall be performed by an alternate method as approved by the Engineer. Alternate methods may include jack-hammering and removal of existing pavement and base materials by hand, or by use of smaller grinding equipment.

Where tree roots are encountered during pavement excavation, the Contractor shall cut the roots off six inches below the planned subgrade. Each cut shall be clean with no torn bark or splintered wood remaining on the root and shall be accomplished by use of a saw appropriate for the size of the root to be cut.

19-2.03B Surplus Material: Surplus soil from this project has been approved for disposal at the City's Pond 2 Decommissioning and Grading Project at 35 Stony Point Road Santa Rosa, CA.

The following Pond 2 surplus soil transport and placement conditions shall be adhered to:

1. Material must be free of asphalt concrete; asphalt and soil grindings associated with pavement excavation and reconstruction;
2. Soil beneath asphalt that was previously oiled for paving is not allowed;
3. Sewer, water or storm drain pipe of any kind or type are not allowed;
4. Concrete; metal; rock greater than 6" in size; vegetation; and other deleterious materials are not allowed;
5. The quantity of trucks and the volume of soil deposited in Pond 2 from this project will be tracked. Truck drivers will be required to sign a log and be subject to periodic inspections to insure that only soil from this project is deposited in Pond 2
6. The Contractor shall spread and compact all project soils deposited into Pond 2 to 85% relative compaction and testing will be provided and performed by the City's materials Engineering Laboratory. The cost of compaction testing will be borne by the City.
7. Contractor shall comply with all disposal regulations such as City, County, and/or State permits and licenses, as may be required.
8. Soil disposal shall be limited to Monday through Friday between the hours of 7:00 am and 4:30 pm. Advanced, 48-hour notice is required to the City inspector and Water prior to starting.
9. Pond 2 site access is directly affected by weather conditions. You should anticipate no access during and for some time after rain events, unless wet weather site conditions are met at your expense.
10. The haul route shall be through the City Municipal Service Yard. A 15 MPH speed limit shall be observed at all times with stopping at all crosswalks and stop signs. No trucks shall access the site via any other route.

11. Tracking of material from the disposal location onto any and all paved surfaces near the pond is not allowed. Should tracking become evident sweeping will be required at your cost no later than the end of day. Dust control shall be provided at all times in accordance with Section 10.
12. The Idling limits on In-Use Off-Road Diesel Vehicles in section 2449 (d) (3) in Title 13, article 4.8, chapter 9, California Code of Regulations (CCR) shall be effective and enforceable.

The City shall reserve the right to unconditionally suspend or revoke disposal at any time at no cost to the City.

19-2.04 Payment: See Section 01010 Summary of Work for Bid Item descriptions. **Pavement excavation** shall be paid for at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites. price shall include full compensation for all work as specified herein and no additional allowance will be made therefor.

Removal of existing bituminous pavement and base materials will be at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites.

19-5 Compaction

19-5.03B Relative Compaction (95 percent): Relative compaction of not less than 95 percent shall be obtained for a minimum depth of 0.5-foot below the grading plane for the full width of the planned pavement structural section, whether in excavation or embankment.

Relative compaction of not less than 95 percent shall be obtained for embankment under bridge and retaining wall footings without pile foundations within the limits established by inclined planes sloping 1.5:1 out and down from lines one foot outside the bottom edges of the footing.

19-8 Subgrade Enhancement Geotextile

19-8.02 Materials: Soil stabilization fabric shall be installed per manufacturer's recommendations and shall meet or exceed the following specifications:

Grab Tensile Strength (ASTM D4632)	290 lb.
Mullin Burst Strength (ASTM D3786)	500 psi
Trapezoid Tearing Strength (ASTM D4533)	113 lb.
Modulus (Load at 10% Elongation) (ASTM D4632)	120 lb.
Apparent Opening Size (ASTM D4751)	40-70 sieve
Permittivity (ASTM D4491)	0.05 sec^{-1}

Soil stabilization fabric shall be Mirafi 600-X, GeoTex 315ST, Carthage Mills FX-66, TerraTex HD, or approved equivalent.

The soil stabilization fabric shall be held in place with wooden stakes driven through the fabric into the subgrade at the beginning and the end of the fabric and at 50 foot intervals. A minimum of three stakes shall be placed across the width of the fabric roll at each interval. The stakes shall be a minimum length of 8-inches and shall be driven at an angle opposite to the direction of pull exerted on the fabric by the paving machine.

19-8.04 Payment: Full compensation for Stabilization Fabric shall be included in the prices paid for various contract items of work which shall include full compensation for doing all work involved in placing the fabric including root pruning labor, materials, tools and equipment, and no additional allowance will be made therefor. See Section 01010 Summary of Work for Bid Item descriptions. Payment

20-3 IRRIGATION SYSTEM CONSTRUCTION

20-3 Scope of Work: Furnish all labor, materials, supplies, tools, and transportation; and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system as shown on the Project Drawings.

20-3.02M(3) Materials:

A. Main lines (constant pressure) below grade 2 inches and larger shall be polyvinyl chloride (PVC) 1120-160 psi with ring-tite connections; ½ inch to 1½ inch shall be PVC 1120 schedule 40.
   1. Join lengths of pipe by means of integrally formed bell end on pipe using rubber ring seal. Use schedule 40 PVC coupling on schedule 40 pipe.
   2. At changes in direction of branch mains and at RCV use appropriate schedule 40 PVC rubber ring seal fittings as approved by the Uniform Plumbing Code.
   3. At the location of RCV, asbestos-cement heavy tapped couplings for PVC pipe will be accepted; tapped couplings as manufactured by Johns-Manville.

B. Lateral lines (non-pressure) below grade shall be 1120-200 psi PVC plastic pipe with schedule 40 Type 1, Grade 1 PVC solvent weld fittings

C. Drip main line (non-pressure) above grade shall be 60 psi Polyetheline tubing, black with Perma Loc Fittings. Drip main line shall be held in place by heavy duty 6" galvanized steel wire anchor stakes with a crimp in middle.

C. Connections between main lines and RCV's shall be of schedule 40 hot-dipped galvanized steel nipples and fittings. Galvanized steel pipe and fittings shall be wrapped with a 40-mil thickness of self-adhesive polyethylene tape and coated with an epoxy material specifically formulated for such use.

G. Remote control valves (RCV)
   1. RCV and controllers shall be by the same manufacturer.
   2. RCV shall be Griswold 2000 or approved equal.
   3. RCV wiring shall not be connected to control wire.

P. Miscellaneous Installation Materials
   1. Solvent cement for solvent weld joints shall be of make and type approved by manufacturer(s) of pipe and fittings. Cement shall be maintained at proper consistency throughout use.
   2. Lubricant for assembling rubber ring seal joints shall be of make and type approved by manufacturer of pipe.
   3. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as teflon tape or approved equal.

20-5.08 Layout of Work: The Contractor shall coordinate layout of the irrigation system with the City and Engineer before construction is started. Any changes, deletions or additions shall be determined at this check.

20-5.09 Installation:

A. Preparation. Schedule and coordinate placement of materials and equipment in a manner to effect earliest completion of work in conformance with construction and progress schedule.

B. Protect work and materials from damage during construction and storage.

C. Layout:
   1. Layout work as accurately as possible in accordance with agreed upon layout.

D. Install water lines in 1120-Schedule 40 PVC plastic sleeves at street crossings.
E. Excavation and Trenching
    1. Excavation shall be in all cases ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining.
    2. Make trenches for pipe lines deep enough to provide minimum cover from finish grade as follows:
        a. 24-inch minimum cover over main lines to control valves and quick coupling valves.
        b. 24-inch minimum cover over control wires from controller to valves.
        c. 16-inch minimum cover over RCV-controlled lines to sprinkler heads.
        d. 48-inch minimum cover over all lines inside street right of way.
    3. Restore surfaces, existing underground installations, etc., damaged or cut as result of excavations to original conditions in manner approved by Engineer.
    4. Where drainage line interferes with irrigation trenching and pipe work, adjust the trench depth as instructed by the Engineer.
F. Assembling Pipe Lines
    1. All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.
    2. Rubber ring seal joint:
        a. Use factory-made male end or prepare field-cut male end to exact specifications of factory-made end. Beveling is to be done with a tool specifically designed for that purpose.
        b. Carefully clean bell or coupling and insert rubber ring seal without lubricant. Position ring carefully, according to manufacturer's instructions.
        c. Place a reference mark on each male end at the proper distance from the beveled end as indicated by the manufacturer's instructions. Lubricate male end according to manufacturer's instructions and insert male end to specified depth.
        d. All ring-tite joints are to be left uncovered until after they have been inspected and the pressure test applied.
        e. Form thrust blocks in such a manner to prevent any concrete from coming in contact with the pipe. Thrust blocks shall be between solid soil and the fitting.
    3. Solvent weld joint:
        a. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe and fitting of dirt, dust and moisture.
        b. Dry-insert pipe fitting to check for mis-sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.
        c. Coat the inside socket surface of the fitting and the external surface of the male end of the pipe with P-70 Primer (manufactured by Weld-On). Then without delay, apply Weld-On 711 cement liberally to the male end of the pipe and also apply 711 cement lightly to the inside of the socket. At this time, apply a second coat of the cement to the pipe end.
        d. Insert pipe immediately into fitting and turn ¼ turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket fitting. Check alignment of the fitting. Pipe and fitting shall be aligned properly without strain to either.
        e. Hold joint still for approximately thirty (30) seconds and then wipe excess cement from the pipe and fitting.
        f. Cure a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.
    4. Threaded joint:
        a. Field-threading of plastic pipe or fittings is not permitted. Factory-formed threads only will be permitted.

b. Factory-made nipples shall be used wherever possible. Field-cut threads in metallic pipe will be permitted only where absolutely necessary. When field-threading, cut threads accurately on axis with sharp dies.
c. All threaded joints shall be made up with pipe joint compound. Apply compound to male threads only.
d. Where assembling metallic pipe to metallic fitting or valve, no more than three (3) full threads shall show when joint is made up.
e. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.
f. Where assembling soft metal (brass or copper) to plastic pipe, use strap type friction wrench only; do not use metal jawed wrench.

5. Cap or plug openings as pipelines are assembled to prevent entrance of dirt or obstruction. Remove caps or plugs only when necessary to continue assembly.
6. Where pipes pass through sleeves, provide removable non-decaying plugs at ends of sleeve to prevent entrance of earth.

G. Remote control valves:
1. Install where shown and group together where practical.
2. Locate valves no closer than 24 inches from walk edges, buildings, and walls.
3. Provide 6 inches of pea gravel in bottom of valve box. No soil shall be in contact with RCV.
4. Support valve box with four (4) bricks (one at each corner). Maintain a minimum of 2 inches clearance between PVC pipe and valve box.
5. Valve boxes to be located 4 inches below finished grade with a 3-inch clearance between the remote control valve stem in the fully open position and the underside of the valve box lid.
6. Center rubber valve marker over flow control stem.

J. Testing: Perform test as specified. Remake any faulty joints with all new materials. Use of cement or caulking to seal leaks shall not be permitted.

K. Backfilling:
1. Backfill only after pipe has been inspected and approved.
2. Main line and lateral line backfill to be a 4-inch minimum sand bed on all sides of the pipe. The remaining backfill material shall be native soil excavated from the trenches.
3. Place backfill materials in 6-inch layers and compact by jetting or tamping to a relative compaction of 90 percent.
4. Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfill is completed.
5. In existing turf areas, after trenches have been compacted and settled, replace all sod within a 3-foot diameter of all sprinkler heads. Dress off all other trenches and seed with perennial rye grass.
6. If settlement occurs along trenches, and adjustments in pipes, valves and sprinkler heads, soil, sod, or paving are necessary to bring the system, soil, sod, or paving to the proper level of the permanent grade, the Contractor, as part of the work under this Contract, shall make all adjustments without extra cost to the City.

20-5.10 Tests: The Contractor shall:
1. Notify the Engineer at least three (3) days in advance of testing.
2. Perform testing at their own expense.
3. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered.
4. Apply the following tests after welded plastic pipe joints have cured at least 24 hours.

a. Test Drip irrigation and RCV lines with water at line pressure and visually inspect for leaks. Retest after correcting defects. The Contractor shall make tests and repairs as necessary until test conditions are met.

20-5.11 Inspection: The Contractor shall be subject to inspections at any and all times by authorized representatives of the City.

20-5.12 Guarantee: It shall be the responsibility of the irrigation Contractor to fill and repair all depressions and replace all necessary lawn and planting-loss due to the settlement of irrigation trenches for one year following completion and acceptance of the job.

The Contractor shall also guarantee all materials, equipment, and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within one year after installation is accepted, any and all defective parts that may be found.

20-5.13 Record Plans:

A. The Contractor shall maintain in good order one complete set of black line prints of all sprinkler plans which form a part of this Contract, showing all irrigation lines, valves, controllers and stub-outs. In the event that any work is not installed as indicated on the plans, such work shall be corrected and dimensioned accurately from the building walls on these record plans.
B. All underground stub-outs for future connections shall be located and dimensioned accurately from building walls on all record plans.
C. Upon completion of the work, obtain reproducible prints from the Engineering Department and neatly correct the prints to show the as-built conditions and return to the Engineering Department.

20-5.14 Payment: See Section 01010 Summary of Work for Bid Item descriptions. **Irrigation Systems** shall be paid for at the contract **lump sum** price at applicable sites, which prices shall include full compensation for furnishing all labor, materials, tools and equipment and conforming to the requirements of the Special Provisions and no additional allowance will be made therefor.

(STD2010)

26 AGGREGATE BASE

26-1.01 Aggregate Base: Aggregate base shall be Class 2 conforming to and placed in accordance with the requirements of Section 26 of the City Standard Specifications, with the following modifications and additional requirements.

Rolling shall commence immediately after spreading of the damp material and before the material has dried sufficiently to allow separation between the fine and coarse particles.

26-1.02B Quality Requirements: The minimum sand equivalent shall be 31 for any individual test.

26-1.03D Compacting: The surface of the finished aggregate base shall be firm and unyielding. Any visible movement vertically or horizontally of the aggregate base under the action of construction equipment or other maximum legal axle loads shall be considered as evidence that the aggregate base does not meet this requirement.

26-1.04 Payment: See Section 01010 Summary of Work for Bid Item descriptions. Class 2 Aggregate Base shall be included in the prices paid for various contract items of work which shall include full compensation for doing all work involved in furnishing all labor, materials, tools and equipment and doing all the work involved in furnishing and placing the base material as specified, including furnishing, hauling and applying water as specified and directed by the Engineer.

[Version: 05/03/14 STD2010]

39 HOT MIX ASPHALT

39-1.01 General:

39-1.01A Summary: Section 39 includes special provisions for producing and placing Hot Mix Asphalt (HMA) by mixing aggregate and asphalt binder at a mixing plant and spreading and compacting the HMA mixture.

39-1.01B Definitions: For these special provisions, HMA and asphalt concrete shall be the same.

At the Contractor's option, and at no additional expense to the City, a Cal-trans approved Warm Mix Asphalt (WMA) technology may be added to the HMA. However, the asphalt concrete shall be manufactured at HMA temperatures (300F +/- 25F) at a dosage rate approved by the Engineer. All other HMA project specifications shall be adhered to.

Use Section 39-3 Method construction process of these special provisions for HMA production and construction.

39-1.01C Description: Asphalt concrete shall be placed in separate lifts as shown on the Project Plans.

All existing asphalt concrete that is adhered to the top of gutters shall be removed prior to placement of new asphalt concrete surface in a manner satisfactory to the Engineer and that does not damage the gutter.

Asphalt concrete base shall be placed on the same day the area is excavated so that all areas will either have existing asphalt surface or new asphalt concrete base by the end of each working day. No subgrade areas shall be exposed or open to traffic during non-working hours.

Asphalt concrete base paving shall be accomplished by use of a paving machine. The asphalt mix shall be transferred from the trucks to the hopper of the paving machine by means of a shoulder machine equipped with a side caster. Any equipment used to transfer asphalt concrete to the paving machine shall not exceed the load capacity of any surface it is driven over and shall not produce rutting or pumping of the existing roadway surface or newly placed asphalt concrete base at any time.

Construction vehicles/equipment shall not be allowed on the newly placed asphalt concrete base until the day after it is placed. Super Dumps or other trucks with liftable trailing load bearing axles shall not be allowed on the newly placed asphalt concrete base at any time. All trucks or other construction equipment to be driven on the newly placed asphalt concrete base shall not exceed the surface load bearing capacity and shall not produce rutting or pumping at any time.

All longitudinal surface paving joints shall fall on a lane line. Longitudinal Subsurface paving joints shall be offset by at least 6 inches.

No longitudinal vertical drop offs will be allowed between the lanes when the roadway is opened to traffic. Where a longitudinal vertical drop off occurs along the roadway crown between the existing street surface and the new asphalt concrete base, the Contractor shall grind a 10:1 taper in the existing surface to make a temporary conform to

accommodate traffic. The temporary taper shall be ground after the asphalt concrete base paving has been completed each day.

Where a vertical drop off will occur between the top of the new asphalt concrete base and a valley gutter, driveway, or side street conform, the Contractor shall install a temporary 10:1 asphalt taper.

Where a vertical drop off would occur between the asphalt concrete base and a pedestrian ramp, the Contractor shall install a temporary 12:1 asphalt taper.

All ground edges adjacent to curb ramps and driveways shall have temporary asphalt concrete ramps (tapers) installed if the asphalt concrete surfacing cannot be placed back the same day the existing pavement is removed. Kraft paper or other bond breaker shall be placed under the conform ramps to facilitate removal when paving operations start.

Kraft paper or other bond inhibitor shall be placed under the temporary asphalt taper to facilitate removal when paving operations resume.

Temporary asphalt tapers and associated bond breaker material shall be removed prior to placement of the asphalt concrete surface lift. Where the bond breaker material adheres to the asphalt concrete base course it shall be fully removed with a method, approved by the Engineer that will in no way degrade the quality of the final product.

The Engineer shall provide reference points and cut sheets for the placing of asphalt concrete base and asphalt concrete surface.

The Contractor shall furnish an excavation and paving plan which shall include the following:

1. Requested location for survey staking of reference points
2. Asphalt plant supplying mix including aggregate source
3. Disposal site for spoils
4. Type of trucks and equipment to be used
5. Haul routes through adjacent residential streets
6. Staging locations
7. Sequencing
8. Taper grind locations

The Contractor shall set a string line based on the reference points to control the grade of the paving machine along the crown line. A rotary laser level may be used in lieu of a string line provided the level can be accurately set to the design centerline slope, and the detector is directly mounted to the paving machine screed to control the grade of the paving along the crown line. The Contractor shall also furnish a grade setter to insure that the asphalt concrete base and asphalt concrete surface paving conforms to the lines and grades established by the Engineer.

A tack coat of SS-1h or SS-1 emulsified asphalt shall be applied to all asphalt concrete and concrete surfaces and allowed to break immediately in advance of placing all lifts of asphalt concrete. Unless otherwise shown on the Plans, tack coat shall also be applied to all vertical mating surfaces and conforms to existing pavement, curbs, gutters, and construction joints, and allowed to break immediately in advance of placing all lifts of asphalt concrete. The tack coat shall be reapplied 1) where it becomes contaminated, and 2) where it is significantly tracked (removed) from the surface.

The asphalt concrete base and asphalt concrete surface courses shall be allowed to cool to 160° F at mid depth before the roadway is opened to traffic each day.

At the end of each working day the Contractor shall place retro reflectorized signs and delineators, as required for night time use in accordance with the Standard Specifications and Section 12 of these Special Provisions to warn the public of the existing conditions.

At the end of each work day during paving operations the location of all valves, manholes, monuments and any other facility overlaid with asphalt concrete and required to be raised to grade shall be marked in white paint.

Edge Grind shall be in accordance with City STD-209, the modified detail on the Plans or as specified herein. Longitudinal edge grinds shall be 6' in width.

39-1.02 Materials

39-1.02B Tack Coat: Tack coat must comply with the special provisions for asphaltic emulsion or asphalts. Tack coat shall be diluted SS1 or SS1h.

39-1.02C Asphalt Binder: Asphalt binder in HMA must comply with the special provisions for asphalts.

Asphalt binder to be mixed with aggregate for asphalt concrete surface, leveling and base shall be PG64-16 grade paving asphalt.

The amount of asphalt binder to be mixed with the aggregate shall be specified by the Engineer at the time of paving. Different asphalt binder content may be specified for each lift and each location.

Liquid anti-stripping agent (LAS) shall be added to the asphalt binder at a rate of 0.5 to 1.0% by weight of asphalt binder. The LAS shall be AD-here LOF 65-00 or equivalent, and shall be stored, measured, and blended with the asphalt binder in accordance with the anti-stripping agent manufacture's recommended practice. The LAS can be added at the asphalt plant or at the refinery. When added at the asphalt plant, the equipment shall indicate and record the amount of LAS added. If added at the refinery, the shipping ticket from the refinery shall certify the type and amount of LAS added.

39-1.02E Aggregate: The aggregate grading of the various types of asphalt concrete shall conform to one of the following as directed by the Engineer:

Surface or Leveling Course…….3/4-inch HMA Type A, or ½-inch Coarse HMA Type A, or ½-inch Medium HMA Type A

Base Course……..…….¾-inch HMA Type A

Aggregates should be of high abrasion resistance and durability. Excessively soft and friable aggregates are not allowed.

The specified aggregate gradation must be determined before the addition of asphalt binder and includes supplemental fine aggregate.

The proposed aggregate gradation must be within the TV limits for the specified sieve sizes shown in the following tables:

Aggregate Gradation
(Percentage Passing)
HMA Types A

3/4-inch HMA Type A

Sieve sizes	TV limits	Allowable tolerance
1"	100	--
3/4"	95–100	TV ± 5

3/8"	65–80	TV ± 5
No. 4	49–54	TV ± 5
No. 8	36–40	TV ± 5
No. 30	18–21	TV ±5
No. 200	2.0–8.0	--

1/2-inch Coarse HMA Type A

Sieve sizes	TV limits	Allowable tolerance
3/4"	100	—
1/2"	94–100	--
3/8"	70–90	--
No. 4	55–61	TV ± 5
No. 8	40–45	TV ± 5
No. 30	20–25	TV ± 5
No. 200	2.0–8.0	--

1/2-inch Medium HMA Type A

Sieve sizes	TV limits	Allowable tolerance
3/4"	100	--
1/2"	95-100	--
3/8"	80-95	--
No. 4	59-66	TV ± 5
No. 8	43-49	TV ± 5
No. 30	22-27	TV ± 5
No. 200	2.0–8.0	--

Before the addition of asphalt binder and lime treatment, aggregate must have the values for the quality characteristics shown in the following table:

Quality characteristic	Test method	HMA Type A
Percent of crushed particles Coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve.) One fractured face	California Test 205	 90 75 70
Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.	California Test 211	 10 45
Sand Equivalent (min.)[a]	California Test 217	50[b]
Fine aggregate angularity (% min.)	California Test 234	45
Flat and elongated particles (% max. by weight @ 5:1)	California Test 235	10

[a] Reported value must be the average of 3 tests from a single sample.
[b]Minimum Sand Equivalent of 45 for asphalt concrete base.

39-1.02F Reclaimed Asphalt Pavement: Reclaimed Asphalt Pavement (RAP) may be used at the Contractor's option. If RAP is used, the Contractor shall provide the proposed mix design and the quality control for all HMA that includes RAP, in accordance with the following requirements:

1. Contractor shall provide City with a mix design per California Test 384 for the proposed RAP HMA.

2. As part of City's evaluation of RAP HMA, Contractor and City shall perform bitumen ratio tests on at least six split samples of Contractor's RAP to establish correlation between respective binder ignition ovens.
3. RAP shall be processed from reclaimed Asphalt Concrete pavement only.
4. RAP pile(s) shall be separate from the stacker pile, not intermingled with other materials, and stored on smooth surfaces free from debris and organic material.
5. The project RAP pile shall be processed and mixed, identified, and of adequate quantity for the proposed project. "Live" piles shall not be permitted.
6. Contractor shall sample the RAP pile and determine the bitumen ratio (using same binder ignition oven used in #2 above) and provide the test results to the City at least one week prior to producing RAP HMA.
7. A minimum of three samples shall be tested for bitumen ratio for RAP pile of 1500 tons, or portion thereof.
8. RAP pile shall be mixed such that individual bitumen ratio test results of RAP pile so not vary more than +/- 0.5%.
9. During RAP HMA production, RAP shall be sampled by the Contractor off of the belt (into the batch plant), per method established by the City, and samples provided to the City.
10. Bitumen ratio of RAP sampled off of the belt shall be 4.0% minimum, as determined by City binder ignition oven. City shall select binder content for RAP HMA mix per special provisions.
11. RAP content shall be no more than 20% by dry aggregate mass in the HMA. If proposing a change in the RAP content, the Contractor shall notify the Engineer. If the content changes more than 5%, the Contractor shall submit a new mix design.
12. Moisture content of RAP pile shall be 4.0% maximum and shall be tested the day prior to the day of paving and tested/monitored during each day of HMA production.
13. RAP pile(s) shall be protected from exposure to moisture.
14. RAP HMA shall comply with all the special provisions for HMA.
15. If batch mixing is used, RAP shall be kept separate from the virgin aggregate until both ingredients enter the weigh hopper or pugmill. After introduction to the pugmill and before asphalt binder is added, the mixing time for the virgin aggregate and RAP shall not be less than five seconds. After asphalt binder is added, the mixing time shall not be less than 30 seconds.
16. If continuous mixing is used, the RAP shall be protected from direct contact with the burner flame with a device such as a shield, separator, or second drum.
17. If any of the above criteria are not satisfied, or if the RAP HMA test result determined by the City are inconsistent, RAP HMA production shall stop for City projects until the issue(s) are corrected.

39-1.03 HOT MIX ASPHALT MIX DESIGN REQUIREMENTS:

39-1.03E Job Mix Formula Verification: (Not Applicable)

39-1.08 Production

39-1.08A General: During production, with approval of the Engineer, you may adjust hot or cold feed proportion controls for virgin aggregate and RAP.

39-1.12 Smoothness

39-1.12A General: Determine HMA smoothness with a straightedge. The completed surfacing shall be thoroughly compacted, smooth and free from ruts, humps, depressions or irregularities. Any ridges, indentations or other objectionable marks left in the surface of the asphalt concrete by blading or other equipment shall be eliminated

by rolling or other means. The use of any equipment that leaves ridges, indentations or other objectionable marks in the asphalt concrete shall be discontinued, and acceptable equipment shall be furnished by the Contractor.

39-1.13 Hot Mix Asphalt On Bridge Decks: The aggregate grading of the asphalt concrete shall be as directed by the Engineer.

39-1.14 Miscellaneous Areas and Dikes: The aggregate grading for asphalt concrete placed on miscellaneous areas shall conform to that specified for the asphalt concrete placed on the traveled way, unless otherwise directed by the Engineer.

Dikes shall be shaped and compacted with an extrusion machine or other equipment capable of shaping and compacting the material to the required cross section.

39-1.15 Minor Hot Mix Asphalt: (Not Applicable)

39-3.02 Acceptance Criteria

39-3.02A Testing: The acceptance testing requirement for Sand Equivalent shall be 50 (minimum) for asphalt concrete surface and 45 (minimum) for asphalt concrete base. HMA shall meet the following requirements.

Aggregate Micro-Deval (ASTM D6928-10)[1]	Tensile Strength Ratio, TSR (ASTM D7870)[2]
≤16.0%	Not Required
16.1-18.0%	70 (minimum)
18.1-21.0%	80 (minimum)

[1] Asphalt concrete with an aggregate Micro-Deval loss greater than 21.0% shall be removed and replaced at the Contractor's expense. In addition, no single source of asphalt concrete aggregate shall have a Micro-Deval loss greater than 21.0%.

[2] TSR testing shall be performed on re-compacted asphalt concrete (per ASTM D7870), obtained from field cores, and tested within 30 days of asphalt concrete placement. Specimens tested shall include 1 unconditioned sample, and 2 conditioned samples as follows:

a) 20.0 hour Adhesion cycle @ 60˚C
b) 3500 cycles @ 40 psi and 60˚C

A single TSR test shall not represent more than 750 tons of asphalt concrete.
Asphalt concrete not meeting the above requirements shall be removed and replaced at the Contractor's expense.

39-3.04 Transporting, Spreading, and Compacting: Numbers of coverages.
Test sections shall be approved on the basis of the attainment of 93% relative compaction and a satisfactory surface condition following final rolling. The number of coverages required shall be the minimum number required to obtain 93% relative compaction. Relative density shall be the ratio of in-place density (ASTM Test Method D2950) to test maximum density (California Test 309, Method of Test for Determining Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt) determined during production paving.

The HMA may be cored during paving of the test sections, and the in-place density for each test section shall be the average of three core densities determined per California Test 308.

39-6 Payment: See Section 01010 Summary of Work for Bid Item descriptions

Asphalt Concrete Surface shall be paid at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools, and equipment and doing all work involved in placing asphalt concrete surface and overlay, including tack coat and overlay conforms, and no additional allowance will be made therefor.

Asphalt Concrete Base shall be paid for at the contract price at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools, and equipment and doing all work involved in placing asphalt concrete base, including tack coat and temporary tapers, and no additional allowance will be made therefor.

Edge Grind shall be paid at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools, and equipment and doing all work involved in edge grinding, including but not limited to drop-offs and tapers, as specified herein, and no additional allowance will be made therefor.

Conform Grind shall be paid for at the contract price at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools, and equipment and doing all work involved in conform grinding, including but not limited to drop-offs and tapers, as specified herein, and no additional allowance will be made therefor.

Full compensation for removing existing asphalt concrete from top of gutters shall be included in the contract price for asphalt concrete surface and no additional allowance will be made therefor.

[Lab STD2010]

73 CONCRETE CURBS AND SIDEWALKS

73-1.01A Summary: This work shall consist of concrete pads, curbs, gutters, sidewalks, driveways, curb ramps, and gutter depressions and shall be constructed in accordance with the details and at the location shown on the plans and in conformance to the requirements of Section 73 of the City Specifications, and Standard Specifications.

73-1.01E Color: A colored pigment designed for the integral coloring of concrete shall be added to the concrete mix. The pigment shall contain pure concentrated mineral pigments specifically processed for mixing into concrete and complying with ASTM C979. The colored pigment shall be Davis Colors color #860, applied in a dosage of 1/3 pound per 94-pound sack of cement (approximately 1 pounds per cubic yard of concrete for a 6 sack mix), or L. M. Scofield color #SG860 applied in a dosage to produce an equivalent color, or an approved equal.

73-2.03 Construction: Curb construction shall be in accordance with Section 73-1.05 of the City Standards. Curb construction shall be in conformance to the details and at the locations shown on the plans and in accordance with City Specifications.

Curb and gutter shall be constructed in conformance to City STD-241, the details and locations shown on the plans and in accordance with the City Specifications.

Curb openings, for driveways, shall be constructed at existing driveways, and at locations indicated on the plans or directed by the Engineer.

All concrete which is to be removed from curb, gutter, and driveway areas shall be removed to the nearest construction joint or as directed by the Engineer.

Median curb per City STD-242 shall be constructed in conformance to the details and at the locations shown on the plans and in accordance with the City Specifications.

Curb and gutter and median curb shall be cured in accordance with the requirements of Section 90-1.03B of the Standard Specifications except that the Contractor may substitute other than a pigmented sealer upon the approval in writing of such substituted sealer by the Engineer.

All oil, paint, tire marks, and other discoloring shall be removed from the curb and gutter by sandblasting prior to acceptance by the Engineer. Cement mortar will not be an acceptable substitute for sandblasting. Vandalism to uncured concrete surface shall be removed. If it cannot be removed from the surface, then the vandalized concrete shall be removed and replaced to the nearest score mark.

Curb Ramp shall be constructed in accordance with the details and at the locations shown on the plans per Caltrans Standard plan A88A except the thickness shall be 4” minimum. For purposes of payment, curb ramp will be measured between the outside border of the ramp and landing and exclude the curb and gutter. The area of concrete beneath the detectable warning surface shall be paid for at the contract price per square foot of curb ramp.

No deduction in measured length of curb and gutter to be paid for will be made for curb openings for driveways.

73-3.03 Sidewalk, Gutter Depression, Curb Ramp, and Driveway Construction: Sidewalk, gutter depression, median curb, curb ramp, and driveway shall be constructed in accordance with the details and at the location shown on the plans and in conformance to the requirements of Section 73-1.07 of the City Specifications with the following modifications and additional requirements.

All concrete which is to be removed from sidewalk and driveway areas shall be removed to the nearest transverse score mark across the full width of sidewalk or construction joint as directed by the Engineer.

Soft or spongy material shall be removed and replaced with suitable material as required by the Engineer.

Sidewalks, gutter depression, median curb, curb ramps, and driveways shall be cured in accordance with the requirements of Section 90-1.03B of the Standard Specifications except that the Contractor may substitute other than pigmented sealer upon approval in writing of such substituted sealer by the Engineer.

All oil, paint, tire marks, and other discoloring shall be removed from the Sidewalks, gutter depression, median curb, curb ramps, and driveways by sandblasting prior to acceptance by the Engineer. Cement mortar will not be an acceptable substitute for sandblasting. Vandalism to uncured concrete surface shall be removed. If it cannot be removed from the surface, then the vandalized concrete shall be removed and replaced to the nearest score mark.

Curb Ramp shall be constructed in accordance with the details and at the locations shown on the plans per City STD.-232.

Gutter Depression shall be constructed in accordance with the details and at the location shown on the plans and in conformance to the requirements of City STD-243 Standard Valley Gutter.

73-3.04 Payment: See Section 01010 Summary of Work for Bid Item descriptions. **Driveway** shall be paid for at the contract price at the contract **lump sum** price and included as part of any Bid Item that includes **Paving** at applicable sites. Price shall include full compensation for furnishing and applying curing materials, removing discoloring, furnishing all labor, materials, tools and equipment and doing all the work involved in constructing driveway complete in place as specified, including furnishing and placing expansion joint filler, constructing weakened plane joints, excavating, and backfilling. The driveway work shall include all sidewalk, curb and gutter work required to complete the installation of driveway.

[Version: 08/22/18 CDA STD2010]

80 FENCES

80-1.01 Description: All fence shall be constructed in accordance with Section 80 of the Standard Specifications, the details as shown on the plans, these Special Provisions, and as directed by the Engineer. See Section 80-5 for Redwood Fence and 80-10 for Gates. See Section 01540 Security for required temporary fencing.

80-1.02 Demolition: The Contractor may, at their discretion, either remove the existing fence entirely prior to construction of the new fence, or as needed during erection of the new fence.

Except where voids created are reused for new post footings, existing post footings shall be completely removed to a minimum 12 inches below grade, and the voids filled and compacted to 85% RC with native or other approved material.

All removed and unused fencing material shall become the property of the Contractor and shall be disposed of away from the construction site in compliance with all laws and regulations.

80-1.03 Connections: Existing cross fences shall be connected to the new fences or as shown otherwise on plans. Corner posts with braces for every direction of strain shall be placed at the junction with existing fences. The wire in the new and existing fences shall be fastened to the posts.

Chain Link fencing and gates shall consist of steel chain link mesh fabric and steel posts, both vinyl clad. Chain Link fences and gates shall be constructed per Caltrans Standard Plan A85 and Caltrans Standard Section 80-3, with modifications as shown on the Project Plans and as modified herein.

Chain Link fencing and gates shall be 8 feet high with one-inch mesh at the locations shown on the Project Plans. The Chain Link fence shall be constructed per the details indicated on the Project Plans.

80-3 Chain Link Fences

80-3.02 Materials: Fencing materials shall conform to applicable type of fence described in Section 80 of the Standard Specifications and the details as shown on the plans.

80-3.02B Posts, Braces and Framework: All Chain Link fence posts, and rails shall be Schedule 40 steel pipe galvanized according to the specifications of AASHTO Designation M-111, powder coated with black vinyl and shall conform to the dimensions as shown on the plans in accordance with Section 80-3.02B:

Line post spacing shall not exceed ten foot centers. All line and corner posts shall be a minimum of 11 feet in length and gate posts a minimum of 12 feet in length.

All end, corner and gate posts shall be truss braced as shown on the plans with a 3/8" galvanized truss rod assembly.

80-3.02C Chain Link Fence and Gate Fabric: Chain Link Fence and Gate fabric shall be galvanized steel fabric conforming to the specifications of AASHTO Designation M-181. The fabric shall be #9 gauge, Type IV, Class B bonded vinyl-coated, black. Fabric

shall be woven into approximately a one-inch mesh for Chain Link fencing without privacy slats unless shown otherwise on plans.

80-3.02F Vinyl Coating: The strength of the bond between the coating material and the steel of the bonded vinyl-coated chain link fabric or posts shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material and comply with ASTM F668, Class 2b. The color of the vinyl coatings shall be black in compliance with ASTM F934.

80-3.03 Construction: Fence construction shall be in accordance with Section 80-3.03 of the Standard Specifications, the details as shown on the plans, these Special Provisions, and as directed by the Engineer.

80-3.03A Erection: Chain Link Fence and Gate construction shall be in accordance with Section 80-3 of the Standard Specifications, the details shown on the Project Plans, these Special Provisions, and as directed by the Engineer

The Chain Link fence and gates shall be installed by skilled and experienced fence erectors to the lines and grades furnished by the Engineer. Line posts for the Chain Link fence shall be set in concrete foundations a minimum of 39" deep and gate and corner posts a minimum of 48" deep. Concrete foundations shall be no less than three times the diameter of the posts.

80-3.04 Payment: See Section 01010 Summary of Work for Bid Item descriptions. Fencing removal shall be paid for at the contract **lump sum** price as part of **Demolition** at applicable sites, which price shall include full compensation for removing the existing fencing, installing supporting posts, excavating and backfilling holes, complete as shown on the plans and as specified herein.

See Section 01010 Summary of Work for Bid Item descriptions. 8’ High Chain Link Fence shall be paid for at the **lump sum** contract price as part of any Bid Item that includes **Fencing** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all work involved in constructing the 8’ chain link fence in place, complete as shown on the Project Plans, and as herein specified including all necessary concrete and accessories.

[Updated: 10/3014CDA STD2010]

80-5 REDWOOD FENCE

Description: Redwood fencing shall be constructed in accordance with the details shown on the plans, these Special Provisions, and as directed by the Engineer.

Materials: Fencing materials shall consist of the following: 4" x 4" Posts or 2-3/8" dia. galvanized steel @ 8' 0" O.C., 2" x 4" Running Rails, Top, Middle and Bottom, 1" x 6" Fence Boards.

All fencing material shall be standard, rough-sawn redwood.

Payment: See Section 01010 Summary of Work for Bid Item descriptions. **Redwood Fence** shall be paid for at the **lump sum** contract price as part of any Bid Item that includes Fencing at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all work involved in constructing the redwood fence in place, including installing posts, post base, excavating and backfilling holes, and connecting to existing fence, and no additional allowance will be made therefor.

80-10 GATES

80-1.01 Description: All gates shall be constructed in accordance with Section 80 of the Standard Specifications, the details as shown on the plans, these Special Provisions, and as directed by the Engineer.

Gates: Gates shall be placed in the locations shown on the project plans, or as determined in the field by the Engineer.

Swing Gates:
Gate frames: Fabricate chain link swing gates in accordance with ASTM F900, using steel pipe, 1.9-inch OD, weighing 2.28 lb/ft, galvanized according to the specifications of AASHTO Designation M-111 and powder coated with black vinyl unless otherwise shown on the plans. Weld members together forming rigid one-piece frame integral with top track. Frame members to be square, straight and true within 1 mm over a 40-foot span in an unstressed state.

A gate greater than 8 feet in length must have vertical stays such that no panel exceeds 8 feet in length.

Bracing: Provide diagonal adjustable length truss rods of 3/8-inch galvanized steel, in each panel of gate frames and as shown on drawings.

Gate Hangers, Latches, Brackets, Guide Assemblies, and Stops: Malleable iron or steel, galvanized after fabrication. Provide positive latch with provisions for padlocking.

Manway gates shall be provided with catch and locking attachment of an approved design that will not rotate around the latch post. Gate hinges shall provide a 90 degree (minimum) opening. All fittings shall be hot dip galvanized.

Sliding Gates:
Sliding gates shall comply with ASTM F1184, type 1 and be constructed per the details and with the clear openings indicated on the Project Plans. All gate frame joints shall be welded. Sliding gates shall be provided with the locking attachment shown on the Project Plans. Gates designed to open or close by applying an initial pull force no greater 40 lbs.

Gate frames: Fabricate chain link rolling gates using steel pipe, 1.9" OD, weighing 2.28 lb/ft galvanized vinyl clad according to the specifications of AASHTO Designation M-111. Weld members together forming rigid one-piece frame integral with top track. Frame members to be straight and true within 1 mm over a 40 foot span in an unstressed state.

Gate fabric shall be galvanized steel fabric conforming to the specifications of AASHTO Designation M-181. The fabric shall be #9 gauge, Type IV, Class B bonded vinyl-coated, black. Fabric shall be woven into approximately a one-inch mesh for security fencing without privacy slats or as shown otherwise on the plans.

Top track/Rail: Provide guide rail and truck assembly sufficient to keep the gate in alignment while moving.

Truck Assembly: Swivel type, zinc die cast, with four (4) sealed lubricant ball bearing rollers, 2-inches in diameter by 9/16-inch in width, and two (2) side rolling wheel to ensure truck alignment in track. Mount trucks on side of post using 7/8-inch diameter ball bolts with 1/2-inch shank.

Gate Hangers, Latches, Brackets, Guide Assemblies, and Stops: Malleable iron or steel, galvanized after fabrication. Provide latch per City Standards with provisions for padlocking for multiple agencies.

Bottom Guide Wheel Assemblies: Each assembly shall consist of one (1), 4-inch diameter galvanized steel v-groove wheel, straddling bottom horizontal v-track, allowing adjustment to maintain gate frame plumb and in proper alignment.

Gate Posts: Galvanized steel 4-inch OD Schedule 40 pipe, ASTM F 1083, weighing 9.1 lb/ft each. Also includes one (1) 4-inch latch post. Gate post at closer end shall align with sliding gate as required to install latch.

V-track: Minimum 1”x1”x1/4” angle iron track. Track to be welded to a mounting plate and attached to concrete per manufacturer’s details. Galvanize assembly after fabrication.

Payment: See Section 01010 Summary of Work for Bid Item descriptions. Gate removal shall be paid for at the contract **lump sum** price as part of **Demolition** at applicable sites, which price shall include full compensation for removing the existing gates, installing supporting posts, excavating and backfilling holes, complete as shown on the plans and as specified herein.

Gates shall be paid for at the contract **lump sum** price as part of any Bid Item that includes **Gate(s)** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all work involved in constructing the gates in place complete as shown on the plans and as specified herein.

[Version: 10/29/14DCM STD2010]

81 MONUMENTS

81-1.01 Description: All City monuments shown on the plans shall be placed in accordance with the requirements of Section 81 of the City Specifications and these Special Provisions.

The Contractor shall refer to Section 15-1.03 for the protection of existing monuments and fence corners.

The exact location of the monuments will be established by the Engineer and upon completion, the monuments will be checked and the center point stamped by the Engineer.

81-1.04 Payment: City Monuments work shall be included in the prices paid for various contract items of work. Price shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all the work involved in constructing monuments complete in place, including removal of existing monuments disturbed during construction which shall be replaced with new monuments, and no additional allowance will be made therefor.

[Revision:10/29/14DCM STD2010]

90 CONCRETE

90-1.01C(6) Mix Design: The proportions of the water, sand and aggregate shall be regulated so as to produce a plastic, workable and cohesive mixture.

90-1.01D(2) Cementitious Material Content: Concrete shall contain a minimum of 564 pounds of cementitious material per cubic yard. The amount of cement by weight of the specified cementitious material shall be 75 to 85 percent.

90-1.01D(5) Compressive Strength: The 28 day compressive strength of concrete shall be 4000 pounds per square inch (psi) or greater.

90-1.01D(6) Curing Compound: Concrete shall be cured per Section 90-1.03B of the Standard Specifications. Pigmented curing compound or any other material that will leave a noticeable residue shall not be allowed.

90-1.02E(2) Chemical Admixtures: An admixture shall not be used to reduce the amount of cementitious material content.

90-1.04 Payment: Section 01010 Summary of Work for Bid Item descriptions. Concrete shall be paid for at the contract **lump sum** price as part of any Bid Item that includes **Paving** at applicable sites or at the contract **lump sum** price as part of any Bid Item that includes **Fencing, Gates or Walls** at applicable sites. See Price shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all work involved in providing concrete in place complete as shown on the plans and as specified herein.

112 TREE PROTECTION

112-1.01 General: The following requirements shall apply to any contractor who works on any property upon which a protected tree is located.

Protected tree means any tree, including a Heritage tree, designated to be preserved on the plans, or as directed by the Engineer. Heritage tree is any of the trees listed under Section 17-24.010 of the City of Santa Rosa Tree Ordinance.

112-1.02 Scope: Before the start of any clearing, excavation, construction or other work on the site, every protected tree shall be securely fenced off at the protected perimeter. Protected perimeter shall be either the root zone or other limit as directed by the Engineer. Such fences shall remain continuously in place for the duration of all work undertaken in connection with this project. The area so fenced off shall not be used as a storage area, altered, or disturbed except as may be permitted under this section.

If any of the site work encroaches upon the protected perimeter of a protected tree, special measures shall be utilized as approved by the Engineer to ensure that the roots obtain oxygen, water, and nutrients as needed. Any excavation, cutting, filling, or compaction of the existing ground surface within the protected perimeter, if authorized by the Engineer, shall be minimized and subject to such conditions as may be imposed by the Engineer. No significant change in existing ground level shall be made within the drip line of the protected tree except as directed by the Engineer and as shown on the plans. No burning or use of equipment with an open flame shall occur near or within the protected perimeter. All brush, earth, and other debris shall be removed in a manner which prevents injury to the protected tree.

No oil, gas, chemicals, or other substances that may be harmful to trees shall be stored or dumped within the protected perimeter or any other location on the site from which such substances might enter the protected perimeter.

Underground trenching for utilities shall avoid major support and absorbing tree roots of protected trees. If avoidance is impracticable, tunnels shall be made below the roots. Trenches shall be consolidated to serve as many units as possible. Trench within the drip line of the tree shall be avoided and only be done at the approval and direction of the Engineer.

No concrete or asphalt paving shall be placed over the root zones of protected trees. No artificial irrigation shall occur within the root zone of oaks.

No compaction of the soil within the root zones of protected trees shall occur.

112-1.03 Payment: Full compensation for work in this section shall be considered as included in the prices paid for the various contract items of work and no additional allowances will be made therefor.

[Version: 11/6/14CDA STD2010]

121 NOTIFICATION

121-1.01: The Contractor shall notify the Engineer of any work to be performed on any given work day either on the afternoon of the prior working day or before 8:30 a.m. on the given working day. Any work completed for which the Engineer has not received prior notification of its scheduling MAY NOT BE ACCEPTED FOR PAYMENT.

121-3.01 Payment: Full compensation for conforming to the provisions of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

[Version: 10/13/14-CDA STD2010]

124 MATERIAL RECYCLING

124-1.01 Description: The Contractor shall dispose of all portland cement concrete and asphalt concrete, generated from removal or demolition activities on the project, at a recycler for these materials. The Contractor shall provide receipts verifying delivery and approximate quantity (in tons) of the material delivered to a material recycler.

All other excess materials from the project shall become the property of the Contractor and shall be disposed of by him, at his expense.

124-1.02 Payment: Full compensation for material recycling as specified herein shall be considered as included in the contract prices paid for various items of work, and no additional compensation will be allowed therefor.

[Version: 11/6/14CDA STD2010]

132 WATER DISTRIBUTION SYSTEM

132-1.01 Description: Water Distribution System and related appurtenances shall conform to the requirements as specified in the City of Santa Rosa Water Distribution System Construction Standard Specifications Section 132, the Project Plans, and modifications herein.

132-1.11 Excavation, Backfill, and Resurfacing: The Contractor shall remove and replace sidewalk and planter strips as required for all water work to the nearest transverse score mark on both sides and full sidewalk width. All areas of sidewalk removed for construction shall be backfilled and compacted level with temporary asphalt concrete or covered with 1 inch thick plywood, laid flat with ADA compliant temporary asphalt concrete taper on both ends.

132-1.30 Payment: See Section 01010 Summary of Work for Bid Item descriptions.

Backflow Device Installation shall be paid for at the contract **lump sum** price included as part of **Irrigation System** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals, and doing all work involved in backflow device installation, including but not limited to: excavation and disposal of excavated material; dewatering and disposal of trench groundwater; contamination awareness; removing and replacing concrete *as required*; removal and disposal of old backflow, valves, piping and appurtenances *if required*; backflow device; fittings *as required*; enclosure *if required;* insulated cover *if required;* placing and compacting all required bedding and backfill; testing and chlorination; restoration/reconstruction of landscaping/irrigation *as needed*; as specified herein, and no additional allowance will be made therefor.

Backflow Device Testing shall be paid for at the contract **lump sum** price included as part of **Irrigation System** at applicable sites. Price shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals, and doing all work involved to perform backflow device testing, including but not limited to: coordination, notification, preparatory work, testing, and all paperwork as specified herein, and no additional allowance will be made therefor.

Version Date: 11/28/17

APPROVED LIST OF BACKFLOW CONTRACTORS
INSTALLATION, TESTING & REPAIR

ACCO ENGINEERED SYSTEMS 1111 ALADDIN AVE. SAN LEANDRO, CA 94577 PHONE: (510) 346-4300 LICENSE #: 120696	**ALL OUT PLUMBERS/C. CROSS** P.O. BOX 599 CLOVERDALE, CA 95425 PHONE: (707) 894-8434 LICENSE #: 812540	**ALL PRO BACKFLOW/J.LOTITO** P.O. BOX 2193 FOLSOM, CA 95763 PHONE: (916) 276-7162 FAX: (916) 435-4167 LICENSE #: 934557
APB BACKFLOW, INC. 1599 FELTA RIDGE ROAD HEALDSBURG, CA 95448 PHONE: (888) 356-7761 LICENSE: 1032328	**A.S.T.I SERVICES/M.DESCHLER** 102 COUCH ST. VALLEJO, CA 94590 PHONE: (707) 645-1782 FAX: (707) 645-1807 LICENSE #: 742693	**BANNER ENTERPRISES** P.O. BOX 1457 SANTA ROSA, CA 95402 PHONE: (707) 523-1244 LICENSE #: 376828
C.V. PLUMBING/C. VINE P.O. BOX 219 CLOVERDALE, CA 95425 PHONE: (707) 894-8580 FAX: (707) 894-9642 LICENSE #: 843366	**CAGWIN & DORWAN** P.O. BOX 1600 NOVATO, CA 94948-1600 PHONE: (800) 891-7710 FAX: (415) 897-7864 LICENSE #: 202399	**CARRIER CORPORATION** 600 MCCORMICK ST., SUITE B SAN LEANDRO, CA 94577 PHONE: (510) 347-2000 FAX: (510) 347-2099 LICENSE #: 499642
CHECKRITE BACKFLOW SERV. 3618 CHANATE RD. SANTA ROSA, CA 95404 PHONE: (707) 575-5296 FAX: (707) 578-6595 LICENSE #: 836022	**DEVOTO PLUMBING*** 1345 TRIPLE OAK WAY FULTON, CA 95439 PHONE: (707) 545-0734 LICENSE #: 824608	**ECONOMY PLUMBING** P.M.B. #287, 1275 4TH ST. SANTA ROSA, CA 95404 PHONE: (707) 545-4455 FAX: (707) 543-8111 LICENSE #: 748220
GROUND HOG CONSTRUCTION 5353 HESSEL RD. SEBASTOPOL, CA 95472 PHONE: (707) 529-2085 FAX: (707) 823-9389 LICENSE #: 723766	**JV PLUMBING & BACKFLOW*** 2911 MONTECITO AVE. SANTA ROSA, CA 95404 PHONE: (707) 799-2692 LICENSE #: 955698	**LEDUC & DEXTER PLUMBING** 2833 DOWD DR., SUITE A SANTA ROSA, CA 95407 PHONE: (707) 575-1500 FAX: (707) 527-0281 LICENSE #: 651401
NORTHBAY BACKFLOW P.O. BOX 2765 PETALUMA, CA 94953 PHONE: (707) 484-3949 LICENSE #: 878332	**NORTHWOOD BACKFLOW** 911 LAKEVILLE ST., #369 PETALUMA, CA 94952 PHONE: (800) 750-4547 LICENSE #: 749187	**ONGARO AND SONS PLUMBING** 2995 DUTTON AVE. SANTA ROSA, CA 95407 PHONE: (707) 579-3511 LICENSE #: 215233
PUMPMAN NORCAL 4000 S. MOORLAND AVE. SANTA ROSA, CA 95407 PHONE: (707) 584-9191 LICENSE: 200068	**RH & SONS WATER SERVICES** 225 GOLDEN RIDGE AVE. SEBASTOPOL, CA 95472 PHONE: (800) 675-3569 LICENSE #: 698774	**ROBERTS MECHANICAL & ELECTRICAL, INC.** 4649 DOWDELL AVE. SANTA ROSA, CA 95407 PHONE: (707) 584-5880 LICENSE #: 556014
ROBERTSON'S BACKFLOW 6229 SPECKLED RD. POLLOCK PINES, CA 95726 PHONE: (530) 306-1056 FAX: (530) 303-1497 LICENSE #: 972547	**SCOTT CRAMER PLUMBING** P.O. BOX 750084 PETALUMA, CA 94975 PHONE: (707) 778-8789 FAX: (707) 658-1043 LICENSE #: 889152	**STEAD BACKFLOW PREVENTION** 2715 W. KETTLEMAN LN., #203-321 LODI, CA 95242 PHONE: (209) 327-3900 LICENSE #: 848490

NOTE: These contractors have a C-16 or C-36 State Contractor's License or an A-General Engineering License. They are licensed and certified to test, repair, and install any type of backflow device. They are also licensed to work on fire protection backflow devices or fire protection systems. When installing a backflow device, a City Plumbing Permit is required, and if working in the City right-of-way, an Encroachment Permit is needed. All testers are required to have a City Business License. ***Spanish speaking***

A - FEES AND PERMITS

The Contractor shall obtain all necessary and required permits for the project. See Section 01060 Regulatory Requirements for additional information regarding fees and permits.

All permits issued by the City Building Department will be issued at no cost to the Contractor; these fees will be paid by an appropriate City department. All other required permits shall be obtained at the Contractor's expense.

All electrical service charges or fees that may be required by Pacific Gas and Electric Company shall be paid for by an appropriate City department.

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B - SHOP DRAWINGS

The Contractor shall submit shop drawings and/or manufacturer's specifications for all mechanical and electrical equipment. See Section 01330 Submittal for additional information regarding the submittal process.

The Contractor shall prepare or secure and submit five copies of each submittal for review by the Engineer. All submittals shall be approved by the Engineer prior to manufacture, fabrication, or shipment.

After approval of the drawings by the Engineer, the Contractor shall submit copies of purchase orders for items of equipment and material to the Engineer as proof of placing the order. Each copy of a purchase order shall be submitted immediately after the order has been placed and will clearly indicate the date the order was placed. See Section 01330 Submittal for additional information regarding the submittal process. Copies of purchase orders shall be submitted on the following items:

A. Motors
B. Valves
C. All electrical equipment

C - DESCRIPTION OF WORK

See Section 01010 for the Summary of Work and description of all Bid Items

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D - TESTS AND INSPECTIONS

All materials, equipment, installation, and workmanship included in this contract, if so required by the Engineer, shall be tested and inspected to prove compliance with the contract requirements.

All mechanical and electrical equipment shall be tested by the Contractor to the satisfaction of the Engineer before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned, adjusted, and connected. Any changes, adjustments, or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the work.

At least 30 days before the time allowed in his construction schedule for commencing testing and start-up procedures, the Contractor shall submit to the Engineer, in duplicate, details of the procedures he proposes to adopt for testing and start-up of all mechanical and electrical equipment to be operated singly and together, excepting when such procedures have been covered in the special provisions. Tests on hydraulic or pumping equipment shall be conducted using clear potable water. The water required for such tests shall be provided by the Contractor.

During the testing of mechanical, instrumentation, and electrical equipment, the Contractor shall make available experienced factory trained representatives of the manufacturers of all the various pieces of equipment, or other qualified persons, who shall instruct the City's personnel in the operation and care thereof. Instruction shall include step-by-step troubleshooting procedures with all necessary test equipment.

If, under test, any portion of the work shall fail to fulfill the contract requirements and is altered, renewed, or replaced, tests on that portion when so altered, removed, or replaced, together with all other portions of the work as are affected thereby, shall, if so required by the Engineer, be repeated within reasonable time and in accordance with the specified conditions, and the Contractor shall pay to the City all reasonable expenses incurred by the City as a result of the carrying out of such tests.

Where, in the case of an otherwise satisfactorily installed test, any doubt, dispute, or difference should arise between the Engineer and the Contractor regarding the test results or the methods or equipment used in the carrying out of the test by the Contractor, then the Engineer may order the test to be repeated. If the repeat test, using such modified methods or equipment as the Engineer may require, substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the City; otherwise the costs shall be borne by the Contractor. Where the results of any installed test fail to comply with the contract requirements for such test, then such repeat tests as may be necessary to achieve the contract requirements shall be made by the Contractor at his own expense.

As soon as possible after each Contractor's submittal for equipment defined herein has been approved by the Engineer, and no later than the time of delivery of that equipment to the job site, a single copy of operating and maintenance instructions and procedures shall be presented to the Engineer for review and acceptance. Since such instructions are considered to be an integral part of the equipment provided, ten percent of the materials and labor costs for each such item of equipment will be withheld from payment to the Contractor until the instructions have been accepted by the Engineer.

Items or assemblies requiring operating and maintenance instructions shall include all mechanical equipment, electrical, and instrumentation equipment, and, in addition, any other items specifically noted in the special provisions.

The operating and maintenance instructions shall include, as a minimum, the following data for each item of equipment.

A. An itemized list of all data provided.
B. Name and location of the manufacturer, the manufacturer's local representative, the nearest supplier, and spare parts warehouse.
C. Approved submittal information applicable to operation and maintenance.
D. Recommended installation, adjustment, start-up, calibration, and troubleshooting procedures.
E. Recommended lubrication and an estimate of yearly quantity needed.
F. Recommended step-by-step procedures for all modes of operation.
G. Complete internal and connection wiring diagrams.
H. Recommended preventive maintenance procedures and schedule.
I. Complete parts lists, by generic title and identification number, with exploded views of each assembly.
J. Recommended spare parts.
K. Disassembly, overhaul, and reassembly instructions.

Following completion of installation of an item of equipment, operating and maintenance instructions and procedures shall be modified by the Contractor to reflect field changes and corrections made by the Engineer. After corrections have been made, four complete copies shall be submitted.

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SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 Summary

A. The work to be done consists of furnishing all labor, materials, equipment, and services for the City of Santa Rosa Utility Station Repair Project, including demolition and replacement of fencing, gates, walls, irrigation system, miscellaneous equipment, cleaning and repairs, all electrical supply, control and instrumentation work for replacing a generator, automatic transfer switch and antenna; all site work and grading; and all miscellaneous work as shown, specified or required for a complete, operating installation.

B. Project Contacts:

1. City's contact for coordination is:
    a. Eric Frye: (707) 543-3858
2. Engineer's contact for coordination is:
    a. Eric Jones: (916) 273-7190

1.02 Project Sites

Facility Name	Abbr.	Address
Reservoir 17	R-17	2201 Newgate Ct.
Reservoir 2A	R-2A	3899 Parker Hill Rd.[1]
Reservoir 5	R-5	3844 Skyfarm Dr.
Reservoir 6	R-6	5035 Harville Rd.
Potable Water Pump Station 1	S-1	280 Fountaingrove Pkwy.
Potable Water Pump Station 2 and Reservoir 1A and B	S-2/ R-1A&B	1393 Fountaingrove Pkwy.
Potable Water Pump Station 3	S-3	3503 Thomas Lake Harris Dr.
Potable Water Pump Station 5 and Reservoir 2B	S-5/ R-2B	3785 Skyfarm Dr.
Well 6	W-6	3686 Hemlock St.
Sewer Lift Station 18	SLS-18	3975 Shelter Glen Way
Sewer Lift Station 21	SLS-21	3919 Flintridge Dr.
Sewer Lift Station 3	SLS-3	3987 Clearbrook Ct.
Sewer Lift Station 5	SLS-5	3925 Fawnglen Pl.
Sewer Lift Station 1	SLS-1	2101 Stagecoach Rd.

1. Construction access to site is via gate across the driveway from 3895 Parker Hill Rd. Site can also be accessed through trail behind 3999 Parker Hill Rd. near the intersection of Parker Hill Rd and Fountaingrove Pkwy.

1.03 Contractor Scope of Services:

A. The work comprises furnishing all labor, materials, equipment (unless otherwise excluded under "Owner Pre-purchases"), and services for the utility station repair work, including demolition and replacement of fencing, gates, walls, irrigation system, miscellaneous equipment, cleaning and repairs, all electrical supply, control and instrumentation work for replacing a generator, automatic

transfer switch and antenna; all site work and grading; and all miscellaneous work as shown, specified or required for a complete, operating installation.

1.04 Owner Scope of Services

A. The Owner will furnish signage at all sites as shown on the project plans

1.05 Work Included

A. The Contractor shall furnish all labor, superintendence, materials, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services, and other means of construction necessary or proper for performing and completing the work.

B. The Contractor shall obtain and pay for all required permits.

C. Contractor shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property, to the satisfaction of the Owner's Representative and in strict accordance with the Contract Documents.

D. The Contractor shall clean up the work site and maintain it during and after construction, until accepted, and shall do all of the work and pay all costs incidental thereto.

E. The Contractor shall repair all structures and property that may be damaged or disturbed during performance of the work.

F. The Contractor shall provide and maintain such modern tools, and equipment as may be necessary to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his equipment.

1.06 Bid Items, Allowances, and Alternates

A. Any Bid Item may be deleted from the Work and Contract Sum, in total or in part, prior to or after award of Contract without compensation in any form or adjustment of other Bid Items or prices therefore.

B. Payment of all items is subject to provisions of Contract Documents, including without limitation Section 9 Measurement and Payment.

C. For all Bid Items, furnish and install all work indicated and described in Special Provisions and all other Contract Documents, including connections to existing systems. Work and requirements applicable to each individual Bid Item, or unit of Work, shall be deemed incorporated into the description of each Bid Item (whether Lump Sum, or Unit Price).

D. The items below are broken down into lump sum and unit price items. The Contractor shall provide bid prices based on the descriptions, plans, and Special Provisions with the understanding that all work must be included in the stipulated items. Payment for lump sum items will be made at the contract lump sum price upon completion, unless otherwise specified. Payment for unit price items will be made at the contract unit price for each unit installed or completed.

E. All items involving materials and installation are on a furnish and install basis.

F. In underground installations no extra compensation will be made for removal of surface improvements, excavation regardless of material, over excavation shown or placement and removal of temporary asphalt as required, disposal of surplus material in a lawful manner, bedding, backfill, and compaction, testing, or any other work specified or shown.

G. Compensation for safety measures, traffic control, cleanup and any site restoration necessary to pre-existing conditions shall be included in the prices of the various contract items of work unless specified elsewhere.

H. The general description of bid items are as follows:

1. **Bid Item 1 – Mobilization / Demobilization**: Item will be paid on a lump sum basis with a 50% payment of the lump sum upon the Contractors mobilization on site and started work and 50% payment of the lump sum upon the Contractors demobilization from the project site. Line Item 1 cannot represent more than 5% of the overall bid price for the entire project. Mobilization also includes all required submittals Items of demobilization, include removing all equipment, performing site cleanup, submission of warranties, record drawings, O&M manuals and only after final acceptance of the entire project by the City.

2. **Bid Item 2 – Water Pollution Control**: This bid item includes all labor, materials, and equipment necessary to preparation of the Water Pollution Control Program, and provide job site management and temporary sediment control, complete and in accordance with these Special Provisions and the City's standards. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of water pollution control work required.

3. **Bid Item 3 – Demolition**: This bid item includes all work associated with removal, disposal and demolition of existing items as applicable at each site, including fencing and gate mesh, gates and wall, including removing posts and concrete or other footings and any excavation and backfill holes, Sewer Lift Station 1 removal of equipment pad, abandonment of gas line and removal of fire damaged electrical box, Well 6 electrical equipment pull box, concrete pad and above grade well header as shown on the plans and specified herein. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of demolition work required.

4. **Bid Item 4 – Site Preparation**: This bid item includes all work associated with site preparation as applicable at each site, including tree trimming, temporary fencing, removal of fencing mesh, removal of signage, monument protection, survey, clearing and grubbing needed for work or for providing access needed to complete the work, subgrade stabilization, excavation, resurfacing and paving of damaged paving including the area around the gate track concrete and excavation and paving for a new curb cut, gutter and sidewalk as shown on the plans and specified herein. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of site preparation work required.

5. **Bid Item 5 – Fencing and Gates**: This bid item includes all work as applicable at each site and shall include all labor, materials, tools and equipment and doing all work involved in construction of all fencing, gates, the decorative sound wall, and replacing the two damaged fence top rails at Potable Reservoir 2A, in place, complete as shown on the Project Plans, and as herein specified including all necessary concrete, removal and replacement of signage, regrading and accessories. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.

6. **Bid Item 6 – Miscellaneous Cleaning and Repairs**: This bid item includes all work as applicable at each site and shall include furnishing all labor, materials, tools and equipment and doing all work involved in replacing the damaged electrical pull box at Potable Water Reservoir 6, replacing the muffler supports at Potable Water Pump Station 1, replacing the generator fuel line and foam bug stops on metal-seam roof at Potable Water Pump Station 3, installation of an enclosure over the well head and mow strips at Well 6, cleaning/recoating of the electrical panels at Sewer Lift Station 1, installation of signs, and miscellaneous cleaning and repairs as shown on the Project Plans, and as herein specified. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.

7. **Bid Item 7 – Irrigation System**: This bid item includes all work as applicable at each site associated with irrigation system and shall include furnishing all labor, materials, tools and equipment and doing all work involved in installing the drip tubing, irrigation control valves and boxes, backflow preventer including freeze protection blanket, appurtenances, backflow testing and certification, connection to water service and leak testing, complete as shown on the Project

Plans, and as herein specified including. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.

8. **Bid Item 8 – Potable Water Pump Station 1 - Retaining Wall Drainage System**: This bid item includes all work at the site associated with furnishing all labor, materials, tools and equipment and doing all work involved replacing the damaged retaining wall drainage system including removal of existing damaged system, excavation, backfill and compaction, cleaning, coating as shown on the Project Plans, and as herein specified. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.
9. **Bid Item 9 – Potable Water Pump Station 1 - Antenna Replacement**: This bid item includes all work at the site associated with furnishing all labor, materials, tools and equipment and doing all work involved replacing the Antenna including removal of old antenna and electrical equipment, anchor bolts seismic calculations, construction of new antenna in place, installation of electrical conduit/ conductors, connection to existing panel, testing and adjusting as shown on the Project Plans, and as herein specified. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.
10. **Bid Item 10 – Sewer Lift Station 5 - Generator Enclosure**: This bid item includes all work at the site associated with furnishing all labor, materials, tools and equipment and doing all work involved in replacing the existing generator enclosure, including removal, installation and testing as shown on the Project Plans, and as herein specified. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.
11. **Bid Item 11 – Sewer Lift Station 1 - Generator Replacement**: This bid item includes all work at the site associated with furnishing all labor, materials, tools and equipment and doing all work involved in replacing the existing generator, including removal, installation and testing as shown on the Project Plans, and as herein specified. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.
12. **Bid Item 12 – Sewer Lift Station 1 - ATS Replacement**: This bid item includes all work at the site associated with furnishing all labor, materials, tools and equipment and doing all work involved in replacing the existing ATS, including removal, installation and testing as shown on the Project Plans, and as herein specified. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.
13. **Bid Item 13 – Sewer Lift Station 1 - Electrical Installation**: This bid item includes all work at the site associated with furnishing all labor, materials, tools and equipment and doing all work involved in electrical connection of the Generator and ATS, conduit, conductors, wiring, startup, testing and miscellaneous electrical work as shown on the Project Plans, and as herein specified. Payment will be made at the lump sum price given in the Bid Schedule and based on percent completion of work required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01014
WORK SEQUENCE

PART 1 - GENERAL

1.01 Summary

A. Section includes requirements, constraints and limitations on the sequence and scheduling of Work required to complete the project affected by site conditions, construction and plant operations.

B. Related Sections

Section	Title
Section 01010	Summary of Work
Section 01311	Scheduling and Reporting

1.02 General Constraints on Work Sequence

A. The existing water and wastewater facilities are currently and continuously in use and shall not be interrupted except as specified herein.

1. The Contractor shall coordinate the work to avoid any interference with normal operation of the water and wastewater facilities.
2. The Contractor shall keep the City fully advised as to plans for carrying out the work and obtain the City's approval for all phases of construction operations, as hereinafter specified.
3. Prepare work plan that identifies the areas where work will occur and the areas needed for ingress and egress to the work.
4. Complete all work outside the existing structure prior to the planned shutdown period. Maintain access for City staff at all times.
5. Planned utility service shutdowns to any service area shall be accomplished during periods of minimum use. The Contractor shall program work so that service will be restored in the minimum possible time. No utility shall be disconnected without prior written approval from the City. Provide at least two (2) working day's notice to the City.
6. The Contractor shall note that only certain structures, tie-ins and constraints are addressed in this Section. All work, whether or not addressed here, shall be governed by applicable parts of this Section, and schedules and procedures further submitted for approval.

1.03 Work Plan

A. The Contractor shall submit a detailed outage plan and time schedule for operations that will make it necessary to remove any pipeline, electrical circuit or equipment from service. The schedule shall be coordinated with the construction schedule specified in Section 01311-Scheduling and Reporting and shall meet the restrictions and conditions specified in this section.

B. Contractor is responsible for preparing a plan that identifies the locations and durations that access is to be provided.

C. The Contractor shall observe the following requirements:

1. Systems or individual equipment items shall be isolated, dewatered, decommissioned, de-energized, or depressurized in accordance with the detailed outage plan and schedule. The City shall be notified in writing at least one week, or as specified below, in advance of the planned operation.

2. Any temporary facilities and equipment not required after completion of the final work shall be promptly removed.
3. When shutdown of any existing facilities is necessary, the Contractor shall notify the City not less than 14 days prior to the shutdown.
4. The Contractor shall not begin an alteration until specific permission has been granted by the City in each case for each site. The City will coordinate the Contractor's planned procedure with the operation of the system. The making of connections to existing facilities or other operations that interfere with the operation of the existing equipment shall be completed as quickly as possible and with as little delay as possible.
5. The City will be the sole judge of when the Contractor's operations are causing interference with existing water and wastewater facilities, and the City's orders and instructions shall be carried out without delay.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01050
SURVEY WORK

PART 1 - GENERAL

1.01 Datum

A. Vertical and horizontal datum are based on the coordinates and benchmarks shown on the Drawings. The Contractor shall establish other vertical and horizontal control from these City furnished reference points as required to properly lay out and construct the Work. All connections shall be installed based on actual elevations of existing structures to which connections are made.

1.02 Lines and Grades

A. The Contractor shall lay out all work, including structures and pipelines, and shall be responsible for any errors resulting therefrom. In all questions arising as to proper location of lines and grades, the City's decision will be final.

B. As part of the bid price for the construction of the improvements the Contractor shall provide and be responsible for the layout of all work specified in the contract.

   1. All Contractor surveying shall be done by a registered land surveyor.
   2. Contractor shall submit the surveyor's credentials prior to any layout work.
   3. The Contractor shall provide all necessary surveys, field staking, and positioning for the construction of all components at the proper alignment, elevations, grades, and positions, as indicated on the Drawings and as required for proper operation and function. The Contractor shall stake the work limits.

C. The Contractor's layout shall be based upon existing structures and the vertical and horizontal datum established by the City.

D. The Contractor shall supply such labor as required, at no extra charge, to aid and assist the City's Representative in checking line, location and grades of the work as set by the Contractor, if requested by the City's Representative. Work shall include moving materials and equipment that interfere with a clear line of sight between horizontal control points and the construction work.

E. The Contractor shall survey the forms of the first slab pour of all major structures to check line and grade of the concrete forms.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01060
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 Applicable Codes and Regulations

A. Including but not limited to:

1. California Building Code, 2007 Edition
2. California Plumbing Code
3. California Mechanical Code
4. National Electrical Code
5. California Fire Code
6. CAL-OSHA Requirements

PART 2 - FEES AND PERMITS

2.01 Contractors Fees and Permits

A. Contractor shall have in possession prior to award and throughout construction a valid Business License and a valid Contracting License.

B. The Contractor shall apply and pay for all permits required by any legally constituted public authority.

C. Including but not limited to:

1. Hazardous Materials Safety Permit
2. Bay Area Air Quality Management District Air Quality Permit
3. Santa Rosa Fire Hazard Permit

****END OF SECTION****

SECTION 01061
SAFETY AND HEALTH

PART 1 - GENERAL

1.01 General

A. The construction of this project may expose the contractor's workers to areas that may be considered a confined space and/or hazardous to open flame or sparks. The Contractor shall require the workers to observe proper safety and hygienic precautions.

B. The Contractor shall be solely responsible for the storage, usage, handling and application of all hazardous materials encountered or provided in the Contract.

1.02 Safety and Health Regulations

A. The Contractor shall comply with all applicable regulations, including but not limited to 29 CFR Parts 1910 through 1926, of the Occupational Safety and Health Administration (OSHA) for Construction Work as promulgated by the US Department of Labor and the California Labor Code, Division 5, Safety in Employment, Occupational Safety and Health.

B. Prior to excavation of trenches 5-feet or deeper, the Contractor shall submit to the Construction Manager a copy of the company’s annual Cal-OSHA trenching permit.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01071
STANDARD REFERENCES

PART 1 - GENERAL

1.01 Abbreviations

A. Wherever used in these Special Provisions, the following abbreviations will have the meanings listed:

Abbreviation	Title
AAMA	Architectural Aluminum Manufacturer's Association
AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute, Inc.
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CALSPEC	Standard Specifications, State of California
CBC	California Building Code
CMC	California Mechanical Code
CPC	California Plumbing Code
CALTRANS	Department of Transportation State of California Business & Transportation Agency
FEDSPEC	Federal Specifications General Services Administration Specification and Consumer Information Distribution Branch
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
OSHA	Occupation Safety and Health Act U.S. Department of Health Occupational and Health Administration

Abbreviation	Title
SSPWC	Standard Specifications for Public Works Construction
U.L., Inc.	Underwriter's Laboratories, Inc.

1.02 Applicable Publications

A. Wherever references are made to published specifications, codes, standards, or other requirements, and where no date is specified, it shall be understood that the latest specifications, standards, or requirements of the respective issuing agencies published as of the date that the work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01201
PROJECT MEETINGS

PART 1 - GENERAL

1.01 General

1.02 Preconstruction Conference

A. Date, Time and Location: A Preconstruction Conference will be held after execution of the Contract and before construction is started at the site. The City's Representative will fix the date, time and location of the meeting in accordance with requirements of the General Conditions.

B. The City's Representative will prepare the agenda, preside at the meeting, and prepare and distribute a transcript of the proceedings to all parties.

C. The Contractor shall provide data required, contribute appropriate items for discussion, and be prepared to discuss all items on the agenda.

D. The Design Engineer shall respond to requests for information and provide construction administrative services as requested by the City and Construction Manager.

E. Required Attendance

1. City's Representative.
2. Contractor and Major Subcontractors.
3. Design Engineer.
4. City.
5. Representatives of government agencies having any degree of control or responsibility, if available.

F. Agenda will include, but will not necessarily be limited to, the following:

1. Designation of Responsible Personnel.
2. Project Directory.
3. Contractor's Emergency Contact List.
4. Subcontractors.
5. Coordination with other Contractors.
6. Construction Schedule.
7. Project Schedule Constraints.
8. Outages and Tie-in Procedures.
9. Contractor's List of Submittals.
10. Processing of Field Decisions and Change Orders.
11. Requirements for Copies of Contract Documents.
12. Insurance in Force.
13. Schedule of Values.
14. Processing and Schedule of Payments.
15. Use of Premises.

16. Location of the Contractor's Temporary Facilities.
17. Contractor Responsibility for Safety and First Aid Procedures.
18. Security
19. Housekeeping.
20. Record Drawings.
21. Letter of Notice to Proceed.
22. Any Other Project Related Items.

1.03 Progress Meetings

A. Regular progress meetings will be held at the site.
   1. Meetings will be held weekly or City-approved frequency.
   2. Meetings to be held at field office or other mutually agreed location.
   3. Agenda and minutes to be prepared by the City's Representative. Required Attendance
      a. City's Representative.
      b. Contractor and Major Subcontractors.
      c. Design Engineer.
      d. City.

B. Agenda will include, but will not necessarily be limited to, the following:
   1. Work Progress
   2. Schedule
   3. Submittals
   4. RFIs
   5. Coordination with City
   6. Resolution of conflicts or problems
   7. Payment Requests
   8. Change Orders
   9. Safety
   10. Other items affecting progress of Work

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.01 Summary

A. Section Includes:

1. Description of general requirements for Submittals for the Work.

1.02 Submittals

A. Where required by the Special Provisions, the Contractor shall submit descriptive information which will enable the Engineer to advise the City whether the Contractor's proposed materials, equipment or methods of work are in general conformance with the design concept and are in compliance with the drawings and Special Provisions. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results and other such information, all as specifically required in the Special Provisions.

B. The Contractor shall submit the following items:

1. Schedule of Submittals and Shop Drawings
2. List of Submittals, Shop Drawings, Product Data and Materials
3. Contractor’s Safety Program
4. Designated Safety Supervisor
5. Designated “Competent Person(s)”
6. Schedule of Values
7. Construction Schedule
8. Substitutions List
9. Shop Drawings
10. Product Data
11. Samples
12. Material Safety Data Sheets
13. Operation and Maintenance Manuals
14. Project Closeout Information
15. Warranty Data
16. Others as Specified in the Special Provisions
17. Manufacturer’s Instructions
18. Manufacturer’s Certifications and Test Reports

Quantity of Submittals:

19. Submit one (1) digital PDF format of all submittals.
    a. PDF submittal shall be clear and readable.
    b. PDF submittal shall be searchable (not scanned or copied).
    c. Annotate or mark submittal to clearly show the item or model being submitted.

d. Submittal shall have a Cover Letter

1) Cover Letter shall detail all relevant information included within the submittal package and describes the applicability of the submitted documentation.

2) Cover letter shall note all product substitutions and summarize all proposed products or materials not consistent with the project documents.

e. Submittals shall have a detailed table of contents

f. The Contractor shall utilize the relevant specification section to indicate conformance, substitutions, deviations or non-conformance to the technical information. Next to each specification paragraph or line item, utilize the following designations:

1) Utilize a check mark "√" next to each specification to indicate full compliance to the specification paragraph or line item as a whole;

2) If substitutions, deviations or non-conformance from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and noted by a number in the margin of the paragraph or line item that references to a detailed written explanation of the request for substitution, deviation, or non-conformance.

g. Where applicable, a copy of the contract document plans that apply to the submitted equipment or materials shall be annotated to indicate specific changes or conformance to the Contract Documents.

C. Where the Contractor is required by these Special Provisions to submit samples of products, the Contractor shall provide a sufficient number of physical samples to allow three (3) to be retained by the City's Representative of all structural and architectural products involving color, finish, texture, or the like.

D. List of Submittals:

1. Within thirty-five (35) days after the Notice to Proceed, the Contractor shall submit a List of Submittals to the City's Representative for review.

2. The List shall include all items of equipment and materials for mechanical, piping, architecture, electrical, heating and ventilating, equipment piping, and plumbing work; and the names of manufacturers with whom purchase orders have been or will be placed.

3. The List shall be arranged in the same order as the Special Provisions and shall contain sufficient data to identify all items of material and equipment the Contractor proposes to furnish. The List shall include Specification and/or Drawing references.

4. After the submission is favorably reviewed and returned to the Contractor by the City's Representative, it shall become the basis for the submission of detailed manufacturer's drawings, catalog cuts, curves, diagrams, schematics, data, and information on each separate item for review as set forth in the Special Provisions. The approved list reviewed by the City's Representative and Engineer shall not constrain or restrict the number of submittals requested by the Engineer from the Contractor. The Contractor must submit all construction related materials to the Engineer for review and approval prior to installation or mobilization. If the Contractor fails to submit on any individual item specific to any portion of the Construction project, the Engineer has every right to stop construction and require the Contractor to resubmit the proper documentation or re-perform the Activity based upon the Approved submittal documentation.

5. At the close of the project, all approved submittals shall be compiled in searchable PDF form and submitted to the City, separate from the required O&M manual submittal.

E. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall ensure that the material, equipment or method of work shall be as described in the submittal.

1. Submittals shall contain all required information, including satisfactory identification of items, units and assemblies in relation to the contract drawings and Special Provisions.
2. The Contractor shall verify that the material and equipment described in each submittal conforms to the requirements of the Special Provisions and drawings.
3. Unless otherwise approved by the Engineer, submittals shall be made only by the Contractor, who shall indicate by a signed stamp on the submittals that the Contractor has checked the submittals and that the work shown conforms to contract requirements and has been checked for dimensions and relationship with work of all other trades involved.
4. If the information shows deviations from the Special Provisions or drawings, the Contractor, by statement in writing accompanying the information, shall identify the deviations and state the reason(s) therefore.
5. The Contractor shall ensure that there is no conflict with other submittals and shall notify the Engineer in each case where the Contractor's submittal may affect the work of another contractor or the City.
6. The Contractor shall ensure coordination of submittals among the related crafts and subcontractors.

1.03 Submittal Transmittal Procedure

A. General: Submittals regarding material and equipment shall be accompanied by a transmittal form from the Contractor. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete specification sections for which a submittal is required. However, submittals for various items shall be made with a single form only when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

B. Submittal Identification: Each set of submittals or samples shall be attached to the submittal transmittal form.

1. The submittal number shall be made up of two parts: XXX-ZZ. The XXX shall be sequential number 001 for the first item submitted, 002 for the second, etc. The ZZ shall be the sequential number of a specific submittal or resubmittal (01 for the first submittal, 02 for the first resubmittal, etc.).
2. All submittals shall show the contract title, shall indicate the name of the vendor, and shall indicate when the equipment and/or material will be required by the construction schedule.
3. The submittal must be adequate to permit a comprehensive review without further reference to the Contractor. The documents submitted must be separately identifiable on the Contractor's submittal transmittal form.

C. Deviation from Contract: If the Contractor proposes to provide material or equipment which does not conform to the Special Provisions and drawings, this shall be indicated under "deviations" on the submittal transmittal form accompanying the submittal copies.

1. If the City accepts such deviation, the City shall issue an appropriate Contract Change Order, except that, if the deviation is minor, or does not involve a change in price or in time of performance, a Change Order need not be issued.
2. If any deviations from the Contract requirements are not noted on the submittal, the review of the shop drawing shall not constitute acceptance of such deviations.

D. Submittal Completeness: Submittals which do not have all the information required to be submitted, including deviations, shall be considered as not complying with the intent of the contract and are not acceptable and will be returned without review.

1. A complete submittal shall contain sufficient data to demonstrate that the items comply with the Special Provisions, shall meet the minimum requirements for submissions cited in the Special Provisions, shall include materials and equipment data and seismic anchorage certifications where required, and shall include any necessary revisions required for equipment other than first named.

E. Review of Subsequent Resubmittals: It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the City's Representative at least by the second submission of data. At the discretion of the Engineer costs associated with the review of any subsequent resubmittals may be borne by the Contractor. The Contractor will be billed for these costs by the City. Costs due may be deducted from progress payments due the Contractor by the City.

1.04 Submittal Review

A. Within 14 calendar days after receipt of the submittal by the Engineer, the submittal will be reviewed by the Engineer and the Engineer will return the marked-up submittal. The returned submittal shall indicate one of the following actions.

1. If the review indicates that the material, equipment or work method is in general conformance with the design concept and complies with the drawings and Special Provisions, submittal copies will be marked "NO EXCEPTIONS TAKEN". In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED". The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in operation and maintenance data, a corrected copy shall be provided. Otherwise, no resubmittal will be required.

3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT". The Contractor shall not undertake work covered by this submittal until the submittal has been revised, resubmitted and returned marked either 'NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

4. If the review indicates that the material, equipment or work method is not in general conformance with the design concept or in compliance with the drawings and Special Provisions, copies of the submittal will be marked "REJECTED - SEE REMARKS". Submittal with deviations which have not been identified clearly may be rejected. The Contractor shall not undertake work covered by such submittal until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

B. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide shall not relieve the Contractor of responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer, the City's Representative or the City, or by any officer, employee or subcontractor thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure of the method of work, material, or equipment so reviewed.

1. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the City has no objection to the Contractor, upon its own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

2. Favorable review of submittals does not constitute a change order to the Contract requirements.

3. The favorable review of all submittals by the Engineer shall apply in general design only and shall in no way relieve the Contractor from responsibility for errors or omissions contained therein.
4. Favorable review by the Engineer shall not relieve the Contractor of its obligation to meet safety requirements and all other requirements of laws, nor constitute a Contract Change Order.
5. Favorable review by the Engineer will not constitute acceptance by the Engineer of any responsibility for the accuracy, coordination, and completeness of the submittals or the items of equipment represented on the submittals.
6. The favorable review of shop drawings shall be obtained prior to the fabrication, delivery and construction of items requiring shop drawing submittal.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01301
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 Summary

A. This Section defines the process whereby the Schedule of Values (lump sum price breakdown) shall be developed. Monthly progress payment amounts shall be determined from the monthly progress updates of the Schedule activities. The majority of the project is FEMA funded. The Schedule of values shall be developed to separate FEMA funded activities from activities that are not covered by FEMA public assistance project numbers 36373, 36375 and 37303.

1.02 Submittals

A. Preliminary Schedule of Values

1. The Contractor shall submit a preliminary Schedule of Values for the major components separated by site of the work at the Preconstruction Conference.
2. The Contractor, Engineer, and City shall meet and jointly review the preliminary Schedule of Values and make any adjustments in value allocations if, in the opinion of the City, these are necessary to establish fair and reasonable allocation of values for the major work components and provide separation for FEMA funded activities.
    a. Front end loading will not be permitted.
    b. The City may require reallocation of major work components from items in the above listing if, in the opinion of the City, such reallocation is necessary.
    c. This review and any necessary revisions shall be completed within 15 days from the date of Notice to Proceed.

B. Detailed Schedule of Values

1. The Contractor shall prepare and submit a detailed Schedule of Values to the City within 30 days from the date of Notice to Proceed.
2. The detailed Schedule of Values shall be based on the accepted preliminary Schedule of Values for major work components. Because the ultimate requirement is to develop a detailed Schedule of Values sufficient to determine appropriate monthly progress payment amounts, sufficient detailed breakdown shall be provided to meet this requirement.
3. The City shall be the sole judge of acceptable numbers, details and description of values established. If, in the opinion of the City, a greater number of Schedule of Values items than proposed by the Contractor are necessary, the Contractor shall add the additional items so identified by the City.
4. The Contractor and City shall meet and jointly review the detailed Schedule of Values within 35 days from the date of Notice to Proceed.
5. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been proposed. Any adjustments deemed necessary to the value allocation or level of detail shall be made by the Contractor and a revised detailed Schedule of Values shall be submitted within 40 days from the date of Notice to Proceed.

C. The list below includes the major activities not included under FEMA funding that will need to be itemized separately in the Schedule of Values:

1. New personnel gate and driveway at Sewer Lift Station 3
2. New rolling gate and driveway at Sewer Lift Station 1
3. Repaving Sewer Lift Station 1

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01311
SCHEDULING AND REPORTING

PART 1 - GENERAL

1.01 General

A. The scheduling of the work under the Contract shall be performed in accordance with the requirements of this Section.

B. The development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) or bar chart scheduling.

1.02 Definitions and Requirements

A. Critical Path Method (CPM): CPM, as required by this Section, shall be interpreted to be generally as outlined in the Association of General Contractors (AGC) publication, "The Use of CPM in Construction." except that either "i-j" arrow diagrams or precedence diagramming format may be utilized. In the case of conflicts between this specification and the AGC Document, this specification shall govern.

B. Construction Schedules: Construction schedules shall include a graphic network diagram and computerized construction schedule reports.

C. Networks: The CPM network shall be in a form of a time scaled "i-j" activity-on-arrow or precedence type diagram and may be divided into a number of separate sheets with suitable match lines relating the interface points among the sheets.

   1. Individual sheets shall not exceed 36-inch by 60-inch.

D. All construction activities and procurement shall be indicated in a time-scaled format and a calendar time line shall be shown along the entire sheet length.

   1. Each activity arrow or node shall be plotted so that the beginning and completion dates of each activity are accurately represented along the calendar time line.

   2. All activities shall be shown using the symbols that clearly distinguish between critical path activities, non-critical activities and free float for each non-critical activity.

   3. All activity items shall be identified by their respective Activity Number, Responsibility Code, Work Duration, and their Dollar Value.

   4. All non-critical path activities shall show their total float time in scale form by utilizing a dotted line or some other graphical means.

E. Duration Estimates: The duration estimate indicated for each activity shall be computed in calendar days and shall represent the single best estimate considering the scope of the activity work and resources planned for the activity. Except for certain non-labor activities, such as curing of concrete or delivery of materials, activity duration shall not exceed 10 calendar days nor be less than one calendar day unless otherwise accepted by the City’s Representative.

1.03 Submittals

A. Submit schedules per requirements of Section 01300 - Submittals.

B. Preliminary Schedule

1. The Contractor shall submit a preliminary schedule document at the Preconstruction Conference, to identify the manner in which the Contractor intends to complete all work within the Contract Time.

C. Original Schedule

1. The Contractor shall submit an original schedule document within 10 days following the Preconstruction Conference.

D. Revised or Updated Schedules

1. Submit when required to reflect changes to original schedule.

1.04 Construction Schedule

A. The schedule shall indicate the major components of the project work and the sequence relations between major components and subdivisions of major components.

B. The schedule shall be cost loaded based on the schedule of values as approved by the City's Representative.

C. Sufficient detail shall be included for the identification of subdivisions of major components into such activities as:

1. All work tasks requiring a partial or complete shutdown of existing facilities.
2. Foundation subgrade preparation.
3. Foundation concrete.
4. Structural concrete.
5. Yard piping.
6. Equipment installation.
7. Electrical.
8. Instrumentation and control work.
9. Site work.
10. Other important work within the overall project scope.

D. Planned durations and start dates shall be indicated for each work item subdivision. Each major component and subdivision component shall be accurately plotted on time scale sheets not to exceed 36-inch by 60-inch in size. Not more than one sheet shall be employed to represent this information.

1.05 Schedule Review

A. The City's Representative and the Contractor shall meet to review and discuss the preliminary schedule within 5 days after it has been submitted to the City's Representative.

1. The City's Representative's review and comment on the schedules shall be limited to Contract conformance with the sequencing and milestone requirements as stated in other sections of the Special Provisions.
2. The Contractor shall make corrections to the schedules necessary to comply with the Contract requirements and shall adjust the schedules to incorporate any missing information requested by the City's Representative.

1.06 Acceptance

A. The acceptance of the Contractor's schedule by the City's Representative and City will be based solely upon the schedule's compliance with the Contract requirements.

B. By way of the Contractor assigning activity durations and proposing the sequence of the Work, the Contractor agrees to utilize sufficient and necessary management and other resources to perform the work in accordance with the schedule.

C. Upon submittal of a schedule update, the updated schedule shall be considered the "current" project schedule.

D. Submission of the Contractor's progress schedule to the City or City's Representative shall not relieve the Contractor of the Contractor's total responsibility for scheduling, sequencing, and pursuing the Work to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed work.

1.07 Monthly Updates and Periodic Schedule Submittals

A. Following the acceptance of the Contractor's Original Construction Schedule, the Contractor shall monitor the progress of the Work and adjust the schedule each month to reflect actual progress and any changes in planned future activities.

   1. Each schedule update submitted must be complete including all information requested in the original schedule submittal.

   2. Each update shall continue to show all work activities including those already completed.

   3. These completed activities shall accurately reflect the "as built" information by indicating when the work was actually started and completed.

B. Neither the submission nor the updating of the Contractor's original schedule submittal nor the submission, updating, change or revision of any other report, curve, schedule or narrative submitted to the City's Representative by the Contractor under this Contract, nor the City's Representative's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying, in any way, the Contract completion date or milestone dates or of modifying or limiting, in any way, the Contractor's obligations under this Contract. Only a signed, fully executed change order can modify these contractual obligations.

C. The monthly schedule update submittal will be reviewed with the Contractor during a construction progress meeting held on a month end date to be determined. The goal of these meetings is to enable the Contractor and the City's Representative to initiate appropriate remedial action to minimize any known or foreseen delay in completion of the Work and to determine the amount of Work completed since the last month's schedule update.

   1. The status of the Work will be determined by the percent complete of each activity shown in the Network Diagram.

   2. These meetings are considered a critical component of the overall monthly schedule update submittal and the Contractor shall have appropriate personnel attend.

   3. As a minimum, these meetings shall be attended by the Contractor's Project Manager and General Superintendent.

   4. Within seven (7) calendar days after the progress meeting, the Contractor shall submit the revised schedule.

   5. Within five (5) calendar days of receipt of the above noted revised submittals, the City's Representative will either accept or reject the monthly schedule update submittal.

   6. If accepted, the percent complete shown in the monthly update will be the basis for the Application for Payment to be submitted by the Contractor.

7. If rejected, the update shall be corrected and resubmitted by the Contractor before the Application for Payment for the update period can be processed.

D. Schedule Revisions: The Contractor shall highlight or otherwise identify all changes from the previous schedule. The Contractor shall modify any portions of the schedule which become infeasible because of activities behind schedule or for any other valid reason.

1.08 Change Orders

A. Upon approval of a change order, or upon receipt by the Contractor of authorization to proceed with additional work, the change shall be reflected in the next submittal of the schedule by the Contractor.

B. The Contractor shall utilize a sub-network in the schedule depicting the changed work and its effect on other activities.

C. This sub-network shall be tied to the main network with the appropriate logic so that a true analysis of the Critical Path can be made.

1.09 Project Status Reporting

A. In addition to the submittal requirements for the scheduling identified in this Section, the Contractor shall provide monthly project status reports.

B. The Contractor shall prepare monthly written narrative reports of the status of the project for submission to the City's Representative. Written status reports shall include:

1. The status of major project components (Percent Complete, amount of time ahead or behind schedule) and an explanation of how the project will be brought back on schedule if delays have occurred.
2. The progress made on critical activities indicated on the schedule.
3. Explanations for any lack of work on critical path activities planned to be performed during the last month.
4. Explanations for any schedule changes, including changes to the logic or to activity durations.
5. A list of the critical activities scheduled to be performed in the next two month period.
6. The status of major material and equipment procurement.
7. The value of materials and equipment properly stored at the site, but not yet incorporated into the work-in-place.
8. Any delays encountered during the reporting period.
9. An assessment of inclement weather delays and impacts to the progress of the Work.

C. The Contractor may include any other information pertinent to the status of the project. The Contractor shall include additional status information requested by the City's Representative.

1.10 Inclement Weather Provisions of the Schedule

A. The Contractor's construction schedule shall include lost days on the CPM schedule's critical path due to inclement weather typical for the area of construction based on the average rain days for the past five (5) years.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 Summary

A. The Contractor shall provide all temporary facilities and utilities required for prosecution of the work, protection of employees and the public, protection of the work from damage by fire, weather or vandalism, and such other facilities as may be specified or required by any legally applicable law, ordinance, rule, or regulation.

B. The Contractor shall keep the work site clean and free from rubbish and debris. Materials and equipment shall be removed from the site when they are no longer necessary on a daily basis as directed by the City's Representative. All cables, slings and other materials used to set the pipe and equipment shall be removed from the project site. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance.

1.02 Temporary Facilities

A. Electrical Service

1. The Contractor shall arrange, at its own cost, with the local utility to provide adequate temporary electrical service at a mutually agreeable location.
2. The Contractor shall then provide adequate jobsite distribution facilities conforming to applicable codes and safety regulations.
3. The Contractor shall provide, at its own cost, all electric power required for construction, testing, general and security lighting, and all other purposes whether supplied through temporary or permanent facilities.

B. Water

1. The Contractor shall pay for and shall construct all facilities necessary to furnish water for its use during construction.
2. Water used for human consumption shall be kept free from contamination and shall conform to the requirements of the State and local authorities for potable water.
3. The Contractor shall pay for all water used for the Contractor's operations prior to final acceptance.

C. Sanitary Conveniences

1. The Contractor shall provide suitable and adequate sanitary conveniences for the use of all persons at the site of the Work.
2. Such conveniences shall include chemical toilets or water closets and shall be located at appropriate locations at the site of the Work.
3. All sanitary conveniences shall conform to the regulations of the public authority having jurisdiction over such matters.
4. At the completion of the Work, all such sanitary conveniences shall be removed and the site left in a sanitary condition.

D. Telephone

1. The Contractor shall arrange, at its own cost, with the local utility to provide adequate temporary telephone service for its use during construction.
2. Contractor shall pay for all telephone services required for its own use.

1.03 Construction Facilities

A. Construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities shall be of ample size and capacity to adequately support and move the loads to which they will be subjected. Railings, enclosures, safety devices, and controls required by law or for adequate protection of life and property shall be provided.

B. Staging and Falsework

1. Temporary supports shall be designed by a professional registered engineer with an adequate safety factor to assure adequate load bearing capability. If requested by the City's Representative, the Contractor shall submit design calculations for staging and shoring prior to application of loads.
2. Excavation support shall be in accordance with applicable codes and regulations.

C. Temporary Enclosures

1. When sandblasting, spray painting, spraying of insulation, or other activities inconveniencing or dangerous to property or the health of employees or the public are in progress, the area of activity shall be enclosed adequately to contain the dust, over-spray, or other hazard.
2. In the event there are no permanent enclosures of the area, or such enclosures are incomplete or inadequate, the Contractor shall provide suitable temporary enclosures.

D. Warning Devices and Barricades

1. The Contractor shall adequately identify and guard all hazardous areas and conditions by visual warning devices and, where necessary, physical barriers.
2. Such devices shall, as a minimum, conform to the requirements of Cal/OSHA.

1.04 Protection and Restoration of Existing Improvements

A. The Contractor shall be responsible for the protection of public and private property at and adjacent to the Work and shall exercise due caution to avoid damage to such property.

B. The Contractor shall repair or replace all existing improvements which are not designated for removal (e.g., curbs, sidewalks, survey points, fences, walls, signs, utility installations, pavements, structures, etc.) and are damaged or removed as a result of its operations. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.

C. Trees, lawns, and shrubbery that are not to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original conditions and location as is reasonably possible. Lawns shall be re-seeded and covered with suitable mulch.

D. The Contractor shall give reasonable notice to occupants adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers, and other improvements within the right-of-way which are designated for removal or would be destroyed because of the Work.

1.05 Access Roads

A. Access roads shall be maintained to all storage areas and other areas to which frequent access is required. Similar roads shall be maintained to all existing facilities on the site of the Work to provide access for delivery of material and for maintenance and operation. Where such temporary roads

cross buried utilities that might be injured by the loads likely to be imposed, such utilities shall be adequately protected by steel plates or wood planking, or bridges shall be provided so that no loads shall discharge on such buried utilities.

1.06 Noise Abatement

A. Operations at the Worksite shall be performed so as to minimize unnecessary noise.

B. Special measures shall be taken to suppress noise during night hours.

C. Noise levels due to construction activity shall not exceed the levels specified by local ordinance.

D. Internal combustion engines used on the Work shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated without said muffler.

1.07 Construction Cleaning

A. The Contractor shall, at all times, keep property on which work is in progress and the adjacent property free from accumulations of waste material or rubbish caused by employees or by the Work. All surplus material shall be removed from the site immediately after completion of the work causing the surplus materials. Upon completion of the construction, the Contractor shall remove all temporary structures, rubbish, and waste materials resulting from its operations.

1.08 Disposal of Material

A. The Contractor shall make arrangements for disposing of materials outside the Site and the Contractor shall pay all costs involved.

1. The Contractor shall first obtain permission from the property City on whose property the disposal is to be made and absolve the City from any and all responsibility in connection with the disposal of material on said property.

2. When material is disposed of as above provided, the Contractor shall conform to all required codes pertaining to grading, hauling, and filling of earth.

1.09 Parking and Storage Areas – Reference Section 5 Control of Work and Section 12 Traffic Control

1.10 Traffic Regulation- Reference Section 12 Traffic Control

1.

PART 2 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01540
SECURITY

PART 1 - GENERAL

1.01 General

A. The Contractor shall safely guard all work, materials, equipment and property from loss, theft, damage and vandalism. Contractor's duty to safely guard property shall include the City's property and other private property from injury or loss in connection with the performance of the Contract.

B. The Contractor may make no claim against the City for damage resulting from trespass.

C. The party responsible for security shall make good all damage to property of City and others arising from failure to provide adequate security.

D. Security measures taken by the Contractor shall be at least equal to those usually provided by the City to protect the existing facilities during normal operation.

E. A security program shall be maintained throughout construction until final acceptance and occupancy precludes need for Contractor's security program.

F. Fire Extinguishers

1. Sufficient number of fire extinguishers of the type and capacity required to protect the Work and ancillary facilities, shall be provided and maintained in readily accessible locations.

G. Temporary Fences

1. Except as otherwise provided, the Contractor shall enclose the site of the Work with a fence adequate to protect the Work and temporary facilities against acts of theft, violence, or vandalism.

2. In the event all or a part of the site is to be permanently fenced, this permanent fence or a portion thereof may be built to serve for protection of the Work site, provided however, that any portions damaged or defaced shall be replaced prior to final acceptance.

3. Temporary openings in existing fences shall be protected to prevent intrusion by unauthorized persons and animals. During night hours, weekends, holidays, and other times when no work is performed at the site, the Contractor shall provide temporary closures or guard service to protect such openings. Temporary openings shall be securely fenced when no longer necessary.

4. If existing fencing or barriers are breached or removed for purposes of construction, the Contractor shall provide and maintain temporary security fencing equal to the existing in a manner satisfactory to the City's Representative. Temporary 6 foot tall Chain Link construction fencing panels with temporary footings and bracing secured together and at connections to adjacent existing fencing will be an acceptable method when approved by the City's Representative

1.02 Contractor's Access to the Site

A. Access to the project site for Contractor's employees, material, tools, and equipment shall be via roads designated by the City's Representative and as shown on the Drawings.

B. The Contractor shall ensure that each of its employees, representatives, material men, suppliers and others acting for the Contractor shall be subject to the following:

1. No Contractor employee's personal vehicle shall be allowed to park anywhere other than the Contractor Employee's Parking Area.

2. The Area shall be designated by the City's Representative.
3. The Contractor shall prepare and maintain this area as required.

C. The Contractor shall obtain and follow all security measures and procedures as outlined by the City and Police Departments.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01600
MATERIAL AND EQUIPMENT SUBSTITUTION

PART 1 - GENERAL

1.01 Section Includes

A. Procedures for substitution of material and equipment from named products specified elsewhere in these Special Provisions.

1.02 Submittals

A. Submit information described in Part 2 of this specification.

B. All Material and Equipment Substitutions submittals shall be in compliance with requirements listed under Section 01300 – Submittals.

PART 2 - PRODUCTS

2.01 Material and Equipment Substitutions

A. In preparing these Special Provisions, the Engineer has named those products which to its knowledge meet the Special Provisions and are equivalent in construction, functional efficiency, and durability.

B. Wherever catalog numbers and specific brands or trade names preceded by "similar and equal" or followed by the designation "or equal" are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Special Provisions, they are used to establish the standards of quality and utility required.

C. The first-named manufacturer is the basis for the project design and the use of alternative-named or unnamed manufacturer's products proposed by the Contractor may require modifications in the project design and construction. Where only one product has been named by brand, it is the only brand, trade name, or manufactured product known to the Engineer that meets these Special Provisions.

D. Wherever catalog numbers and specific brands or trade names not preceded by designation "similar and equal" nor followed by the designation "or equal", are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Special Provisions, to ensure compatibility with existing facilities, no substitutions will be favorably reviewed.

2.02 Substitutions

A. Substitutions which are equal in quality and utility to those specified will be permitted, subject to the following provisions.

1. For this purpose, the Contractor shall submit to the City’s Representative, no later than thirty five (35) days after the Notice of Award, a typewritten list containing a description of each proposed substitute item or material.

2. Sufficient data, drawings, samples, literature, calculations, or other detailed information as will demonstrate to the Engineer that the proposed substitute is equal in quality and utility to the material specified in the project documents. All substitutions shall be clearly identified in project submittals and appended to this list.

3. The Engineer will favorably review in writing such proposed substitutions as are, in its opinion, equal in quality to the items or materials specified.

B. Failure of the Contractor to submit proposed substitutions for review in the manner described above and within the time prescribed shall be sufficient cause for rejection by the City's Representative of any substitutions otherwise proposed.

2.03 Modifications and Costs

A. If alternative named or substitutions are proposed by the Contractor and favorably reviewed by the Engineer, the Contractor is responsible for providing, at no additional cost to the City, any electrical, mechanical, structural, or other related changes or testing that may be required to accommodate or provide the particular material or equipment the Contractor desires to use.

B. Any deviation from the Special Provisions or the Drawings resulting from the type of material or equipment to be used shall not be the basis for any "extra charges" above and in excess of the original bid price of the work.

C. In addition the Contractor is responsible for all additional costs to the City, and its agents and representatives, for evaluation of data submitted by the Contractor for alternative named or substitutions and any redesign necessary. The City shall deduct said costs from the Contract monies due the Contractor.

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01620
PROTECTION OF MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 General

A. Materials and equipment shall be shipped, handled, stored, and installed by methods that will prevent damage to the items. Damaged items will not be permitted as part of the Work except in cases of minor damage that have been satisfactorily repaired and are acceptable to the City's Representative.

B. Materials shall be stored in such a manner as to ensure the preservation of their quality and fitness for the Work. When considered necessary by the City's Representative, materials shall be placed on platforms or other hard, clean surfaces, and covered when directed.

C. Materials shall be stored so as to facilitate inspection. Storage areas shall be suitably fenced, if necessary to protect the public or the material.

D. Unless otherwise designated in the General Requirements, locations and arrangements for storage sites for materials and equipment outside the limits of work, shall be selected and maintained by the Contractor at its expense. Full compensation for furnishing such storage sites as may be necessary or required by the Contractor shall be considered as included in the price bid and no additional compensation will be allowed therefor. The City shall be specifically exempted in any agreement from any liability incurred from the use of private property for construction purposes. Use of portions of the City's area at the site for materials and equipment storage shall be permitted only upon the approval of the City's Representative.

1.02 Equipment

A. Definition:

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

B. Packing and Marking:

1. All equipment shall be adequately and effectively protected against damage from moisture, dust, handling, or other cause during transport from manufacturer's premises to the Work site.
2. Each item or package shall be clearly marked with the number unique to the Special Provisions reference covering the item.
3. Each piece of equipment shall receive, as far as practicable, a distinguishing mark that shall be shown on the packing lists.

C. Stiffeners shall be used where necessary to maintain shapes and to give rigidity. Parts of equipment shall be delivered in assembled or sub-assembled units where possible.

D. Identification of Equipment:

1. All pieces of equipment with an assigned equipment number shall have affixed to them, in a prominent location, a label or tag displaying the assigned equipment number.
2. Equipment lacking a number shall have a similar tag providing a unique description of the item.
3. Markers shall be of stainless steel or aluminum, affixed to the item in question with stainless steel fasteners or as otherwise approved by the City's Representative. Plastic tape labels will not be acceptable.

1.03 Delivery and Acceptance of Equipment

A. Contractor is responsible for shipment, delivery, off-loading, and acceptance of all material and equipment required for the Work.

B. The City's personnel or City's Representative will not accept materials or equipment deliveries for the Contractor.

C. The source quality control tests and delivery inspections shall be at the Contractor's expense for any materials or equipment specified herein and shall include the following:

   1. Test items at the place of manufacture during and/or on completion of manufacture, comprising material tests, hydraulic pressure tests, electric and instrumentation subsystem tests, performance and operating tests and inspections in accordance with the relevant standards of the industry and more particularly as detailed in individual clauses of these Special Provisions to satisfy the City's Representative that the items tested and inspected comply with the requirements of this contract.

   2. All items delivered at the site or to any authorized place of storage may be inspected to satisfy the City's Representative that such items are of the specified quality and workmanship and are in good order and condition at the time of delivery.

      a. To that end, the Contractor shall be prepared to remove all coverings, containers or crates to permit the City's Representative to conduct an inspection.

D. Should the City's Representative find indication of damage or deficient quality of workmanship, the Contractor shall provide the necessary documentation or conduct such tests deemed necessary by the City's Representative to demonstrate compliance.

1.04 Storage of Equipment:

A. During the interval between delivery and installation, all equipment to be incorporated into the project shall be stored to prevent damage or deterioration.

   1. Environmental controls such as heaters or protective encapsulation shall be provided to ensure against condensation and moisture damage.

   2. In the event prolonged (more than 90 days or per manufacturer's recommendation) storage is required for any item of rotating equipment, the Contractor shall institute a preventive maintenance program which shall include grease protection of bare metal surfaces, periodic indexing of rotating parts, renewal of grease in bearings and any procedures recommended by the manufacturer.

      a. The Contractor shall maintain adequate records to demonstrate full compliance with these requirements.

      b. All equipment shall be available for inspection by the City's Representative.

B. Electrical and Control Panels

   1. To insure adequate protection of all electrical and instrumentation equipment and panels and electric motors, all such equipment shall be stored in a suitable enclosure designed to protect the equipment from dust and moisture.

   2. The Contractor shall be responsible for maintaining the storage facilities and equipment stored therein and shall make provision for all utilities required.

   3. Continuous access shall be provided to the City's Representative for all equipment so stored.

C. Protection of Equipment After Installation:

   1. After installation, all equipment shall be protected from damage, including but not limited to, moisture, condensation, dust, abrasive particles, debris and dirt generated by the placement,

chipping, sandblasting, cutting, finishing and grinding of new or existing concrete, terrazzo and metal; and the fumes, particulate matter, and splatter from welding, brazing, and painting of new or existing piping and equipment.

2. Contractor shall lubricate and rotate by hand, all rotating equipment per the manufacturer's recommendations.
3. Contractor shall provide temporary heat to control panels to prevent condensation buildup on the inside of un-energized panels. Provide temporary electrical connection to equipment and panels equipped with space heaters or internal heating elements.
4. During concreting, including finishing, all equipment that may be affected by cement dust must be completely covered.
5. During painting operations, all grease fittings and similar openings shall be covered to prevent the entry of paint.

1.05 Hazardous Materials

A. The storage and handling of potential pollution causing and hazardous materials, including but not necessarily limited to, gasoline, oil and paint shall be in accordance with all local, state and federal requirements.

B. All hazardous materials shall be stored and handled in strict accordance with the Material Safety Data Sheets for the products.

C. Material Safety Data Sheets, shall be submitted to the City's Representative prior to the delivery of materials to the project.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01700
RESTORATION OF IMPROVEMENTS

PART 1 - GENERAL

1.01 Structures

A. The Contractor shall remove existing structures, including paving, sidewalks, curbs, gutters, pipelines, and rip rap, as may be necessary for the performance of the work and shall rebuild the structures thus removed in as good a condition as found with the requirements specified. Concrete structures such as curbs and gutters shall be replaced from joint to joint or as directed by the City's Representative. The Contractor shall also repair existing structures that may be damaged as a result of the work under this contract.

1.02 Roads

A. Unless otherwise specified, roads or other paved surfaces in which the surface is removed, broken, or damaged, or in which the ground has caved or settled during the work under this contract, shall be resurfaced and brought to the original grade and section. Requirements for paving restoration are covered in Section 19, 26, and 39.

1.03 Restoration of Existing Installations

A. The Contractor shall, at no cost to the City, immediately correct or replace existing equipment, controls or systems that are damaged as a result of construction or Contractor operations.

1.04 Warranty of Restoration Work

A. The Contractor shall include all restoration work under the one (1) year guarantee included in the General Conditions.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01710
FINAL CLEAN-UP

PART 1 - GENERAL

1.01 Requirements

A. As a condition precedent to final acceptance or release of a structure, space or process unit for use by the Owner, the Contractor shall thoroughly clean all floors and walls to leave same in first-class condition.

B. All pits and sumps shall be cleared of silt, sand, debris and construction materials. Ductwork, air intakes and exhaust grilles shall be inspected and cleared of extraneous material, and all grounds shall be cleared of all debris.

C. At the completion of each project site, the Contractor shall perform the following:

1. Remove and dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.
2. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.
3. Remove spatter, grease, stains, fingerprints, debris, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering.
4. Repair, patch and touch up chipped, scratched, dented or otherwise marred surfaces to match specified finish.
5. Remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.
6. Wash and shine glazing and polished surfaces.
7. Clean all floors, slabs, pavements, and ground surfaces.
8. Maintain cleaning until acceptance by the Owner.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01720
RECORD DRAWINGS

PART 1 - GENERAL

1.01 General

A. This Section describes the requirements for maintaining records of actual conditions in the field and for changes in the Work as contained on the As-Built drawings.

B. As-Built drawings shall be transcribed to become the Project's Record Drawings. The purpose of the Project Record Drawings is to provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modifications of the work to proceed without lengthy and expensive site measurement, investigation, and examination.

C. The Contractor shall provide the City's Representative neatly and legibly marked contract drawings showing the final horizontal and vertical location of piping, equipment, electrical conduits, outlet boxes and cables. Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. These drawings shall be available to the City's Representative throughout the construction period. Final payment shall not be made until the marked up record drawings are delivered to and approved by the City's Representative.

1.02 Documents Required

A. The following shall be maintained in the Contractor's field office in clean, dry, legible condition:

1. Drawings,
2. Special Provisions,
3. Change Orders and other Modifications to the Contract Documents,
4. Survey Data,
5. Field Orders or Directives,
6. Reviewed Shop Drawings, Product Data, and Samples,
7. Testing Reports,
8. Requests for Information,
9. Claims,
10. Training.

1.03 Maintenance of Documents

A. Store record documents and samples in Contractor's field office apart from documents used for field construction purposes. Make documents and samples available at all times for inspection by the City's representatives.

B. Update the documents within 24 hours after receiving information that a change has occurred or clarification has been issued.

C. Drawings shall be updated weekly. Progress payments may be delayed until the Record As-Built drawings are updated to meet requirements and date of pay request.

D. Record documents shall not be used for any other purpose and shall not be removed from the office without approval of the City's Representative.

1.04 Recording

A. Label each document with “AS BUILT PROJECT RECORD” in neat, Large Printed lettering.

B. Two, full-sized sets of the Contract Drawings will be furnished to the Contractor by the City. These Drawings shall be updated with record information and one copy of the updated record drawings shall be submitted for review to the City’s Representative every month. The Record Drawing shall be up-to-date and its completeness shall be a precondition of the next month’s partial payment request approval.

1. Make annotations with erasable colored pencil conforming to the following color code:

Annotations	Color
Additions:	Red
Deletions:	Green
Comments	Blue
Dimensions:	Graphite

C. The Contractor may submit additional 24 X 36 sheets detailing record work as approved by the City’s Representative.

D. Record information concurrently with the construction process.

1. Do not conceal any work until required information is properly recorded and documented.
2. Completely, accurately, and legibly record to the satisfaction of the City’s Representative, all deviations in construction, especially pipe and conduit locations, and any deviations caused by Approved changes and/or clarifications to the Work.
3. Date all entries.
4. Call attention to Record Drawing entries by drawings a “Cloud” around the affected area.
5. Use different colors to designate overlapping changes.

E. Legibly mark drawings to record actual construction:

1. Identify location of spare conduits including beginning, ending and routing through pull boxes, and manholes. Record spare conductors, including number and size, within spare conduits, and filled conduits.
2. Record actual depths, horizontal and vertical location of underground pipes, duct banks and other buried utilities. Reference dimensions to permanent surface features.
3. Identify specific details of pipe connections, location of existing buried features located during excavation, and the final locations of piping, equipment, electrical conduits, manholes, and pull boxes.
4. Depths of various elements in relation to finished work.
5. Horizontal and vertical positions of underground utilities and appurtenances referenced to fixed surface improvements.
6. Locations of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
7. Field changes of dimension and detail.
8. Approved changes to the work.

9. Details not originally included within the scope of the original contract documents.
10. Mark and record field changes and detailed information contained in submittals and change orders.
11. Provide schedules, lists, layout drawings, and wiring diagrams.

F. Legibly mark each section of the Special Provisions to record:
   1. Manufacturer's trade name, catalog number, and supplier of each product and item of equipment installed,
   2. Changes made reflecting Approved changes to the Work.

G. Legibly maintain shop drawings as record drawings. Annotate shop drawings to record changes made after Approval.

1.05 Final Project Record Documents

A. At the time nearing Substantial Completion of the Work, obtain from the Engineer through the City's Representative the original AutoCAD or Electronically Derived Contract Documents. Unless otherwise notified, the Contractor shall reproduce the As-Built Contract Documents, transferring all identified changes during the construction project into the Record Drawings.

B. The As Built Documents shall be Approved by the Project Inspector that all data has been correctly incorporated to the truest extent feasible.

C. Submit the complete set of As Built Project Documents to the City's Representative upon request for Substantial Completion.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

****END OF SECTION****

SECTION 01900
SEISMIC CRITERIA

PART 1 - GENERAL

1.01 Summary

A. This section establishes the minimum seismic anchorage and bracing requirements for mechanical, and electrical components, as well as non-building structures. All components and non-building structures shall be permanently attached to supporting structures with sufficient strength and ductility to resist the forces described in this Section. Gravity supports and anchorages are specified on the drawings and Special Provisions.

1.02 Contractor Responsibilities

A. Design, provide and install all supports, restraints, and anchorages as required herein.

B. Engineering design is not required where tabularized system selection guides are specified using listed References.

C. Ensure that all manufacturers, material suppliers, and subcontractors understand and conform to requirements of this Section.

D. Coordinate and verify the location of anchor bolts prior to the placing of concrete. See paragraph 3.01

E. Component testing and certifications described in IBC 1707.7.2 and 1707.7.3 are not required except for anchors, structural connectors, proprietary structural components or systems or as indicated on the Drawings. Where Ip = 1.5 seismic qualification requirements for mechanical and electrical components shall conform to IBC 1708.5.

1.03 Seismic Design Requirements

S_{DS} ..... Varies by Site
S_{D1} ..... Varies by Site
Site Class……..... D
Risk Category …… III
Seismic Design Category ..... D
Importance Factor, Ie 1.25
Element & Non-structural Importance, Ip 1.00

1.04 References

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly.

B. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

C. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization, or if there are no replacement documents, the last version of the

document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
IBC	2006 International Building Code, locally amended
ASCE 7-05	Minimum Design Loads for Buildings and Other Structures
ASTM C 635	Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
ASTM C 636	Standard Practice for Installation for Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
API STD 650	Welded Steel Tanks for Oil Storage
AWWA D100	Welded Steel Tanks for Water Storage
ASME A 17.1	Safety Code for Elevators and Escalators
ASME B 31	Code for Pressure Piping
ASME	Boiler and Pressure Vessel Code
SMACNA	Seismic Restraint Manual
NFPA	Standard for the Installation of Sprinkler Systems
Rack Manufacturers Institute	Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks

1.05 Submittals

A. Submittals shall be provided for each piece of equipment, system, or anchorage, in accordance with Section 01340 and shall include the following information:

1. A copy of this Special Provisions section, with addendum updates included, with each paragraph check-marked to indicate Special Provision compliance or marked to indicate requested deviations from Special Provision requirements.

   a. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the Special Provisions are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.

   b. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the Special Provisions. Failure to include a copy of the marked up Special Provision sections, along with justification(s) for any requested deviations to the Special Provision requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Certificate of Compliance for each Contractor Designed bracing system, signed and sealed by a Professional Engineer registered in the state of the project. Certification shall state that the component's support and anchorage systems are designed to withstand the required seismic forces and displacements in accordance with this Section.

3. Installation drawings for each component of sufficient detail to represent the installed conditions. Provide component information including weight, location, bracing and anchor types, material, size, embedment, number and locations. If Contractor designed, comply with Submittal item #2.

4. If component importance factor Ip = 1.5, provide Certificate of Compliance per IBC 1708.5.

5. Structural calculations certified by a Professional Engineer currently registered as such by the State of California to comply with the above requirements.

1.06 PRODUCTS

A. Materials and products associated with the requirements of this Section are specified in their respective Sections or noted on the drawings.

PART 2 - EXECUTION

2.01 General Requirements

A. Design and construct component bracing and anchorage to resist the seismic forces specified above. These forces shall be considered acting at the center of gravity of the piece under consideration. No equipment shall be anchored to vertical structural elements without written approval of the Construction Manager.

B. All anchorage of equipment is specified to be made by cast-in anchor bolts in concrete elements unless specifically noted otherwise on the drawings or other Special Provision Sections.

C. Contractor shall be responsible for any remedial work or strengthening of concrete elements because of superimposed seismic loading if anchor bolts are improperly installed or omitted due to lack of submittal review or improper placement for any reason, at no additional cost to the Owner.

D. The exceptions to bracing and anchorage requirements in Section 9.6.1 of ASCE-7 do not apply to process equipment and associated piping, power supply, instrumentation and control features required for the normal or emergency operation of the facility.

2.02 Mechanical Components

A. Mechanical components include, but are not necessarily limited to HVAC ducts and mechanical units in total, boilers and furnaces, plumbing to include non-buried pipes and all fixtures, fire protection systems, power generation equipment, manufacturing and process mechanical equipment units and piping, storage tanks and bins, conveying systems, elevators and escalators.

B. Vibration isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4-inch.

C. Piping with flexible connections and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system.

D. Ducts and pipes shall be braced according to SMACNA for the Seismic Hazard Level (SHL) in the facility at the point of anchorage as described in the Project Manual. Associated equipment units whose weight falls within the SMACNA tables may also be braced using this method. Larger units shall be braced with Contractor Designed systems.

2.03 Electrical Components

A. Electrical components include but are not necessarily limited to power distribution systems and associated equipment, control and instrumentation systems and associated equipment, and lighting systems.

B. Conduits shall be braced according to SMACNA for the Seismic Hazard Level (SHL) in the facility at the point of anchorage as described in the Project Manual. Cable trays and grouped duct runs whose weight falls within the SMACNA tables may also be braced using this method. Heavier components shall be braced with Contractor Designed systems.

****END OF SECTION****

SECTION 03315
GROUT

PART 1 - GENERAL

1.01 Summary

A. The work of this Section includes providing grout other than that required for masonry work.

B. The following types of grout are included in the work of this Section:

1. Non-Shrink Grout: This type of grout shall be used wherever grout is required, unless another type is specifically indicated.

C. Except as otherwise indicated, the current versions of the following apply to the work of this Section:

Reference	Title
CRD-C 621	Corps of Engineers Specification for Non-shrink Grout
ASTM C109	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
ASTM C531	Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfacings
ASTM C579	Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings
ASTM C827	Test Method for Early Volume Change of Cementitious Mixtures
ASTM D696	Test Method for Coefficient of Linear Thermal Expansion of Plastics

1.02 Submittals

A. The following shall be submitted in compliance with Section 01300 – Submittals Procedures:

1. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of non-shrink and epoxy grouts proposed for use in the work.
2. Certified test results verifying the compressive strength, shrinkage, and expansion properties.

1.03 Quality Control

A. Field Tests

1. When a project is used without documentation, compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the Engineer to insure continued compliance with these Special Provisions.
2. Compression tests and fabrication of specimens for non-shrink grout will be performed as specified in ASTM C 109. A set of three specimens will be made for testing at 7 days, 28 days, and each additional time period as appropriate.

B. The cost of all laboratory tests on grout will be borne by the Contractor. The Contractor shall assist the City's representative in obtaining specimens for testing. The Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the Special Provisions. The Contractor shall supply all materials necessary for fabricating the test specimens.

PART 2 - PRODUCTS

2.01 Cement Grout

A. Cement grout mix design shall satisfy the same requirement as concrete, except that cement grout has no large aggregate requirement when the grout thickness is less than 3”.

2.02 Prepackaged Grouts

A. Non-Shrink Grout

1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout indicated herein shall be that recommended by the manufacturer for the particular application.
2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.
3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi and shall meet the requirements of CRD C 621.

B. Application

1. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout indicated herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.
2. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.

2.03 Curing Materials

A. Curing materials shall be per ACI 301 for cement grout and as recommended by the manufacturer of prepackaged grouts.

2.04 Consistency

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

B. Unless otherwise noted on contract dwgs, grout for base plates and equipment leveling shall have flowable, semi-flowable, and packable viscosities. Flowable and semi-flowable consistencies requires formwork.

2.05 Measurement of Ingredients

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement is not an acceptable method of measurement.

PART 3 - EXECUTION

3.01 General

A. All surface preparation, curing, and protection of cement grout shall be as required. The finish of the grout surface shall be troweled smooth unless noted otherwise.

B. Where pre-packaged product is used, the manufacturer's representative shall provide on-site technical assistance upon request.

C. Base concrete or masonry must have attained its design strength before grout is placed. When bonding to an existing cementious material is expected, waterblasting or sandblasting to roughen the substrate is required.

3.02 Grouting Procedures

A. Base Plate Grouting

1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a grout thickness not exceeding 2x the anchor bolt diameter.
2. After the base plate has been set in position at the proper elevation double nutted on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout. The grout shall be placed so there a no voids between the bottom of the base plate and the concrete.
3. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
4. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping and fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

****END OF SECTION****

SECTION 05120
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 Description

A. The work of this Section includes providing structural steel and related appurtenances.

B. Related Sections

05910	Hot Dip Zinc Coating
09900	Protective Coating Systems

1.02 References

AISC 303	Code of Standard Practice for Steel Buildings and Bridges
AISC S326	Design, Fabrication and Erection of Structural Steel for Buildings
ASTM A36	Structural Steel
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless, Grade B
ASTM A283	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A307	Carbon Steel Externally Threaded Standard Fasteners, Grade A
ASTM A320	Alloy-Steel Bolting Materials for Low Temperature Service
ASTM A325	High-Strength Bolts for Structural Steel Joints
ASTM A490	Heat-Treated Structural Steel Bolts
ASTM A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, Grade B
ASTM A501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A666	Austenitic Stainless Steel, Sheet, Strip, Plate and Flat Bar for Structural Applications, Grade A, Type 304
AWS-B3.0	Welding Procedures and Performance Qualifications
AWS-D1.1	Structural Welding Code - Steel

1.03 Shop Drawings and Samples

A. The following shall be submitted in compliance with Section 01300-*SUBMITTALS*:

1. Shop drawings, including details, dimensions, details of match markings and all information necessary for fabrication. Drawings shall conform to AISC standards.
2. Welding procedures and welder qualifications.
3. Certificates that steels comply with the indicated standards (“mill certs”).

PART 2 - PRODUCTS

2.01 Materials

A. Materials for structural steel members and connection shall comply with the Construction Drawings.

2.02 Fabrication

A. Fabrication shall be in accordance with ANSI/AISC 360 Chapter M and AISC 303. All structural steel welding in off-site fabrication shops shall be continuously inspected by a Certified Special Inspector. The continuous inspection will be waived if the work is done in a shop certified by AISC.

PART 3 - EXECUTION

3.01 Installation

A. General

1. Structural assemblies and shop and field welding shall meet the requirements of AISC 303.
2. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.
3. Structural steel completely encased in concrete need not be galvanized or painted and shall have a clean surface for bonding to concrete.

B. Welding

1. Welding shall be performed by operators who have been qualified by tests as prescribed by AWS D1.1.
2. Continuous seal welds shall be applied on structural steel designed to be exposed to weather or submerged in water or wastewater. Continuous seal welds shall be applied on both sides of structural steel designed to be submerged in water or wastewater.

3.02 Corrosion Protection

A. Unless otherwise indicated, all structural steel, including that used in the fabrication of process equipment, shall be surface prepared and coated in accordance with Section 09900-Coating Systems and shall include the following operations:

1. Exterior and interior edges of flame-cut pieces shall be ground smooth.
2. Sharp edges and punched holes shall be ground smooth.
3. Uneven or rough welds shall be ground smooth.

3.03 Touch-Up and Repair

A. After installation, damaged surfaces of shop-primed structural steel shall be cleaned and touched-up with same material used for shop coat. Prepare surface and recoat per recommendations of Manufacturer's product data sheet.

****END OF SECTION****

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 Summary

A. Miscellaneous metalwork includes the following:

1. Metal Framing, Supports and Brackets.

1.02 Related Sections

A. Section 03315-Grout

B. Section 09900-Protective Coating Systems

1.03 Codes

A. The work of this Section shall comply with the current edition of the California Building Code.

1.04 Specifications and Standards

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Federal Specifications:

QQ-F-461 C (1)	Floor Plate, Steel, Rolled
MIL-6-18015	(Ships) Aluminum Planks, (6063-T6)

2. Commercial Standards:

AISC MO11	Manual of Steel Constructions
ASTM A36	Specification for Structural Steel
ASTM A48	Specification for Gray Iron Castings
ASTM A53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A125	Specification for Steel Springs, Helical, Heat Treated
ASTM A153	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A283	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
ASTM A320	Specification for Alloy-Steel Bolting Materials for Low-Temperature Service
ASTM A489	Carbon Steel Eyebolts

ASTM A569	Specification for Steel, Carbon, (0.15 Maximum Percent) Hot Rolled, Sheet and Strip, Commercial Quality
ASTM A575	Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM B98	Specification for Copper-Silicon Alloy Rod, Bar, and Shapes
ASTM B210	Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
ASTM B221	Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
ASTM B438	Specification for Sintered Bronze Bearings (Oil-Impregnated)
ANSI/AWS D1.1	Structural Welding Code - Steel
NFPA 101	Life Safety Code
NAAMM	Metal Stairs Manual

1.05 Shop Drawings and Samples

A. The following shall be submitted in compliance with Section 01300-Submittals:

1. Shop drawings of miscellaneous metalwork including seat angles, supports and guides.
2. Shop drawings of gratings and grating supports.
3. Shop drawings of metal stairs.
4. Product data on gratings, cover plates, and stair nosings.

PART 2 - PRODUCTS

2.01 Materials

A. Materials: Except as otherwise indicated, products fabricated of structural steel shapes, plates and bars shall comply with the requirements of ASTM A 36 or ASTM A283.

B. Stainless Steel: Stainless steel metalwork and bolts shall be of Type 316 or 316L stainless steel for all corrosive environments.

2.02 Fabrication

A. Corrosion Protection:

1. Miscellaneous steel metalwork shall be hot-dip galvanized after fabrication except as otherwise indicated.
2. Miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment or will be submerged in wastewater, shall be coated in accordance with Section 09900-Protective Coating Systems.

B. Welding:

1. Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" and supplemented by other standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.
2. In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall comply with the AWS Code.
3. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

C. Galvanizing:

1. Where galvanizing is indicated, structural steel plates, shapes, bars and fabricated assemblies shall be thoroughly cleaned of rust and scale and shall be galvanized in accordance with the requirements of ASTM A 123.
2. Any galvanized part that becomes warped during the galvanizing operation shall be straightened.
3. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.

2.03 Bolts

A. Bolt Requirements: Bolts shall comply with the following:

1. The nuts shall be capable of developing the full strength of the bolts.
   a. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads.
   b. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
2. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 3 threads beyond the nut.

B. Standard Service Bolts (Not Buried, Corrosive or Submerged):

1. Except where otherwise indicated, bolts and nuts shall be steel and shall be hot-dip galvanized after fabrication.
2. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing.
3. Except as otherwise indicated herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 307 Grade A or B, or threaded parts of ASTM A 36.

2.04 Framing

A. Furring Members and Accessories: ASTM C645, hat-shaped and as indicated on the construction documents.

B. Fasteners: ASTM C646, type and size recommended by furring manufacturer for the substrate and application indicated.

C. Non-load bearing steel studs: US Gypsum: ST20. Sizes as indicated on the construction drawings

D. Steel ceiling framing: Dietrich CSJ x 20 gauge. Sizes as required by span. Refer to drawings for span table.

2.05 Other Materials

A. All other materials not specifically described but required for a complete and proper installation of sound fence, shall be as selected by the Contractor subject to approval of the Engineer.

PART 3 - EXECUTION

3.01 General

A. Fabrication and Erection: Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

B. General:

1. Fieldwork, including cutting and threading, shall not be permitted on galvanized items.
2. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.
3. Grouting of anchor bolts with non-shrink or epoxy grouts, where indicated, shall be in accordance with Section 03315-Grout.
4. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.
5. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if indicated, recesses or blockouts shall be formed in the concrete.
    a. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned.
    b. Recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place.
6. Holes shall be punched 1/16-inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.
7. Fabrication including cutting, drilling, punching, threading and tapping required for miscellaneous metal or adjacent work shall be performed prior to hot-dip galvanizing.

**** END OF SECTION ****

SECTION 05910
HOT-DIP ZINC COATING

PART 1 - GENERAL

1.01 Summary

A. This Section specifies hot-dip zinc coating. Unless otherwise specified, steel items not fully encased in a building envelope shall be hot-dip zinc coated. Also termed hot dip galvanized.

B. References

ASTM A90	Standard Test Methods for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A123	Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip
ASTM A153	Zinc Coating on Iron and Steel Hardware
ASTM A384	Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
ASTM A385	Providing High Quality Zinc Coatings on Assembled Products
ASTM A386	Zinc Coating on Assembled Steel Products
MILSPEC	Paint, High Zinc Dust Content, Galvanizing
DOD-P-21035	Repair

PART 2 - PRODUCTS

2.01 Materials

A. The coating material shall be as specified in ASTM A153 or ASTM A123.

PART 3 - EXECUTION

3.01 Galvanizing

A. The thickness, chemistry, and all other engineering properties of galvanizing shall be defined by ASTM A153 and ASTM A123.

3.02 Field Repairs

A. Where zinc coating has been damaged, substrate surface shall be cleaned and repaired with zinc dust-zinc oxide coating in accordance with MILSPEC DOD-P-21035. Field repair of zinc coated surfaces, including Unistruts shall be accomplished with Z.R.C., as manufactured by Z.R.C. Chemical Products Co.; Galvicon as manufactured by Galvicon Co.; or equal.

3.03 Post-Galvanizing Coating

A. When paint is required over a hot-dip galvanized coating, the galvanized surface requires special preparation. Chemical or abrasive methods may be used, with care exercised to not remove too much of the galvanized coating.

SECTION 06110
FRAMING AND SHEATHING

PART 1 - GENERAL

1.01 Summary

A. Work Included

1. Sound fence sheathing.

1.02 Quality Assurance

A. Source Quality Control

1. Lumber to have visible grade stamp, of an agency certified by NFPA.

B. Reference Standards

1. ASTM A307 - Carbon Steel Externally and Internally Threaded Standard Fasteners.
2. PS 1 - Construction and Industrial Plywood.
3. PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
4. PS 20 - American Softwood Lumber Standard.
5. WCLIB - West Coast Lumber Inspection Bureau Standard Grading and Dressing Rules No. 17.
6. WWPA - Western Wood Products Association Western Lumber Grading Rules.

PART 2 - PRODUCTS

2.01 Lumber and Sheet Materials

A. Lumber: PS 20 graded in accordance with NFPA recognized grading standards issued by WCLIB or WWPA; maximum moisture content of 19 percent; of the following species and grades:

1. Non-structural Light Framing: Douglas Fir-Larch; No. 2 grade

B. Plywood

1. Structural components (roof sheathing, shear wall sheathing, soffits): APA Rated Sheathing, Exposure 1, in accordance with PS 1 and PS 2, exterior rated glue.
2. Non-Structural Components: Douglas Fir, APA Rated Sheathing, Exposure 1, in accordance with PS 1 and PS 2 using thickness as noted on Drawings.

C. Oriented Strand Board may be used in lieu of plywood for structural and non-structural components for wall sheathing by written engineer's approval.

D. Wood in contact with concrete shall be pressure treated Hem-Fir.

2.02 Accessory Materials

A. Nails, Spikes, and Staples: Galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations; size and type to suit applications.

B. Bolts, Nuts, Washers, Lags, Pins, and Screws: ASTM A307 steel; sized to suit application; galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations.

C. Steel connections: As noted on Drawings; galvanized finish “Z-max”, manufactured by Simpson Strong-Tie Company or equal.

PART 3 - EXECUTION

3.01 Framing

A. Erect wood framing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch.

B. Space framing members at 16 inches on center maximum unless otherwise noted on Drawings.

C. Construct members of continuous pieces of longest possible lengths.

D. Vertical stud splicing not permitted.

E. Double wall framing members at openings over 100 square inches. Space short member above and below openings in same manner as for walls.

F. Contractor shall ensure that framing moisture content prevents splitting during nailing.

3.02 Sheathing and Sub-flooring

A. Place wall sheathing with end joints staggered. Maintain minimum 1/16 inch and maximum 1/8 inch spacing between joints on walls. Place plywood sheets with face grain perpendicular to framing members.

B. All floor sheathing unsupported edges shall be blocked.

C. Use common wire nails of size noted on drawings. Shorter nails of same minimum diameter may be used to attach light-gauge metal wood connectors per manufacturer's instructions.

3.03 Fasteners

A. Holes for bolts shall not be more than 1/16" larger in diameter than the bolts.

B. All bolt and lag screws shall be tightened on installation and retightened before closing in or at completion of job.

C. Screws shall not be hammered into place. Pre-drilling shall not be larger than the root diameter of the threads for the depth of the threaded portion.

D. Nailing shall conform to convention framing standards unless otherwise noted.

**** END OF SECTION ****

SECTION 09900
PROTECTIVE COATING SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Scope:

1. The Contractor shall furnish all labor, materials, equipment and incidentals required to provide painting as shown and specified. The work includes the coating and finishing of all interior and exterior items and surfaces throughout the project except as otherwise shown or specified. Surface preparation, priming and coatings may be in addition to shop priming and surface treatment specified under other Sections.
2. Where items are factory-coated, repair or touch-up the factory coating and/or apply additional field coatings to achieve a complete coating system complying with the type and thickness of the coatings specified in this Section.
3. The term “coating” as used herein means all coating systems materials, which includes but is not necessarily limited to pretreatments, primers, intermediate coats, finish coats, emulsions, enamels, varnishes, stains, sealers, fillers, and other applied materials whether used as prime, intermediate or finish coats.
4. The term “exposed” as used herein means all items not covered with concrete, plaster, fireproofing or similar material.
5. Where items or surfaces are not specifically mentioned, coat these items or surfaces the same as adjacent similar materials or surfaces.
6. “Typical Examples” of items to be coated are provided on each coating system description sheet. These examples are intended to show the general scope of items to be coated are not intended to be exhaustive of all items to be coated by that particular coating.
7. Items which must be coated under this section include but are not necessarily limited to the following:
    a. Tesco Panel
    b. Bollards
    c. Exposed Piping
    d. All other surfaces not otherwise excluded herein.

B. Coordination

1. Review installation procedures under other Sections and coordinate the installation of items that must be field coated or painted.
2. Coordinate the coating of areas to be coated that will be inaccessible once equipment has been installed.
3. Provide finish coats that are compatible with the primers used. Contractor shall be responsible for the compatibility of all shop primed and field coated items in this Contract. Barrier coats shall be provided over incompatible primers or primers shall be removed and re-primed as required.

C. Pre-Finished Items: Unless otherwise shown or specified, coating shall not be included when factory finishing such as baked-on enamel, porcelain, polyvinylidene fluoride, fusion bonded epoxy, or other similar finish is specified for such items.

1. Touch up factory-finished items only with coatings supplied by the item manufacturer per the requirements and instructions of the manufacturer.
2. If a factory-finished coating is applied to an item, which is not specified to receive a factory finish coat, acceptance of the factory finish coat shall be at the discretion of the Engineer. The color shall be noted with the equipment submittals.

D. Items Not to be coated: The following items are excluded from coating unless otherwise specified or show:

1. Corrosion resistant surfaces that are in chases or other inaccessible areas unless specified or shown on drawings.
2. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts unless otherwise specified.
3. Code-required labels, such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
4. Stainless steel.
5. Copper.
6. Aluminum.
7. Fiberglass.
8. Instrumentation and galvanized instrument supports

1.02 References

A. Reference Standards: Applicable provisions and recommendations of the following shall be complied with, except where otherwise shown or specified:

Reference	Title
ANSI A13.1	Scheme for the Identification of Piping Systems
Ten States Standards	Great Lakes - Upper Mississippi River Board of State Sanitary Engineers, Recommended Standards for Waste Treatment Works - Latest Edition, Recommended Color Scheme for Piping
OSHA 1910.144	Safety Color Code for Marking Physical Hazards
SSPC Volume 2	Systems and Specification, Surface Preparation Guide and Paint Application Specifications

1.03 Submittals

A. Shop Drawings: The following shall be submitted for approval:

1. Manufacturer's technical information, including coating label analysis and application instructions for each material proposed for use. Each material shall be listed and cross-referenced to the specific coating system and application, and shall be identified by manufacturer's catalog number and general classification.
2. Provide itemized schedule of all the surfaces to be coated. After approval of submittals and prior to beginning work, City's Representative will note on the schedule the colors to be furnished.
3. Manufacturer's complete color charts for each coating system.
4. Certifications from manufacturers shall be provided, verifying that the factory applied prime coats are compatible with specified finish coatings.

1.04 Delivery, Storage, and Handling

A. Delivery of Materials: All materials shall be delivered to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information.

1. Name or title of material
2. Manufacturer's stock number and date of manufacture
3. Manufacturer's name
4. Contents by volume, for major pigment and vehicle constituents
5. Thinning instructions where recommended
6. Application instructions
7. Color name and number

B. Storage of Materials

1. Only acceptable project materials shall be stored on project site.
2. Store materials in compliance with manufacturer's requirements in a location approved by the City's Representative. Area shall be kept clean and accessible.
3. Storage shall be restricted to coating materials and related equipment only.

PART 2 - PRODUCTS

2.01 Manufacturers:

A. Products manufactured by one of the following shall be provided:

1. Tnemec Company, Incorporated
2. International Coatings
3. Or equal

B. Substitutions

1. No substitutions shall be considered that decrease the film thickness, the number of coats, the surface preparation or the generic type of coating specified. Approved manufacturers must furnish the same color selection as the manufacturers specified, including accent color in all coating systems.

2.02 Materials

A. Only the best grade of the various types of coating suitable for use in water and wastewater treatment plants, as regularly manufactured by acceptable coating material manufacturers, shall be provided. Material not displaying the manufacturer's identification as a best-grade product will not be acceptable.

B. Primers shall be produced by the same manufacturer as the intermediate and finish coats. Use only thinners recommended by the manufacturer and use only to recommended limits.

C. Coatings and pipe markers of durable and washable quality shall be provided. Materials that will withstand normal washing as required to remove grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage shall be used.

2.03 Colors and Finishes

A. Surface treatments, and finishes, are shown under Coating Systems below. All substrates indicated shall be coated whether or not shown on the Drawings, or in Schedules, unless an item is specifically scheduled as not requiring coating.

B. Color Selection

1. The City reserves the right to select non-standard colors for all coating systems specified within the ability of the manufacturer to produce such non-standard colors. Selection of non-standard colors shall not be cause for the Contractor rejecting City's color selections and the Contractor shall supply such colors at no additional expense to the City.

C. Piping Color Code:

1. To be selected by the City.

D. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated.

2.04 Coating Systems

A. Refer to the following Coating System Sheets.

B. The Contractor shall coat all items, which fall into the categories described. The examples given on the coating system sheets are presented for the Contractor's convenience and may not include all items which require coating. In general, all exposed ferrous materials shall be coated. This includes galvanized materials and shop primed material unless specifically excluded elsewhere.

Coating System 2

A. Service:

1. Structural steel, miscellaneous metals, and steel, ductile iron, or cast iron piping
2. Exterior exposure
3. Non-submerged applications (greater than 3' above highest possible water level)

B. Typical Examples:

1. All exposed structural steel including but not limited to columns, beams, roof joists, purlins and other supporting members.
2. Equipment including but not limited to pumps, blowers, air compressors, valves, other process equipment, motors, gear reducers, and equipment guards.
3. Overhead coiling and man doors if not specified door elsewhere.
4. Steel, ductile, or cast iron piping not otherwise coated as specified in piping sections.

C. Shop Surface Preparation:

1. Shop: SSPC-SP 6 Commercial Blast as specified in herein
2. Field: Sandblasting of field welds and other imperfections. City's Representative may require all areas to be blasted at his discretion, SSPC-SP 6, commercial blast as specified in herein.

D. Products and Manufacturer: One of the following shall be provided:

1. Tnemec
   a. Primer: Series V69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
   b. Intermediate: Series V69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
   c. Finish: Series 1075 Endura-Shield - one or more coats, 3.0 - 5.0 total dry mil thickness
      1) Note: Finish color for all non-buried piping to be gunmetal grey.
2. Or equal

Coating System 4

A. Service:

1. Galvanized structural steel, galvanized miscellaneous metals, and galvanized steel pipe.
2. Aluminum tube
3. Exterior exposure
4. Non-submerged applications (greater than 3’ above highest possible water level)

B. Typical Examples:

1. All exposed galvanized structural steel including but not limited to columns, beams, roof joists, purlins and other supporting members.
2. Flashing
3. Galvanized rigid conduit
4. Bollards
5. All buried and exposed aluminum tubing in contact with dissimilar materials including but not limited to other metals, concrete, wastewater, and soil.

C. Surface Preparation:

1. Solvent Cleaning, SSPC-SP 1 as specified in herein, followed by brush off blast to provide an anchor profile of 1.5 to 2.0 mils minimum

D. Product and Manufacturer: One of the following shall be provided:

1. Tnemec
   a. Primer: Series V69 Hi-Build Epoxoline II -- one or more coats, 3.0 - 5.0 total dry mil thickness
   b. Intermediate: Series V69 Hi-Build Epoxoline II -- one or more coats, 3.0 - 5.0 total dry mil thickness
   c. Finish: Series 1075 Endura-Shield -- one or more coats, 3.0 - 5.0 total dry mil thickness
2. Or equal

Coating System 7

A. Service:
   1. Plastics including PVC and CPVC Piping
   2. Interior or exterior exposure
   3. Non-submerged applications

B. Typical Example:
   1. Exposed PVC and CPVC piping.
   2. Notable Exceptions:
      a. Do not coat submerged or partially submerged plastic piping.
      b. Do not coat plastic valves, unions, valve handles or other similar plastic items.
      c. Do not coat exposed PVC conduit or exposed rigid steel with PVC coating conduit.

C. Surface Preparation:
   1. Plastic shall be prepared in accordance with SSPC SP-1 (Solvent Cleaning) followed by SSPC-SP 2 (Hand Tool cleaning). Contractor shall use a solvent compatible with the specified coating and roughen surfaces by sanding.

D. Product and Manufacturer: One of the following shall be provided:
   1. Carboline
      a. Finish: Carbothane 134VOC – two coats, 5.0 total dry mil thickness
   2. Tnemec
      a. Finish: Tnemec Series 1075 – two coats, 5.0 total dry mil thickness
   3. International
      a. Finish: ICI Devoe Devthane 378H - two coats, 5.0 total dry mil thickness
   4. Or equal

PART 3 - EXECUTION

3.01 Examination

A. The Contractor and his applicator shall examine the areas and conditions under which painting work is to be performed and notify the City's Representative in writing of conditions detrimental to the proper and timely completion of the Work. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the City's Representative.

B. The Contractor shall not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.02 Preparation

A. Coordination:

1. The Contractor shall review installation procedures under other Sections and coordinate the installation of items that must be field painted in this Section.
2. The Contractor shall coordinate the painting of areas to be painted that will be inaccessible once equipment has been installed.
3. The Contractor shall provide finish coats that are compatible with the prime paints used.
4. The Contractor shall review other Sections of these Special Provisions in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates.
5. The Contractor shall be responsible for the compatibility of all shop primed and field painted items in this Contract.
6. The Contractor shall furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used. Barrier coats shall be provided over incompatible primers or primers shall be removed and re-primed as required.

B. Protection:

1. Finished Work of other trades and surfaces not being painted concurrently or not to be painted shall be covered or otherwise protected.
2. Work of other trades shall be protected, whether to be painted or not, against damage by the painting and finishing work. All such work shall be left undamaged. All damage shall be corrected by cleaning, repairing or replacing, and repainting, as acceptable to the City's Representative.
3. Wet Paint signs shall be provided as required to protect newly painted finishes. All temporary protective wrapping provided for protection of this Contract shall be removed after completion of painting operations.

C. Surface Preparation

1. General:
   a. All preparation and cleaning procedures shall be performed as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.

b. All hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted shall be removed or provided surface applied protection prior to surface preparation and painting operations. The Contractor shall remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, the removed items shall be reinstalled by workmen skilled in the trades involved.

c. Surfaces to be painted shall be cleaned before applying paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. The cleaning and painting shall be programmed so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

d. All surfaces that were not shop painted or that were improperly shop painted, and all abraded or rusted shop painted surfaces, which are to be painted, as determined by the City's Representative, shall be prepared as specified below.

2. Concrete and Masonry Surfaces:

a. Surfaces of concrete, precast concrete, and concrete block to be painted and sealed with clear finish shall be prepared by removing all efflorescence, chalk, dust, dirt, grease and oils with soap and water.

b. The alkalinity and moisture content of the surfaces to be painted shall be determined by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, this condition shall be corrected before application of paint. The City's Representative shall be provided with suitable testing materials to carry out alkalinity and moisture tests.

c. The Contractor shall not paint over surfaces where the moisture content exceeds 8 percent, unless otherwise permitted in the manufacturer's printed directions.

d. Concrete and concrete block surfaces that cannot be adequately cleaned by soap and water shall be acid etched. Exceedingly dense concrete may require a second etching.

e. Brush blast clean shall be equivalent to SSPC-SP 7, to open bug holes and remove all non-adhering concrete. All areas so prepared shall be thoroughly cleaned before beginning coating work.

3. Ferrous Metals:

a. Non-submerged ferrous surfaces, including structural steel and miscellaneous metal to be shop primed, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by commercial blast cleaning complying with SSPC-SP 6.

b. Submerged ferrous surfaces, including structural steel and miscellaneous metal to be shop primed, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP 10.

c. Non-submerged, ferrous surfaces that have not been shop-coated shall be cleaned of all oil, grease, dirt, loose mill scale and other foreign substances by commercial blasting, complying with SSPC-SP 6.

d. Submerged ferrous surfaces that have not been shop-coated or that, in the opinion of the City's Representative, have been improperly shop-coated, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP 10.

e. Bare and blasted or pickled clean metal shall be treated with metal treatment wash coat, prior to priming only if recommended by the paint manufacturer.

f. Shop applied prime coats that have damaged or bare areas shall be touched-up with primer recommended by the coating manufacturer after commercial blasting complying with SSPC-SP 6.

g. Weld Preparation: Remove weld spatter and slag by chipping or grinding. Grind all sharp edges and corners to a smooth contour. Welds to be ground free from undercuts, recesses and pinholes.

4. Non-Ferrous Metal Surfaces:

a. Non-ferrous metal surfaces shall be cleaned in accordance with the coating system manufacturers instructions for the type of service, metal substrate, and application required.

5. Galvanized Surfaces:

a. The Contractor shall clean free of oil and surface contaminants with solvent or other methods recommended by the coating manufacturer, complying with SSPC-SP 1.

b. All coated galvanized ferrous metal, interior and exterior, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by a brush-off blast cleaning complying with SSPC-SP 7 with 1.5 to 2.0 mils profile.

D. Materials Preparation

1. General:

a. Painting materials shall be mixed and prepared in strict accordance with the manufacturer's directions.

b. Coating materials produced by different manufacturers shall not be mixed, unless otherwise permitted by the manufacturer's instructions.

c. Materials not in actual use shall be stored in tightly covered containers. Containers used in storage, mixing, and application of paint shall be maintained in a clean condition, free of foreign materials and residue.

d. All materials shall be stirred before application to produce a mixture of uniform density, and as required during the application of the materials. Any film that may form on the surface shall not be stirred into the material. The film shall be removed and, if necessary, the material shall be strained before using.

e. Brush stripe edges and corners to achieve specified coating thickness and coverage.

2. Tinting:

a. Each undercoat shall be tinted a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Undercoats shall be tinted to match the color of the finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat. A code number shall be provided to identify material tinted by the manufacturer.

3. Mixing:

a. The Contractor shall mix only in mixing pails placed in a suitably sized non-ferrous or oxide resistant metal pans to protect concrete floor from splashes or spills which could stain exposed concrete or react with subsequent finish floor material.

b. Paint shall be mixed and applied only in containers bearing accurate product name of material being mixed or applied.

3.03 Application

A. General:

1. Paint shall be applied by mechanical application techniques such as roller, brush, trowel, air spray, or airless spray in accordance with the manufacturer's directions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable, or as required in these Special Provisions. Brushes best suited for the type of material being applied shall be used. Where approved by the City's Representative, rollers of carpet, velvet back, or high pile sheep's wool shall be used, as recommended by the paint manufacturer for material and texture required.
2. The number of coats and paint film thickness required is the same regardless of the application method. Succeeding coats shall not be applied until the previous coat has completely dried.
3. Where multiple coats of the same material is used, tint prime and intermediate coats in order to distinguish each coat.
4. Additional coats shall be applied when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense primary accent colors. The Contractor shall insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
5. Surfaces not exposed to view do not require color coding but require the same coating systems specified for exposed surfaces. Exposed to view surfaces are defined as those areas visible when permanent or built-in fixture, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.
6. The backs of access panels and removable or hinged covers shall be painted to match the exposed surfaces.
7. Aluminum parts in contact with dissimilar materials shall be painted as specified with appropriate finish.
8. Brush stripe welds; bolts; nuts; edges and corners to achieve proper coating thicknesses.

B. Electrical Work:

1. Electrical items to be painted include, but are not limited to, the following:
   a. Conduit and fittings.
   b. Miscellaneous panels, junction boxes, motors and accessories.

C. Minimum / Maximum Coating Thickness:

1. The Contractor shall apply each material at not less than the manufacturer's recommended spreading rate and provide total dry film thickness as specified. Extra coat shall be applied if required to obtain specified total dry film thickness or uniform opacity. If the recommended maximum coating thickness is exceeded, the excess amount will be removed and repaired as specified.

D. System Coating Thickness:

1. The system total dry mil thickness shall be the sum of the Primer, Intermediate and Finish Coats specified.

E. Scheduling Painting:

1. The first-coat material shall be applied to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before

subsequent surface deterioration. Abrasive blasted ferrous metal surfaces shall be coated within eight (8) hours on the same day of abrasive blasting.

2. Subsequent coats shall be applied as per manufacturer's written recoat parameters as detailed on their product data sheet. Sufficient time between successive coating shall be allowed to permit proper drying. The Contractor shall not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting of loss of adhesion of the undercoat.

F. Prime Coats:

1. Primed and sealed walls and ceilings shall be recoated where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.

G. Pigmented (Opaque) Finish:

1. The Contractor shall completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

H. Brush Application:

1. All brush coats shall be brushed-out and worked onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. All glass and color break lines shall be neatly drawn.

I. Mechanical Applicators:

1. Mechanical methods shall be used for paint application as suggested by the paint manufacturer. Conduct spray coating under controlled conditions. Protect adjacent structure for overspray.

2. For spray application, apply coating to thickness not greater than suggested in paint manufacturer's instruction.

3. Wherever spray application is used, each coat shall be applied to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of 2 coats in one pass.

3.04 Field Quality Control

A. The right is reserved by the City's Representative to invoke the following material testing procedure at any time, and any number of times during the period of field painting:

1. Engage the service of an independent testing laboratory to sample any of the paint being used. Samples of materials delivered to the project site will be taken, identified and sealed, and certified in the presence of the Contractor.

2. The testing laboratory will perform appropriate tests for any or all of the following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative material analysis.

3. If the test results show that the material being used does not comply with the specified requirements, the Contractor may be directed to stop the painting Work, and remove the non-complying paint; pay for testing; repaint surfaces coated with the rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with the specified paint, the two coatings are non-compatible.

B. Prior to initial coat and after completion of each successive coat of paint, the Contractor shall notify the City's Representative. After inspection, checking of film thickness and approval by the

City's Representative, proceed with the succeeding coat. Contractor shall supply the City's Representative for his use a Gardner dry-film thickness gage.

3.05 Cleaning

A. During the progress of the Work, all discarded paint materials, rubbish, cans and rags shall be removed from the site at the end of each work day.

B. Upon completion of painting work, all paint-spattered surfaces shall be cleaned. Spattered paint shall be removed by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, all damaged or defaced painted surfaces shall be touched-up and restored, as determined by the City's Representative.

3.06 Demonstration

A. Completed Work:

1. The Contractor shall match approved samples for color, texture and coverage.
2. Work not in compliance with specified requirements shall be removed, refinished or repainted, as required by the City's Representative.

**** END OF SECTION ****

SECTION 16010
GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 Summary

A. This division includes the provisions for all material, labor, tools, equipment, testing and services necessary to provide a complete and operable electrical system.

B. The provisions of this Section shall apply to all electrical items specified in the various sections of Division 16 (Electrical), Division 17 (Instrumentation) and all other Divisions specifying electrical items of these Special Provisions, except where otherwise specified or shown on the Contract Documents.

C. Furnish all necessary labor, materials, equipment and incidentals required to install a complete and operational electrical system according to the intent of this Special Provision and the accompanying drawings, whether itemized or not.

D. Examine the Special Provision and drawings for mechanical equipment and provide all starters, circuit breakers, switches, pushbuttons and appurtenances, which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.

E. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contractor's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction; ensure that adequate protection from these atmospheres is provided that is acceptable to the City’s Representative. Cap conduit runs during construction. Energize all space heaters furnished with equipment.

F. Interpretation of Drawings:

1. Any error or omissions of detail in either the drawings or the Special Provisions shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical system.

2. The Contractor shall inspect the site and verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.

3. The electrical drawings are diagrammatic, but shall be followed as closely as existing conditions and work of other contractors will permit. All deviations from the drawings required to make the work conform to structures as constructed, and to the work of others, shall be made at the Contractor's expense.

4. The Contractor shall examine the architectural, structural, mechanical and manufacturer's drawings for the various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.

5. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.

6. Existing Conditions:

   a. The electrical drawings were developed from past record drawings and information supplied by the Owner.

b. Carry out any work involving the shutdown of existing services to any piece of equipment now functioning or the tie-in of equipment to the existing system at such time as to provide the least amount of inconvenience to the . Provide such work when directed by the City's Representative.

c. After award of Contract, confer with Engineer to verify at each area of construction activity the location of existing underground utilities. Protect all existing underground utilities during construction.

d. NO work shall be started that involves the existing electrical system without first obtaining and completing all coordination forms required by the City.

e. Prior to staring any underground work the Contractor shall obtain all the information of the underground utilities or obstructions from the Engineer and take proper precautions to locate the utilities by potholing or other approved means in accordance with Special Provisions.

G. Substitutions – No Substitutions shall be allowed unless specifically noted as "or equal" or as "or approved equal."

1. The contract documents were developed using the first named manufacturer to determine physical space requirements, conduit and wiring requirements, capacities/ratings and implementation of the contract electrical and instrumentation. When indicated in the contract documents, the contractor may elect to use one of the other named manufacturers, or where allowed, provide equivalent previously unnamed manufacturers. Any deviations from the contract documents that result from using a manufacturer other that the first named manufacturer are the responsibility of the contractor.

2. Specific brand names and catalog numbers are used to describe materials in order to establish standards of performance and quality.

3. The decision of the Engineer shall govern as to what is equal to the item specified. Equality will be judged on the basis of the following:

   a. Conformance with description or performance required

   b. Equal in quality

   c. Comparable in appearance and artistic effect where these are considerations

   d. Comparable operation, maintenance and performance

   e. Equal in longevity and service under conditions of climate and usage

   f. Conformance with space allocations and requirements for operations from mechanical or electrical services provided without necessitating changes in details and construction or related work

4. If the Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Engineer.

5. Any material, article, or method judged by the Engineer equal to that specified will be approved, provided the Contractor submits a single written request to the Engineer, per Special Provisions Section, with the following information for each item:

   a. Name of manufacturer or supplier

   b. Trade or brand name

   c. Type, model, style, and/or catalog number

   d. Size or capacity rating

6. The Contractor assumes full responsibility for including complete, correct data in this one request and shall also attach completely referenced diagrams descriptive and technical data sheets for the Engineer's determination of equality or suitability of appearance of any substitution item. Only one such request may be submitted. The Engineer's rejection of any substitute shall automatically require the Contractor to furnish the specified item without further discussion or delay.

1.02 REFERENCES

A. Electrical work, including connection to electrical equipment integral with mechanical equipment described elsewhere in these Special Provisions, shall be performed in accordance with the latest published regulations of the following codes and standards:

Reference	Title
	Federal Standards
	State Codes and Ordinances and Inspecting Authorities
	Local Codes and Ordinances and Inspecting Authorities
	The National Board of Fire Underwriters
NFPA	National Fire Protection Association
UL	Underwriters Laboratories
NEMA	National Electrical Manufacturers' Association
ANSI	American National Standards Institute
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
OSHA	State Department of Industrial Safety
	State Public Utilities Commission
NEC	National Electrical Code (NEC) for all items not specifically covered the state and local ordinance.
NFPA 79	Electrical Standard for Industrial Machinery
AHJ	Authority Having Jurisdiction, City of Santa Rosa

B. Nothing in these special provisions or on the drawings shall be interpreted as permission or direction to violate any governing code or ordinance.

C. Materials and equipment used in the performance of the electrical construction shall be fully UL approved for the class of service for which they are intended prior to submittal of shop drawings.

D. Without limiting the generality of other requirements of these Special Provisions, all work specified herein shall conform to or exceed the applicable requirements of the National Electric Code (NEC); provided, that where a local code or ordinance is in conflict with the NEC, the provisions of said local code ordinance shall take precedence.

E. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the Cal OSHA Safety orders (Title 8, CCR), State Building Standards, and applicable local codes and regulations

1.03 System Description

A. The general extent of the electrical work includes, among others, the furnishing and installing of the following items:

1. Demolition of the existing systems indicated on the Drawings.
2. New standby generator, automatic transfer switch, manual transfer switch, and antennal mast.
3. All supports, bases, anchors, sleeves, hangers, conduit seals, and the like, all electrical work shown and/or specified, not particularly mentioned above
4. Complete grounding systems
5. Instruction, maintenance and overhaul manuals
6. Installation of panels
7. Installation of conduit and conductors between field equipment and panels including termination of conductors within the panels
8. Conduit, wire, cable terminations, and equipment mounting associated with the Instrumentation System
9. Interconnection wiring diagrams
10. Integration of new control points with existing programmable controller and programming
11. Integration of new control points with existing Operator Interface Terminal and programming
12. Electrical connections to all Mechanical equipment and instruments
13. Electrical Tests

B. Manufacturer’s Directions: Manufacturer's directions shall be followed in all cases where manufacturers furnish instructions covering points not shown on the drawings or herein specified.

1.04 Submittals

A. General: Submittals for all electrical equipment provided under this project manual shall be prepared and submitted within 60 days after notice to proceed.

B. Materials and Equipment Schedules: The Contractor shall deliver to the Engineer a complete list of all materials, equipment, apparatus, and fixtures which it proposes to use. The list shall include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.

C. The submittal package for each individual equipment or groups of related equipment shall be complete and in accordance with this Section. As a condition precedent to the review of submittals and with the requirements of Special Provisions, the Contractor shall furnish the manufacturer's statements accepting unit responsibility. The purpose of this provision is to ensure compatibility of all components specified under the specific Special Provision and to provide sole source responsibility for system performance and maintenance. Not withstanding these provisions, however, the Contractor is not relieved of his responsibility for the indicated portions of the work. The following, as a minimum, shall be submitted:

1. Manufacturer and manufacturer's type and designation
2. Manufacturer's catalog data indicating rated capacity, efficiency, rated output and other characteristics
3. Manufacturer's catalog cut sheets shall be annotated to indicate all relevant items to the Project
4. Any exception to these Special Provisions along with justification for each exception shall be clearly stated on the first page of the submittal

5. Shop drawings
6. Parts list with material of construction
7. Installation requirements, showing various clearances required
8. Details of all appurtenances to be furnished with the specified item

D. Shop drawings are required for materials and equipment listed in this and other sections. Shop drawings shall provide sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Special Provisions. The following shall be included:

1. Front, side, and rear elevations, footprints and top views, with dimensions
2. Location and size of conduit entrances and access plates
3. Component data
4. Connection diagrams, terminal diagrams, schematic wiring diagrams, conductor size, and type, etc.
5. Method of anchoring and embedded structural members; weight
6. Finish
7. Nameplates
8. Temperature limitations, as applicable
9. Rating of equipment as per Special Provisions and drawings
10. NEMA rating of enclosures
11. Approved listing

E. Catalog data shall be submitted to supplement all shop drawings. Catalog cuts, bulletins, brochures, or the like or photocopies of applicable pages thereof shall be submitted for mass produced, non-custom manufactured material. These catalog data sheets shall be stamped to indicate the project name, applicable Special Provision section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the stamp.

F. Record Drawings: In addition to the Record Drawings as a part of the record drawing requirements specified in the General Requirements, the Contractor shall show depths and routing of all concealed below-grade electrical installations. Said set of record drawings shall be available to the Engineer and the Inspector during construction. After final inspection, the Contractor shall transfer all record drawing information to a set of reproducible vellums which shall then be delivered to the Engineer. In addition, the Record Drawings shall show all variations between the work as actually constructed and as originally shown on the Drawings, based upon information supplied by the Contractor.

G. Manufacturer's Drawings: One set of equipment manufacturer's drawings shall be submitted to the Engineer for its records.

H. The Contractor shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of spare parts of the General Requirements. After approval, Contractor shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. Contractor shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the City, only. Any spare parts which the Engineer permits the Contractor to use for startup activities shall be replaced by the Contractor prior to the City's acceptance of beneficial use of the equipment.

1. During the term of this Contract the Contractor shall notify the Engineer in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the Engineer determines that the modified parts are no longer applicable to the supplied equipment, the Contractor at its expense shall provide applicable spare parts.

1.05 Quality Assurance

A. Performance and Design Requirements

1. Manufacturer's Qualifications: The equipment furnished under this division shall be the product of firms regularly engaged in the design and manufacture of the type of item specified, possessing the required technical competence, skill, resources and ability to complete the work specified herein with the requisite degree of quality in a timely and efficient manner. The Contractor shall be prepared to adequately document the qualifications of the manufacturers nominated to provide the equipment specified under this division. All documentation shall be submitted to the City's Representative prior to design fabrication and shipment of any component specified herein. Nothing contained within these provisions shall be construed as relieving the Contractor of his responsibility for any portion of the work covered by this Section.
2. Arrangement: The drawings are generally diagrammatic and the location of outlets and equipment terminals are approximate unless detailed or dimensioned. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences and the location of electrical terminations on equipment.
3. The Contractor shall examine the structural and mechanical plans and shop drawings for the various equipment to determine exact routing and final terminations for all raceways and cables. Conduits shall be stubbed up as near as possible to equipment terminals and shall be within the concrete base for the equipment or a separate concrete curb.
4. All conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, the Contractor shall submit proposed locations to the Engineer for review. Where equipment is installed without instruction by the Engineer and City must be removed, it shall be removed without additional cost to the City.
5. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.
6. Allowance has been made in the design for the number of raceways, cables and conductors considered adequate for feeding the various drives and equipment. These circuits and diagrams are based on available data pertaining to the particular design of equipment and portray the systems, which the City has chosen to effect the required operation and level of control. Equipment provided by the Contractor (even though of the make and model specified) may differ in detail, arrangement, or connections from that shown. If the Contractor uses equipment which differs from the equipment shown in major aspects and requires modifications to power, control or other electrical service, the 's acceptance of the equipment will be based upon the Contractor providing the modifications required, and they shall be of the same quality as shown and shall be provided at no additional cost to the .
7. Protection of Equipment and Materials: The Contractor shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the work and until acceptable by the Engineer and the Inspector.

8. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.
9. The Contractor shall replace or have refinished by the manufacturer, all damaged materials or equipment, including face plates of panels and switchboard sections, at no expense to the .
10. Tests: The Contractor shall make all tests required by the Engineer or the Inspector or other authorities having jurisdictions as per applicable standards.. All such tests shall be performed in the presence of the Engineer or the Inspector. The Contractor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation. Operational testing shall be performed on all equipment furnished and/or connected in other Sections of Division 16. Electrical and all other divisions specifying electrical items including furnishing of support labor for testing.
11. Standard test reports for mass-produced equipment shall be submitted along with the shop drawing for such equipment. Test reports on testing specifically required for individual pieces of equipment shall be submitted to the Engineer and the Inspector for review prior to final acceptance of the project.
12. Any test failure shall be corrected in a manner satisfactory to the Engineer and Inspector.
13. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in these particular Special Provisions or shown on the drawings.
14. The Contractor shall apply and pay for all permits required by any of the legally constituted public authorities for the installation or construction of the work included under this Division. The Contractor shall arrange and pay for any inspections or examinations so required and deliver certificates of all such inspections to the City's Representative. When these Special Provisions call for materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of the Special Provisions shall take precedence.

B. Operating Requirements:
1. Permits: The Contractor shall pay for permits, inspections and other costs incidental to providing electrical installations.
2. Contractor's Record Drawings: The Contractor shall maintain a neatly marked set of record drawings showing the installed location and routing of conduits, trays, cables, junction boxes, pull boxes, outlets, and interconnection circuits, etc., and the current status of control circuits as reflected on the control diagrams to the satisfaction of the Engineer
3. Inspection: The Contractor shall cooperate with the Engineer and shall provide assistance at all times for the inspection of the electrical work performed under this contract. The Contractor shall remove covers, operate machinery, or perform any reasonable work which, in the opinion of the Engineer, is necessary to determine the quality and adequacy of the work.

C. Quality of Materials
1. All electrical materials used on this project shall be new and free from defects.
2. All electrical materials used on this project shall conform where applicable, to the following standards, unless otherwise noted:
   a. NEMA - National Electrical Manufacturers Association
   b. ANSI - American National Standards Institute
   c. UL - Underwriters Laboratories, Inc

3. Each type of material shall be of the same manufacturer and quality throughout the work.

1.06 Delivery, Storage, and Handling

A. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturer's recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in indoor locations that are clean and dry. Items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls store in clean, dry, indoor, heated locations. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in all new equipment.

B. Shipment: The major equipment items listed in this provision and furnished under this contract shall be shipped in sealed, weather-tight, enclosed conveyances in a manner designed to protect the equipment against damaging stresses during transport.

C. Inspection

1. The Contractor shall cooperate with the Engineer and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate machinery, or perform any reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality or adequacy of the work.
2. If any material does not conform to these Special Provisions the Contractor shall, within three days after being notified by the Engineer, remove the materials from the premises.
3. Work shall not be closed in or covered before inspection and approval by the Engineer. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor.

D. Supervision and Workmanship

1. The Contractor shall employ a competent electrical foreman with good English communication skills on the job throughout the entire period of construction to see that his work is carried on without delay and completed as rapidly as possible.

E. Cooperative Work with Others

1. The Contractor shall cooperate with others, with due regard to their work, towards promotion of rapid completion of project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provision in time by Contractor, then he shall bear expense of such changes as necessary to be made in work of others.
2. Labor and materials, including templates, sleeves, anchors, concrete inserts and the like shall be furnished in ample quantities at such times as necessary to ensure uninterrupted progress of work.
3. Contractor shall cease work at any particular point temporarily and transfer his operations to such points or execute such portions of work as directed, when in the judgment of the Engineer it is necessary to do so.

F. Cleanup

1. In addition to the requirements of Special Provisions, in all parts of the materials and equipment shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. All oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners scraped out.
2. During the progress of the work, the Contractor shall clean the premises and shall leave the premises and all portions of the site free of debris

1.07 Project / Site Conditions

A. General: For purposes of delineating electrical enclosure and electrical installation requirements of this project, certain areas have been classified in the Contract Documents as defined below. Electrical installations within these areas shall conform to the referenced code requirements for the area involved.

B. Seismic Consideration

1. All structures shall be designed in accordance with Section 01900 and the requirements for Site Class D in accordance with Section 1613.3.2 of the 2013 CBC and Table 20.3-1 of ASCE 7-10.

2. Before any concrete pours associated with electrical equipment anchoring can begin, seismic calculations and submittals shall be approved by the Engineer.

3. Each piece of equipment installed shall be anchored as required for Site Class D in accordance with Section 1613.3.2 of the 2013 CBC and Table 20.3-1 of ASCE 7-10. No equipment shall be anchored to vertical structural elements without written approval of the Engineer. Vibration isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4 inch.

4. Vibration isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4 inch.

5. All raceways, ductwork, accessories, and appurtenances, furnished with equipment shall be anchored to resist a lateral seismic force of 40 percent of its operating weight without excessive deflection. This force shall be considered acting at the center of gravity of the piece under consideration.

6. Calculations and shop drawings shall be submitted for all anchorage details. All calculations shall be made and signed by a registered engineer in California. In as much as all anchorage of equipment is to be made of cast-in-place concrete elements, it is imperative that types of anchorage be coordinated with the concrete contractor so that anchorage may be installed at the time of concrete placement. If calculations and anchorage details are not submitted prior to placement of the concrete, the Contractor shall be responsible for any strengthening of concrete elements because of superimposed seismic loading.

C. Unclassified Field Locations

1. Field equipment located in interior areas which have not been classified as hazardous locations as defined by the National Electrical Code, Article 500, may be subjected to ambient temperatures varying from 10 degrees F and 115 degrees F and relative humidity ranging from 10 to 90 percent. Incidental quantities of hydrogen sulfide gas and dust also may be present.

2. In exterior areas, ambient temperatures may vary from 10 degrees F and 115 degrees F with strong direct radiation from the sun. Relative humidity in all exterior field areas will vary from 10 to 100 percent with condensation and icing occurring. All areas may have trace quantities of hydrogen sulfide gas with wind blown dust, sand, hail, and rain occurring.

3. In exterior locations, exposed conduits shall be PVC coated Rigid Steel entrances shall be threaded; and fittings shall have gasketed covers. Provisions shall be made to drain the fitting or conduit system. Threaded fastening hardware shall be stainless steel. Mounting brackets shall be galvanized. Attachments or welded assemblies shall be galvanized after fabrication.

Instruments and control cabinets, panels, switchboards and motor control centers shall be "Weatherproof NEMA Type 3R." Enclosures shall be mounted 1/4-inch from walls to provide an air space, unless specifically shown otherwise.

D. Damp Location: Locations which are indoors and 2 feet below grade elevation or which are classified as damp locations on the Drawings shall have electrical installations which conform to the requirements for outdoor locations; except, that the air space from walls may be less than 1/4-inch and enclosures shall be NEMA Type 2. "Damp locations" shall include pipe galleries, tunnels, and basements. All rooms housing liquid handling equipment are also classified as damp locations regardless of grade elevation.

E. Splash Locations: Areas shown as splash-proof shall have electrical installations as described for "outdoor locations"; except, that NEMA Type 4 enclosures shall be provided for instruments and controls, panels, switchboards, and motor control centers.

F. Classified Field Locations

1. Field equipment located in hazardous areas shall comply with the National Electrical Code, Article 500.

2. Hazardous Locations: Areas shown as hazardous shall have electrical installations suitable for Class 1, Division 1, Group C and D locations as required under NFPA 820 and Cal/OSHA Safety orders (Title 8, CCR). Enclosures shall be NEMA type 7**.**

3. For this project, hazardous areas of the facility are as follows:

   a. None designated

G. Corrosive Locations

1. Field equipment located in areas subject to ammonia, corrosive fumes, or liquid chemical spills shall utilize materials and equipment specifically for corrosive areas.

2. Corrosive locations shall have stainless steel threaded hardware; all other electrical hardware, fittings, and raceway systems shall be PVC-coated. Enclosures shall be of fiberglass reinforced polyester or 316 stainless steel and meet NEMA Type 4X requirements.

H. Electrical Equipment Enclosures

1. Remote electrical units located in electrical equipment enclosures will be subjected to environmental conditions where temperatures may vary from 10 degrees F and 115 degrees F; relative humidity may range from 10 to 100 percent; and dust and trace quantities of chlorine may be present.

2. In exterior areas, ambient temperatures may vary from 10 degrees F and 115 degrees F with strong direct radiation from the sun. Relative humidity in all exterior field areas will vary from 10 to 100 percent with condensation and icing occurring. All areas may have wind blown dust, sand, hail, and rain occurring

1.08 Sequencing and Scheduling

A. Sequencing and scheduling plan shall be provided that minimizes station downtime. Note that the station must remain operational during all phases of construction.

1.09 Maintenance

A. Information to be provided:

   a. Wiring and interconnection diagrams which show terminal blocks of all distribution and control assemblies; all power, control and signal raceways; junction and pull boxes; all devices; and all interconnecting wiring. Diagrams shall show conductor tag numbers, control wire color code as applicable and power wire and cable sizes.

b. The outgoing power and control wires shall be run as single lines representing the raceways and shall show any junction boxes or ancillary control devices that may be located in the raceway system or tapped off the raceway along the route. All raceways shall be appropriately identified showing the proposed tag inscription. Wires are to be fanned out and labeled at each point showing the terminal number of the wire and typical wire tags. For factory wired equipment, both the factory terminal numbers as well as the terminal numbers shown on the contract control diagrams shall be shown. If additional space is required, more than one sheet may be used for the connection diagram.

c. Operation and maintenance data

d. Maintenance manuals

e. Installation certificates

PART 2 - PRODUCTS

2.01 Equipment and Materials

A. All material and equipment shall be new, free from defects, of current manufacture, and of the quality specified or shown, and shall be listed by the Underwriters Laboratories Inc. (UL) for the purpose for which it is to be used where such listing has been applied by UL to similar products. Each type of material shall be of the same manufacture and quality throughout the work.

B. Where more than one unit of the same class of material or equipment are required, provide products of a single manufacture. Component parts of materials or equipment of the same manufacturer are preferred.

C. All electrical equipment shall be approved by a testing laboratory recognized by the City and shall conform to all applicable requirements of the latest edition of the California Building Code. In lieu of such approval, the Contractor must submit the equipment for approval to the independent NETA certified electrical testing laboratory. This shall include the plant preferred list of equipment and components specified in the plans and Special Provisions. Contractor shall also include in his delivery schedule the approval time required by the independent NETA certified electrical testing laboratory for equipment without UL listing.

D. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers' latest standard design that conforms to these Special Provisions.

E. Equipment Finish: Provide materials and equipment with manufacturers' standard finish system, in accordance with Division 9 Finishes. Provide manufacturers' standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in accordance with Division 9 Finishes with ANSI No. 61, light gray color.

2.02 Fabrication

A. Corrosion Protection

1. Unless otherwise noted, all equipment and appurtenances provided under this section shall be treated with zinc phosphate, bonderized or otherwise given a rust-preventive treatment, then primed and painted with a durable enamel finish. Minimum dry film thickness shall be 3 mils. The Contractor shall ensure that all panels or enclosures specified to be painted in this section shall match in color Plymouth Rock Gray on all exterior surfaces and flat white on all interior surfaces. Nonconforming panels shall be repainted.

2. Field painting of all equipment shall conform to the procedure or outline in applicable sections of the Special Provisions that specify painting and finishing.

3. Galvanizing, where specified, shall conform to the applicable division of the Special Provisions. Galvanized equipment and appurtenances shall not be shop primed or painted but shall be field painted and touched up as specified and directed by the Engineer.

B. Special Tools: The Contractor shall provide all special tools required for operation and maintenance of the equipment. The tools shall be considered as part of the product and become the property of the City

2.03 Source Quality Control

A. Hazardous Locations: Provide materials and equipment acceptable to the regulatory authority having jurisdiction for the Class, Division, and Group of hazardous area indicated.

PART 3 - EXECUTION

3.01 Preparation

A. Maintain continuity of electric service to all functioning portions of the process or buildings during hours they are normally in use. Temporary outages will be permitted during cutover work at such times and places as can be prearranged with Engineer and the electric utility company providing service to the facility. Such outages shall be kept to a minimum number and minimum length of time. Make no outages without prior written authorization of the Engineer and notification of the City's Representative. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work.

3.02 Installation

A. For all areas designed as hazardous areas, install all materials and equipment in a manner acceptable to the regulatory authority have jurisdiction for the Class, Division and Group of hazardous area indicated.

B. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between the manufacturers' instructions, codes and regulations, and these Contract Documents, follow Engineer's decision. Keep copy of manufacturers' installation instructions on the jobsite available for review at all times.

C. Use appropriate conduit and conductor entry fittings with enclosures which maintain the specified enclosure environmental capability after proper installation.

D. Relocation or Removal of Materials and Equipment:

1. For existing materials and equipment that are to be relocated, remove all materials no longer used such as studs, straps, conduits and wire. Where not required for used in the relocation, remove or cut off concealed or embedded conduit, boxes or other materials and equipment to a point at least 3/4-inch below the final finished surface.

2. For existing materials and equipment that are to be remove, remove all materials no longer used such as studs, straps, conduits and wire. Remove or cut off concealed or embedded conduit, boxes or other materials and equipment to a point at least 3/4-inch below the final finished surface. Any equipment to be removed that is currently is working condition, shall be returned to the Owner unless otherwise noted in the Contract Documents.

3. Repair affected surfaces to conform to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner. Follow any specific instructions given under Division [9], Finishes. Utilize skilled craftsmen of the trades involved.

E. Cutting and Patching

1. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of Engineer or the Inspector. Carefully carry out any cutting,

channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to original condition. Utilize skilled craftsmen of the trades involved.

3.03 Field Quality Control

A. Each item of equipment provided as a part of this project shall be installed, aligned and tested by skilled workmen to the tolerances recommended by the equipment manufacturer. Provide work which has a neat and finished appearance. Carry out work in accordance with NECA Standard of Installation unless otherwise specified.

B. Allow materials, equipment, and workmanship to be inspected at any time by the Engineer or the City's Representative. Correct work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a manner satisfactory to the Engineer and the City's Representative.

C. Testing and Start-Up

1. General

   a. The Contractor shall furnish all labor, materials, instruments and tools to make all connections for testing. All electric power, fuel, water, supplies, and utilities required for all tests shall be provided by the Contractor.

   b. During checkout and startup of the various plant systems, provide a crew of skilled craftsmen to be available for checkout and troubleshooting activities as required by the ENGINEER. Since coordination with other crafts and Contractors will often be required, the craftsmen assigned to checkout must be available outside normal working hours when necessary.

   c. All equipment shall be demonstrated as operating properly prior to the acceptance of the work.

   d. These tests shall be made in the presence of the City's Representative and the results will be recorded by the City's Representative. All deficiencies or unsatisfactory conditions, as determined by the City's Representative or inspecting authorities, shall be corrected by the Contractor in a satisfactory manner at the Contractor's expense.

2. Protective Devices: All protective devices shall be properly set and operative during the testing period. Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment.

3. Inspection of Joints: Joints and connections in conductors No. 6 AWG and larger shall be inspected by the City's Representative after the joints have been made and prior to application of any tape.

4. Preliminary Testing: After the visual inspection of joints and connections and the application of tape and other insulating materials, all sections of the complete system of wiring shall be thoroughly tested for shorts and grounds. The Contractor shall correct all defects.

5. Insulation Resistance Tests:

   a. Wire and Cable: All wires and cables to be used as feeders, branch circuit wiring, control circuits and other wiring shall be tested with an insulation resistance tester rated 1000 volts D.C. and capable of measuring 2000 megohms. Single-conductor wires and cable shall have a resistance to ground not less than 200 megohms, and conductors of multiple-conductor cables shall have a resistance to ground not less than 100 meg-ohm. Solid

state device circuits shall not be meggered directly. Solid state devices shall be disconnected prior to resistance tests.

b. Tests: The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured for the following:

1) Motor feeders shall be measured with the motor disconnected.

2) Control circuits shall be measured with pushbuttons, interlocking relays, instruments, overcurrent devices, and the like connected.

3) Lighting feeders to panelboards shall be measured with the branch circuit breakers open.

4) The test shall be made with the branch breakers closed, and with receptacles and fixtures mounted, but before lamping.

5) Power feeders shall be measured with switches and circuit breakers in place.

6. Equipment Tests

a. The following tests, if applicable to this project, shall be performed. The tests shall include all new equipment and all existing equipment, if and only if, the existing equipment are affected as shown on the Drawings.

b. Motor Control Centers/Switchboards -The following tests shall be performed

1) The main bus and all power and control circuits shall be meggered.

2) The wire terminals shall be checked and the connections shall be cleaned.

3) All control switches, alarm devices, and indicating instruments shall be checked for proper operation under normal and simulated abnormal conditions.

4) The thermal-overload heaters and the reset mechanism for each motor shall be checked.

5) The motor nameplate full-load current shall be checked as the basis for checking the heater selection.

6) The thermal-overload heaters shall be in accordance with the starter manufacturer's heater tables for motor enclosure and starter enclosure.

c. VFD and RVSS testing shall be per manufacturer’s requirements and by the manufacturer’s representative as required by the extended warranty requirements.

7. Phase Rotation: The connections of all equipment shall be checked for correct phase rotation. Coordinate motor phasing checks with the Engineer’s Representative and the Contractor responsible for the driven equipment. Submit a written report to the Engineer for each motor verifying that phasing has been checked and corrected.

8. Circuit Breakers: The following tests shall be performed:

a. Inspect each circuit breaker.

b. Check for loose connections.

c. Operate each circuit breaker manually.

d. Set the adjustable trips to the values specified.

9. Motor Insulation Testing: Each polyphase motor shall have its insulation resistance to ground measured with 1000 volt "Megger" prior to connection. Values of resistance of less than 100 megohms shall be cause for equipment rejection.

10. Thermal Overload Protective Devices

a. For each motor, the Contractor shall compile the following data in neatly tabulated form. Data shall be obtained from the equipment provided on the job:

   1) Equipment driven

   2) Nameplate amperes

   3) Service factor

   4) Overload device catalog number. Overload device current range and setting

3.04 Adjusting / Cleaning / Protection

A. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The City reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.

B. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturers' recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.

C. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contractor's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided that is acceptable to the Engineer and the Inspector. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.

D. Cleaning and Touchup Painting: Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove all materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish. If extensive damage is done to equipment paint surfaces, refinish the entire equipment in a manner that provides a finish equal to or better than the factory finish, that meets the requirements of the Special Provisions, and that is acceptable to the Engineer and the Inspector.

****END OF SECTION****

SECTION 16011
PROTECTIVE DEVICE COORDINATION STUDY & ARC FLASH ANALYSIS

PART 1 - GENERAL

1.01 Summary

A. The System Integrator (SI) furnishing the electrical panels, or a qualified power system study engineering firm (EF) specified in Section 1.06B hereinafter contracted by the General Contractor (Contractor), shall provide the following electrical power system studies for the project:

1. Arc Flash Hazard Analysis

B. The Contractor shall be responsible for all notification, coordination and scheduling with PG&E . The Contractor shall also be responsible to ensuring that all parties involved in the studies have the necessary information and data to carry out the studies. The SI or EF shall obtain the required information and data from the Electric Utility Company (PG&E), the Engineer and the manufacturers of the equipment and materials.

C. Upon request by the Contractor, the Engineer shall provide the PG&E's contact information to the SI or EF in a timely manner to allow the SI or EF to obtain the required information from PG&E to perform the power study.

D. The Contactor shall be responsible for ensuring that the Arc Flash Hazard Analysis is completed by the SI or EF and approved by the ENGINEER prior to final approval of the electrical panels.

E. If during the studies, the SI or EF finds any inadequacies in the equipment or protective devices, the SI or EF shall make recommendations for improvements as soon as they are identified.

1. All electrical cabinets and disconnects must be rated Arc Flash Hazard Risk Category 2 or less.
2. Any locations noted as greater than Arc Flash Hazard Risk Category 2 shall be immediately brought to ENGINEER's attention. Provide recommendation for any corrective measures that can be made to reduce the Arc Flash Hazard Risk Category to 2 or less.

1.02 References

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these Special Provisions:

Reference	Title
IEEE 141	Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
IEEE 241	Recommended Practice for Electric Power systems in Commercial Buildings
IEEE 242	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
IEEE 399	Recommended Practice for Industrial and Commercial Power System Analysis
IEEE 1015	Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
IEEE 1584	Guide for Performing Arc Flash Hazard Calculations

Reference	Title
ANSI C57.12.00	Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
ANSI C37.13	Standard Application Guide for AC High Voltage Circuit Breakers Used in Enclosures
ANSI C37.010	Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
ANSI C37.41	Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single Pole Air Switches, Fuse Disconnecting Switches and Accessories
NFPA 70	National Electrical Code, Latest Edition
NFPA 70E	Standard for Electrical Safety in the Workplace

1.03 Definitions

A. **Arc Flash Boundary:** The distance from exposed live parts within which a person could receive a 2nd degree burn.

B. **Bus Bolted Fault Current (kA):** The current flowing to a bus fault that occurs between two or more conductors or bus bars, where the impedance between the conductors is zero.

C. **Bus Name:** Fault location for bus report. For line side and load side report options the bus refers to the equipment where the line side and load side protective devices are connected.

D. **Breaker Opening Time:** The time required for a breaker to open after receiving a signal from the trip unit to operate. The combination of the Trip/Delay time and the Breaker Opening time determines the total time required to clear the fault. For low voltage circuit breakers, the total clearing time displayed on the Manufacturer's drawing is assumed to include the breaker opening time.

E. **Equipment Type:** Indicates whether the equipment is Switchgear, Panel, Cable or Open Air. The equipment type provides a default Gap value and a distance exponent used in the IEEE incident energy equations.

F. **Gap:** Defines the spacing between bus bars or conductors at the arc location.

G. **Ground:** Indicates whether the fault location includes a path to ground. Systems with high-resistance grounds are assumed to be ungrounded in the Arc Flash calculations.

H. **Incident Energy:** The amount of energy on a surface at a specific distance from a flash.

I. **Protective Device Arcing Fault Current (kA):** The current flowing through each protective device feeding the electric arc fault. Note that the total arc fault current may flow through several parallel sources to the arc location.

J. **Protective Device Bolted Fault Current (kA):** The portion of the total bolted fault current that flows through a given protective device.

K. **Protective Device Name:** Refers to the protective device that clears the arcing fault or portion of the total arcing fault current.

L. **Required Protective FR Clothing Class (PPE):** Indicates the Personal Protective Equipment (PPE) required to prevent an incurable burn at the working distance during an arcing fault.

M. **Trip / Delay Time:** The time required for the protective device to operate for the given fault condition. In the case of a relay, the breaker opening time is entered separately from the relay trip time. For low voltage breakers and fuses, the trip time is assumed to be the total clearing curve or high tolerance of the published trip curve.

N. **Working Distance:** The distance between the arc source and the worker's face or chest.

1.04 System Description

A. The scope of the studies shall include all new electrical equipment and generator supplied by the Contactor under this Contract.

1.05 Submittals

A. Submit a report in PDF format for review by the Engineer. The report shall include the following as further described in Part 3.

1. Summary of the results of the short circuit and the protective device evaluation and coordination studies as required by Arc Flash Hazards Analysis
2. Description, purpose, basis and scope of the study
3. Single line diagram on 11x17 generated by the selected computer program with node identification
4. Tabulations of electrical capacities and characteristics of the equipment and protective devices
5. Table comparing the calculated short circuit and the equipment ratings
6. Coordination curves showing the proposed settings with the characteristics of the equipment and protective devices shown graphically on industry standard graph paper

B. Submit a subsequent report for review by the Engineer. The report shall include the following as further described in Part 3.

1. Engineer Comments from the preliminary submittal shall be incorporated in the following documents.
    a. Summary of the results of the short circuit and the protective device evaluation and coordination studies as required by Arc Flash Hazards Analysis.
    b. Description, purpose, basis and scope of the study
    c. Single line diagram generated by the selected computer program with node identification
    d. Tabulations of electrical capacities and characteristics of the equipment and protective devices
    e. Table comparing the calculated short circuit and the equipment ratings
    f. Coordination curves showing the proposed settings with the characteristics of the equipment and protective devices shown graphically on industry standard graph paper
2. Arc Flash Hazard Analysis to include computed incident energy levels and flash protection boundary distances.

C. Submit study report within 30 days after shop drawings have been returned for the electrical panels. These shop drawings may have / may have not been approved by the ENGINEER.

D. Submit subsequent study report based on the APPROVED shop drawings for the electrical panels. It may be necessary to modify the design of the electrical panels based on the recommendations included in the Final study report.

E. The electrical panels shall not be constructed until approval of the Final study report.

F. The final version of the Arc Flash Hazard Study and Arc Flash Warning Labels shall be submitted at least 30 days prior to energizing the electrical equipment.

G. Provide three (3) hard copies of the final power system studies, one electronic copy of the final power system studies, software modeling & library files, and one (1) set of warning labels to be affixed on the electrical panels.

1.06 Quality Assurance

A. The Contractor shall have the study prepared by SI's or EF's qualified engineer. The SI's or EF's engineer shall be a California Registered Professional Electrical Engineer who has at least five years of experience and specializes in performing power system studies.

B. By the ENGINEER's approval, the Contractor may contract with an independent power system study engineering firm who shall demonstrate experience with Power System Studies to perform the Arc Flash Analysis. This engineering firm shall submit to the ENGINEER its qualifications and names of at least five clients who this engineering firm has performed Power System Studies in the last three years.

C. The studies shall be performed using computer software from a single software company, SKM PowerTools for Windows, or approved equal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Preparation

A. The SI or EF to furnish short-circuit and protective device coordination studies as required by Arc Flash Hazards Analysis shall collect all required data and information in coordination with PG&E, equipment manufacturers, Contractor, and Owner. Certain information may be available from the ENGINEER upon request by the SI or EF

B. Contractor shall ensure that all data as required by the power system studies is furnished to the SI or EF in a timely manner. The Engineer performing the Arc Flash Hazard Analysis shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the electrical equipment shop drawings and/or prior to the release of the equipment for manufacturing.

C. The Arc Flash Hazard Analysis shall be per NFPA 70E- Standard for Electrical Safety in the Workplace, reference Article 130.3, and Annex D

3.02 Execution

A. Short-Circuit Analysis

1. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141-1993.

2. Transformer design impedances shall be used when test impedances are not available.
3. Calculation of the maximum rms symmetrical three-phase short-circuit current at each significant location in the electrical system shall be made using a commercially available computer program.
4. Appropriate motor short-circuit contribution shall be included at the appropriate locations in the system so that the computer calculated values represent the highest short-circuit current the equipment will be subjected to under fault conditions.
5. A tabular computer printout shall be included which lists the calculated short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings, and notes regarding the adequacy or inadequacy of the equipment.
6. The study shall include a computer printout of input circuit data including conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
7. The system one-line diagram shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.
8. The computer printout shall identify the maximum available short-circuit current in rms symmetrical amperes and the X/R ratio of the fault current for each bus/branch calculation.
9. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.
    a. Evaluate equipment and protective devices and compare to short circuit ratings.
    b. Adequacy of switchgear, automatic transfer switch, enclosed circuit breaker, motor control center and panelboard bus bars to withstand short-circuit stresses.
    c. Notify Engineer in writing, of circuit protective devices improperly rated for the calculated available fault current.

B. Protective Device Time-Current Coordination Analysis

1. Perform a protective device coordination study to select fuse ratings, ratios and characteristics of associated voltage and current transformers, breaker trip characteristics and settings. Include all voltage classes of equipment from the utilities incoming line protective device down to and including all Main Service Breaker, Enclosed Circuit Breaker (for Stationary Generator Connection), main breakers for all motor control centers, main breakers for all control panels, and, at each motor control center provide the motor circuit breaker for each motor size that is greater than 20 HP. Include a description, purpose, basis, and scope of the study and a single line diagram of the portion of the power system which is included within the study. Note inadequacies found during the study.
2. The time-current coordination analysis shall be performed with the aid of a commercially available computer program. It shall include the determination of settings, ratings, or types for the protective devices supplied.
3. Where necessary, an appropriate compromise shall be made between system protection and service continuity with system protection and service continuity considered to be of equal importance.

4. A sufficient number of computer generated log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
5. Provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full size log-log forms. Include with each curve sheet a complete title and one line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Include the following on the curve sheets, where applicable:
    a. Power Company relay and fuse characteristics
    b. Low-voltage equipment circuit breaker trip device characteristics
    c. Low-voltage fuse characteristics
    d. Pertinent transformer characteristics
    e. Pertinent motor and generator characteristics
    f. Characteristics of other system load protective devices
    g. Show transformer full load and 150%, 400%, or 600% currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and symmetrical and asymmetrical fault currents at each switchgear and panelboard
    h. Motor overload characteristics
    i. Conductor damage curves
6. Include with the report the manufacturer's time-current curves for all protective devices.
7. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, the short-circuit current availability at the device location when known, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
8. The study shall include a separate, tabular computer printout containing the suggested device settings of all overcurrent protective devices, the equipment where the device is located, and the device number corresponding to the device on the system one-line diagram.
9. A computer generated system one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
10. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for increasing system protection or device coordination.
11. Significant deficiencies in protection and/or coordination shall be called to the attention of the engineer and recommendations made for improvements as soon as they are identified. Report shall also include suggestions to:
    a. Improve coordination between upstream and downstream devices
    b. Reduce fault current clearing times of upstream devices
    c. Identify equipment protection boundary and inrush current conflicts

C. Arc Flash Hazard Analysis

1. Per NEC 110.16, perform a software-based arc-flash analysis according to IEEE Standard 1584-2018, “IEEE Guide for Performing Arc Flash Hazard Calculations,” based upon results from the short circuit current analysis and optimized overcurrent protective device settings provided in the overcurrent protective device coordination study.

   The software shall determine the incident energy and arc flash boundary values required to comply with NEC equipment labeling. It shall also provide hazard evaluation for shock protection and arc flash PPE according to NFPA 70E 2018. The study shall determine the following:

   a. Flash Hazard Protection Boundary
   b. Limited Approach Boundary
   c. Restricted Boundary
   d. Incident Energy Level
   e. Required Personal Protective Equipment Class
   f. Type of Fire Rated Clothing

2. The arc flash hazard study shall include the electrical distribution system equipment shown on the single line diagrams of the contract documents. The arc flash hazard study shall be used in conjunction with the approved short circuit and protective device coordination studies. The results of the power system studies shall be present in a report format that includes the following sections:

   a. Introduction, executive summary and recommendations, assumptions, reduced copy of the single line diagram
   b. Arc Flash Evaluations Summary Spreadsheet
   c. Bus Details Sheets
   d. Arc Flash Warning Labels printed in color on adhesive backed labels

3. A detailed arc-flash hazard analysis report with computed incident energy levels (Calories per square inches) and flash protection boundary distances at equipment indicated above to insure adequate protection and safety of personnel working in the vicinity of electrical equipment.

4. Arc Flash Hazard warning stickers, sized a minimum of 3.5” x 5” with the seven items listed in paragraph A above shall be located so as to be clearly visible to qualified persons on the existing and new electrical equipment including switchboards, motor control centers, power distribution panels, and panelboards. The labels shall include the bus name; upstream Protective Device Name, Type and Settings; bus line to line voltage and printed in color on adhesive backed Avery Labels.

   a. For each 600, 480, 240, and applicable 208 volt panelboard, one arc flash label shall be provided
   b. For each low voltage switchboard section and drives, one arc flash label shall be provided

3.03 Implementation

A. General: Analyze the short circuit, protective device coordination, and arc flash calculations and highlight any equipment that is determined to be underrated or causes an abnormally high incident energy calculation. Propose approaches to reduce the energy levels Proposed major corrective modification will be taken under advisement by the Engineer, and the Contractor will be given further instructions.

B. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

C. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

D. Notify Engineer in writing of any required major equipment modifications.

E. Arc Flash Training: The SI or EF shall train the Owner's qualified electrical personnel of the potential Arc Flash Hazards and Shock Hazards associated with working on energized equipment (minimum of 4 hours). The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.

****END OF SECTION****

SECTION 16030
ELECTRICAL TESTS

PART 1 - GENERAL

1.01 Summary

A. This Section specifies the work necessary to test, commission and demonstrate that the electrical work satisfies the criteria of these Special Provisions and functions as required by the Contract Documents.

B. The work of this Section includes furnishing the labor, equipment and power required to support the testing specified in other Divisions of these Special Provisions. Electrical testing specified herein, and functional testing of all power and controls not tested under Division 17, Instrumentation and Control shall be completed before commencement of plant start-up. This scope may require the Contractor to activate circuits, shutdown circuits, and run equipment, make electrical measurements, replace blown fuses, install temporary jumpers, etc.

1.02 References

A. NETA Latest Edition

1.03 Submittals

A. Test procedures, test data and test reports upon completion of each phase of testing.

1.04 Quality Assurance

A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere.

1. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.
2. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known, and reasonable, current in the ground current sensor circuit. In general, ground fault tripping should occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amperes or less.
3. Cable Testing:
    a. Cables for 480-volt circuits shall be tested for insulation resistance applying 1000-volt DC to the cables.
    b. Cables shall be tested phase-to-phase and phase-to-ground for all phases.
    c. Testing shall be done before the cables are terminated.
    d. Test results shall be submitted for review 30 days prior to plant operation and any system testing. Equipment which may be damaged during this test shall be disconnected.
    e. Perform tests with all other equipment connected to the circuit. In order to be acceptable, the cable must withstand the test high voltage without breakdown, have steady or decreasing leakage current during the high potential test, and have satisfactory comparable megger readings in each megger test.
    f. Test results shall be submitted to the engineer and shall state equipment used and time of test

g. Cable testing and report submittal shall be performed by an organization sanctioned by the Manufacturer of the cable to be tested.

h. Testing shall verify the quality of cable terminations

4. Test ground fault interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle Manufacturer.

5. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Components and equipment shall be cleaned as required by other provisions of these Special Provisions before commencement of functional testing. Functional testing shall comprise:

   a. Visual and physical check of cables, buss work, circuit breakers, transformers, and connections associated with all new and modified equipment.

   b. Setting of protective relays in conformance with results of the Protective Devices Coordination Study and testing of relays to assure that relays will operate at the current value and time required by the Study.

   c. Circuit breakers which are specified with adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or longtime overcurrent, shall be field adjusted by a representative of the circuit breaker Manufacturer. Time and pickup setting shall correspond to the recommendations of the Protective Devices Coordination Study. Setting shall be tabulated and proven for each circuit breaker in its installed position; test results shall be certified by the tester and transmitted to the Engineer (7 copies).

6. Complete ground testing of all grounding electrodes and grid prior to testing the equipment.

B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the Engineer and after process control devices have been adjusted as accurately as possible. It is intended that the Contractor will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results.

C. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, proper speed control, etc.

D. Subsystems, in the context discussed here, shall mean individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, etc.

E. Start-up commissioning shall not be attempted until all subsystems have been found to operate satisfactorily. Start-up shall only be attempted as a function of normal plant operation in which plan process flows and levels are routine and equipment operates automatically in response to flow and level parameters shall be considered only upon receipt of a written request by the Contractor.

F. The motor current tabulation required by Section 16011, "Short Circuit and Coordination Report", shall reflect the values occurring during start-up. The indications of all switchboard ammeters and kilowatt meters shall be recorded every half-hour during commissioning.

PART 2 - (NOT USED)

PART 3 - EXECUTION

3.01 Field Quality Control

A. Conductors Field Test, Conductors Rated 600 Volts or Less:

1. Perform insulation resistance testing of all power and control circuits 600 volts and less with a 2000-volt megger applying 1000 VDC.
2. Prepare a written test report of the results and submit to the Engineer prior to final inspection.
3. Minimum acceptable value for insulation resistance of cables is 1 mega-ohm.
4. Disconnect equipment that might be damaged by this test. Perform tests with all other equipment connected to the circuit.

B. Conductors Field Test, Instrumentation Cables

1. After instrumentation cable installation and conductor termination by the instrumentation and control supplier, perform tests witnessed by the Engineer to ensure that instrumentation cable shields are isolated from ground, except at the grounding point. Remove all improper grounds.
2. Test instrumentation cables applying 500VDC.

C. Grounding, Field Tests:

1. Test in the Engineer's presence the ground resistance of the grounding system. Ground resistance value shall be 5.0 ohms or less.
2. Test all ground fault interrupter (GFI) receptacles and circuit breakers for proper connection and operation with methods and instruments prescribed by the manufacturer.
3. Provide copies of reports of all grounding system tests for inclusion in Technical Manuals and for review by the Engineer.
4. Provide ground resistance tests in the presence of the Engineer and submit results. Utilize a ground resistance megger "Earth" tester with a minimum resistance capacity range of 0-5000 megohms at 1000 VDC. Utilize the full potential method or the three terminal method as described by Biddle or NETA national electrical test association

D. Electrical Panel, Field Tests:

1. Functional Test: Prior to plant startup, all equipment shall be inspected for proper alignment, proper connection, proper operation of control and instrumentation, proper rotation, and satisfactory starting operation of the indicated motor.
    a. Test all starters for proper contactor action, proper interlocks and permissive operation, and proper indication prior to applying power to motor.
    b. Approval of Engineer prior to energizing motors is required;
2. All functional and field tests are required to be performed in the presence of the Engineer or City Representative.

E. Surge Arrestors

1. The manufacturer shall provide copies of design test data on the arrester provided showing that the arrestors are in compliance with: IEEE C62.2 Guide for application of Gapped Silicon - Carbide Surge Arrestors for AC systems.

a. IEEE C62.11 Standard for Metal Oxide Surge Arrestors for AC Power Circuits

b. IEEE CC2.22 Guide for Application of Metal Oxide Surge Arrestors for AC Systems

2. The following tests shall be made on each arrester in conformance with ANSI 62.1:

a. Power frequency spark over

b. Radio influence voltage

c. Sealing

3. The design test data and the individual arrester test results shall be certified and submitted.

F. Standby Engine Generator Set, Factory Test

1. The engine generator unit shall be tested at the manufacturer's plant before shipment. The test shall consist of a steady load run of at least 60 minutes duration at 100 percent full-rated load. Complete test reports shall be made which shall show the engine fuel consumption and kW output. Test results shall be reviewed by the Engineer prior to shipment.

G. Standby Engine Generator Set, Field Test

1. Upon completion of the engine installation, running tests shall be carried out. The engine shall be operated for a period of not less than 2 hours and all necessary adjustments made by a factory representative of the engine manufacturer. The test shall demonstrate the ability of the engine generator to carry the specified loads. Upon completion of the tests, final adjustments shall be made to the equipment, fuel and oil filters shall be replaced, belt drive tensions checked, and the proper operation of all equipment demonstrated to the Engineer. The Engineer shall be instructed in the maintenance and operation of the equipment.

2. Load starting capability: The engine shall be able to start out under 1/2; 3/4 and full load

3. The engine shall maintain voltage and frequency regulation during starting of 1/2; 3/4 and full load

4. Automatic starting feature upon loss of regular source of power

H. Standby Power System Transfer Switch, Factory Test

1. Alarm and Status indicating devices shall be factory checked for proper operation.

I. Standby Power System Transfer Switch, Field Test

1. Protective and control relays shall be Field Calibrated and Tested based on set values of the Coordination Study at the stand by system and or manufacturers recommendation

2. Alarms and status indicating services shall be field checked for proper operation. Instrumentation loops shall be field checked-calibrated as indicated in Instrumentation section.

3.02 ELECTRIC MOTORS

A. Tests shall be performed as per ANSI/IEEE standard 112-1978 "IEEE Standard Test Procedure for poly phase Instruction Motors and Generates".

****END OF SECTION****

SECTION 16110
RACEWAYS, FITTINGS, AND SUPPORTS

PART 1 - GENERAL

1.01 Summary

A. Scope: This section provides specifications for all raceways, wire ways, raceway supports, cable trays and concrete encased ducts.

B. Type:

1. All conduits shall be polyvinyl chloride (PVC), Schedule 40 for under concrete slabs and raceway duck banks.
2. All direct buried conduits in earth shall be polyvinyl chloride (PVC), Schedule 80.
3. All conduits installed exposed and non-corrosive areas shall be Galvanized Rigid Steel (GRS).
4. All conduits installed in corrosive or wastewater areas shall be PVC coated Rigid Steel Conduit (PVC-RSC).

1.02 References

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these special provisions.

Reference	Title
ANSI C80.1	Electrical Rigid Steel Conduit
UL 1	Flexible Metal Conduit
UL 5	Surface Metal Raceway and Fittings
UL 6	Electrical Rigid Metal Conduit – Steel
UL 514B	Conduit, Tubing and Cable Fittings
UL 651	Schedule 40 and 80 Rigid PVC Conduit and Fittings
NEMA RNI-2005	PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC-2-2003	Electrical PVC Tubing and Conduit
NEMA TC-3-2004	PVC Fittings for Use With Rigid PVC Conduit and Tubing
ANSI/UL 467	Grounding and Bonding Equipment
NEC	National Electric Code, latest edition

1.03 Submittals

A. Submittals shall include the following data, drawings, and description of materials.

1. Manufacturer and manufacturer's type and designations for each equipment item
2. List of construction material for all conduits, fittings, supports and accessories
3. The Contractor shall furnish copies of the manufacturer’s certified test reports for the material being supplied to establish compliance with NEMA RN-1

1.04 Quality Assurance

A. Performance and Design Requirements: The conduits and fittings shall be premium quality and suitable for installation in water facilities. The PVC used for Schedule 40 and 80 conduits and the PVC coating on rigid steel conduit shall be made from virgin material.

B. Inspection: All raceway duct banks shall be inspected by the Engineer prior to backfill. The Engineer shall inspect for drainage slope, spacers, conduit condition, and joints.

C. All equipment furnished by the Contactor shall be listed by and bear the label of Underwriters' Laboratories, (UL) or of an independent testing laboratory acceptable to the Engineer.

1.05 Delivery, Storage, and Handling

A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable with Site Engineer, and secure from weather or accidental damage.

PART 2 - PRODUCTS

2.01 Manufacturers

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only.

2.02 Equipment and Materials

A. All raceways shall be as specified in Section 1.01B.

B. Flexible metal conduit shall be employed for connections to lighting fixtures. Final raceway runs to electrical equipment on machinery requiring flexibility or that is subject to vibration shall be liquid-tight flexible metal conduit.

C. All fittings and supports shall match the conduit types specified in Section 1.01B.

D. Minimum size of all conduits shall be 3/4-inch.

E. Rigid Steel Conduit

1. Comply with Underwriter's Laboratories UL-6 specification, ANSI C80.1-77 and Federal specification WW-C-581E (77 APR 04) or latest revisions. Rigid steel conduit shall be zinc coated both inside and outside after fabrication by hot-dip galvanizing. The threads shall also be hot-dip galvanized.

2. Use rigid steel conduit, including bushings, couplings, elbows, nipples, and other fittings, galvanized by hot-dipping, and meeting the requirements of ANSI C80.1 and ANSI C80.4, UL.

3. Do not use setscrew type couplings, bushings, bends, nipples, and other fittings, unless approved by the ENGINEER or the INSPECTOR. Factory bends are not permitted unless approved by the ENGINEER or the INSPECTOR. Conduit bending radius shall not be less than the minimum cable bending radius of the cable to be installed.

F. PVC Conduit:

1. Nonmetallic conduit shall be high impact polyvinyl chloride (PVC), Schedule 40 or 80 as specified. The nonmetallic conduit shall be corrosion resistant. Minimum tensile strength shall be 6000 psi, and minimum compressive strength shall be 9000 psi. The material shall have a smoke emission rate of not more than 5.1 grams/100 grams by the Arapahoe smoke chamber test.

2. Use rigid PVC Schedule 40 conduit, UL listed for concrete-encased and under concrete slabs.

3. Use rigid PVC Schedule 80 conduit, UL listed for underground direct burial for use with conductors having 90 degrees C insulation.
4. Use conduits, couplings, bushings, elbows, nipples, and other fittings meeting the requirements of NEMA TC 2 and TC 3, Federal Specification W-C-1094, UL, NEC, and ASTM specified tests for the intended use.

G. PVC Coated Rigid Steel

1. PVC coated conduit shall be hot-dip galvanized including the threads. The interior and exterior surfaces shall be coated with 2 mils thick urethane. The exterior of the conduit shall be PVC coated to a minimum 40-mil thickness. The PVC coating shall be permanently bonded to the conduit. The coating shall have a minimum tensile strength of 3500 psi. The interior shall be coated with a urethane coating no more than 7 mils thick.
2. A PVC coated coupling shall be furnished with each length of conduit. The PVC sleeve of the coupling shall equal the outside diameter of the coated conduit and shall extend 1-1/2 inches from each end of the coupling.
3. Prior to coating, the galvanized conduits and fittings shall be UL listed. Use PVC coated fittings with the same interior and exterior coating requirements. PVC coated fittings and sleeves shall be completely watertight to prevent moisture from penetrating the interior of the conduits and fittings.
4. The PVC coating shall be resistant to ultra-violet rays when installed outdoors. The conduit and fittings shall meet all the requirements of NEMA RN-1 1989.

H. Flexible Metal Conduit

1. Flexible metal conduit shall be formed from spirally wound galvanized steel strip with successive convolutions that are securely interlocked. Minimum size of the flexible metal conduit shall be 3/4 inch. Fittings shall be of the compression type. Lengths shall not exceed 60 inches. Flexible metal tubing shall include a code size insulated green ground conductor.

I. Flexible Metal Conduit, Liquid-Tight

1. Use UL listed liquid-tight flexible metal conduit consisting of galvanized steel flexible conduit covered with an extruded PVC jacket and terminated with nylon bushings or bushings with steel or malleable iron body and insulated throat and sealing O-ring.
2. Provide external grounding connector and appropriately sized grounding conductor to assure ground continuity.
3. Minimum size shall match the connecting non-flexible conduit.

J. Wireways

1. All wireways and auxiliary gutters shall be JIC sectional flange oil-tight type with hinged covers. Minimum size shall be 8 inches by 8 inches unless otherwise noted. All wireways shall be painted.
2. Provide outdoor, rain-tight steel-enclosed wireway and auxiliary gutter where indicated. Utilize wireways and fittings that are UL listed, and have a cover that can easily be removed. Manufacturers and types: Square D Square-Duct; General Electric Type HS; or equal.

2.03 Manholes, Handholes & Pullboxes

A. Manufacturers: Christy Concrete Products; Jensen Precast, Inc.; Brooks Products, Inc.; or equal.

B. Equipment and Materials

C. Concrete

1. The structural concrete shall conform to the requirements of Division 3 of these special provisions.
2. The aggregate shall be free of deleterious substances causing reaction with hydrogen sulfide.
3. The cement shall be Portland cement conforming to ASTM C150, Type II. Cement content shall be sufficient to produce a minimum strength of 3000 psi.

D. Reinforcing Steel

1. All reinforcing steel including welded wire mesh shall be as shown. All reinforcing shall be sufficiently tied to withstand any displacement during placement of concrete. All bars shall be hard grade billet steel conforming to ASTM A15. Bars 1/4-inch round and smaller shall be deformed in accordance with ASTM A305.
2. Design loads shall consist of dead load, live load, impact and, in addition, loads due to water table and any other loads which may be imposed on the structure.
3. Live loads shall be for H-20 loading per AASHO standards for highway and bridges.

E. Box dimensions shall be the minimum sized as shown on Contract drawings and in accordance with size, quantity of conductors, and conduit clearances per NEC Article 314 requirements.

F. Manholes: Manholes may be of single- or multiple-section construction. Multiple sections shall be fitted to form watertight joints using tongue and groove joint with flexible plastic adhesive sealing compound.

G. Covers

1. Manholes, handholes and pull boxes shall be provided with reinforced concrete covers and mounting rings reinforced for H-20 loading.
2. Pull boxes, 4 feet square and less than 4 feet 6 inches deep shall have a two-piece rectangular cover. Pull boxes, 2 feet by 3 feet in size shall have a one-piece rectangular cover. All other pull boxes, manholes, and handholes shall have a 30-inch diameter ring cover as shown. Covers shall be bolted down with recessed bolt heads.
3. Each manhole, handhole and pull box cover shall be identified by a cast in label. The cover shall be inscribed with the cast letters ELECTRICAL for electrical service or SIGNAL for communication or instrumentation. In addition, the identification number of the manhole or pull box shall be installed by means of bead weld in letters not less than 1 inch high.
4. Where located in streets or other heavy traffic bearing areas, covers shall be of the heavy street traffic type. When located in sidewalks or other non-vehicular traffic areas and with the approval of the construction manager covers may be of the parkway type.
5. Utilize heavy-duty type frames and covers made of cast iron, suitable for H-20 loading, and having machined bearing surfaces. Provide indented type covers, solid top design, with two drop handles each. On the upper side of each cover, cast or burned by welder, in integral letters not less than 2-inches high appropriate titles, ELECTRICAL, SIGNAL or TELEPHONE.

H. Inserts

1. Concrete inserts for cable racks shall be provided in the walls of each manhole and pull box, one in a 4-foot wall and two in a 6-foot or 8-foot wall.
2. Cable pulling eye bolts shall be provided opposite each conduit entry area, and the inserts shall be designed to provide a minimum of 5,000 pounds tensile strength to accommodate all cable pulls.

I. Conduit Entrances

1. Entries of conduits through walls shall be terminated in a bell flush with the interior wall.

2. Conduit wall penetrations shall be repaired with non-shrink grout.
3. Provide raceway entrances on all four sides. For raceways installed under this Contract, knockout panels or precast individual raceway openings may be used. On sides where no raceways are installed under this Contract, provide knockout panels for future raceway installation.
4. Slope floors toward drain points, leaving no pockets or other non-draining areas.
5. Utilize maintenance hole and handhole hardware of steel, hot-dip galvanized after fabrication

J. All prefabricated maintenance holes shall be shop inspected before delivery to the site.

K. The location of pull boxes, manholes and vaults are shown on Contract drawings to be at their approximate location. The contractor shall adjust these locations to avoid conflicts with other underground utilities.

L. Limit the number of directional changes to the conduit to total no more than 270 degrees in any run between pull points. Where required to ease pulling and as necessary to meet the NEC requirements, the Contactor shall supply and install pull boxes, manholes or vaults, even though not shown on the Drawings at no additional cost to the City.

M. Preparation

1. The pre-cast base section shall be placed on a prepared base of 12 inches of sand or gravel for even distribution of load before leveling. A plastic preformed joint sealant shall be applied between sections. The joint sealant compound shall be impermeable to water, have a high immediate bonding strength, and maintain permanent plasticity. The assembly shall be so located that surrounding paving shall slope up 1 inch above finish to prevent water settling on the cover. In unpaved areas, the slope shall be up 3 inches.
2. Conduit runs between two vaults, manholes, or pull boxes shall be limited to a maximum of 300 feet or less 50 feet for every 90 degrees of conduit change in direction

N. Installation

1. The location of manholes, handholes, and pull boxes are shown on the Contract Drawing at their approximate location. The Contractor shall adjust the location of these manholes, handholes, and pull boxes to avoid conflict with other underground utilities at no additional cost to the City. Provide excavation, shoring, bracing, backfilling, grading, etc., in accordance with requirements specified elsewhere in these Contract Documents.
2. Make installation so that raceways enter manholes, handholes or pullboxes at nearly right angles and as near as possible to one end of a wall, unless otherwise indicated.
3. Pull Boxes, Manholes and Vaults shall be installed accurately to match the surrounding building outline, pavement or sidewalk grade. Set pullboxes parallel or perpendicular to adjacent structures.
4. Install one ground rod in each manhole and handhole. Connect all noncurrent-carrying metal parts in the manholes and any metallic raceway grounding bushings to this ground rod with No. 6 AWG (minimum) copper conductor.
5. Vault, Manhole and Pull Box Entry: Conduits entering underground pull boxes and vaults shall be horizontal, except when required otherwise by Power or Telephone Utility Standards. Conduit shall not enter through the bottom of boxes unless boxes are located above grade.
6. Install covers flush within finished paved or concrete surfaces. In unfinished areas, install covers one inch (1”) above finished grade.

O. Field Quality Control

1. Keep boxes, vaults and manholes closed at all times when not being accessed to prevent entry of foreign matter. Cover to protect them against dirt, paint, water, chemical or mechanical damaged products prior to final acceptance.
2. Clean and remove all debris from maintenance holes and handholes whether new or existing.
3. At the contractor's discretions and with approval of the City, the Contractor may provide additional manholes, handholes and pull boxes, at no additional cost to the City.

2.04 Components and Accessories

A. Fittings in Hazardous Areas: In hazardous areas, use only fittings approved for the atmosphere involved.

B. Use cable sealing fittings forming a watertight nonslip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor OD. For conductors with OD's of ½-inch or less, provide a neoprene bushing where the conductor enters the connector. Use Crouse-Hinds CGBS, Appleton CG Series, or equal, cable sealing fittings.

C. Fittings for Rigid Steel

1. Fittings used with rigid galvanized steel conduit shall be hot-dip galvanized. Locknuts shall be extra heavy galvanized steel for sizes through 2 inches. Locknuts larger than 2 inches shall be galvanized malleable iron. Bushings shall be galvanized malleable iron with insulating collar. Grounding bushings shall be of the locking type and shall be provided with feed-through compression lugs for securing the ground cable. Unions shall be galvanized ferrous alloy types UNF or UNY. Thread-less fittings shall not be utilized with rigid galvanized steel conduits.
2. Expansion fittings in embedded runs shall be of the watertight type and shall be provided with an internal bonding jumper. The expansion material shall be neoprene and shall allow for 3/4-inch movement in any direction.
3. Use insulated throat bushings of metal with integral plastic bushings rated for 105 degrees C.
4. For insulated throat bushings for rigid steel conduit, use Thomas & Betts Nylon Insulated Metallic Bushings, or O.Z. Gedney Type B, or equal.
5. Use Myers Scru-Tite, or equal hubs for rigid steel conduit.
6. Use conduit bodies for rigid steel conduit of metal and sized as required by the NEC (NFPA 70-2008). Use Appleton Form 35 threaded Unilets; Crouse-Hinds Mark 9 or Form 7 threaded condulets; Killark Series O Electrolets; or equal, for normal conduit bodies for rigid steel conduit. Where conduit bodies for rigid steel conduit are required to be approved for hazardous (classified) locations, use conduit bodies manufactured by Appleton, Crouse-Hinds, or Killark, or equal.
7. Use only couplings for rigid steel conduit supplied by the conduit manufacturer.
8. Use Appleton Type EYF, EYM, or ESU; Crouse-Hinds Type EYS or EZS; Killark Type EY or EYS; or equal, sealing fittings for rigid steel conduit. Where condensate may collect on top of a seal, provide a drain by using Appleton Type SF Crouse-Hinds Type EYD or EZD, or equal Drain Seal.
9. Use Appleton Type ECDB, Crouse-Hinds ECD, or equal drain fittings for rigid steel conduit.

D. Fittings for PVC Conduit

1. Fittings used with PVC conduits shall be of the PVC solvent-weld type and shall be of the same material as the conduit.
2. Expansion fittings shall be provided as recommended by the manufacturer.

E. Fittings for PVC Coated Rigid Steel Conduit

1. Fittings with PVC coated rigid steel conduit shall be PVC coated in a manner similar to the conduit. The exterior of the fittings shall be coated with 2-mil thick urethane prior to the application of the 40-mil exterior PVC coat. Interior of the fittings shall have a 2-mil urethane finish. The fittings shall have ribbed finish to assist in the installation of fittings.
2. Thread-less fittings shall not be used with PVC coated rigid steel conduit.
3. Bushings and ground bushings shall be as specified for rigid galvanized steel conduits.

F. Fittings for Flexible Metal Conduit

1. Fittings used with flexible metal conduit shall be compression type, cadmium-plated malleable iron body with locknut and bushing
2. Where applicable, 45- and 90-degree fittings shall be used

G. Fittings for Liquid-Tight Flexible Conduit

1. Fittings used with liquid-tight conduit shall have cadmium-plated malleable iron body and gland-nut, brass grounding ferrule threaded to engage conduit. These fittings shall also use spiral and "O" ring seals around the conduit, the box connection and insulated throat. The insulated throat connectors for liquid-tight flexible metal conduit of metal will have an integral plastic bushing rated for 105 degrees C, and of the long design type extending outside of the box or other device at least 2-inches.
2. Use Thomas & Betts Super-Tite Nylon Insulated Connectors or equal
3. Where applicable, 45- and 90-degree fittings shall be used

H. Raceway Supports

1. General: Raceway support systems shall be designed to provide a factor of safety of no less than five.
2. Conduit Supports: Conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. When used with PVC coated rigid steel conduit, the conduit supports shall be 40 mils thick PVC coated.
3. Ceiling Hangers: Ceiling hangers shall be adjustable galvanized carbon steel, PVC coated 40 mils thick, pipe hangers. Straps or hangers of plumber's perforated type will not be acceptable. Hanger rods shall be 2-inch minimum galvanized all-thread rod and shall meet or exceed ASTM A193-B7 and ASME Boiler and Pressure Vessel Code specifications. Trapeze, rod type hangers shall not be loaded in excess of 700 pounds per rod. Where loading exceeds this value, rigid frames shall be provided.
4. Racks: Racks shall be constructed from framing channel. Channels and all associated hardware shall be steel, hot-dip galvanized after fabrication of the channel. Field cuts shall be painted with zinc-rich paint. Channels attached directly to building surfaces shall be 14-gage minimum material 1-5/8 inches wide by 13/16 inch deep. All other channels shall be 12-gage minimum material 1-5/8 inch wide by 1-5/8 inch minimum depth. Racks shall be designed to limit defection to 1/360 of span. All exposed ends of framing channel shall be covered with manufacturer's standard plastic inserts. The racks shall be PVC coated to 40 mil thickness.

I. Raceway Tags

1. Provide permanent, nonferrous metal markers with raceway designations pressure stamped, embossed, or engraved onto the tag.
2. Tags relying on adhesives or taped-on markers are not acceptable.
3. Attach tags to raceways with noncorrosive wire.

J. Warning Tape:

1. Provide heavy-gauge, yellow plastic tape of 6 -inch minimum width for use in trenches containing electric circuits. Utilize tape made of material resistant to corrosive soil. Use tape with printed warning that an electric circuit is located below the tape. Manufacturers and types: ITT Blackburn Type YT or RT; Griffolyn Co. Terra-Tape; or equal

PART 3 - EXECUTION

3.01 Preparation

A. Store all products specified in this section in a dry location.

B. Minimum Raceway Size: 3/4-inch.

C. Preparation for pulling in conductors:

1. Do not install crushed or deformed raceways. Avoid traps in raceways where possible. Take care to prevent the lodging of plaster, concrete, dirt, or trash in raceways, boxes, fittings, and equipment during the course of construction. Make raceways entirely free of obstructions or replace them. Ream all raceways, remove burrs, and clean raceway interior before introducing conductors or pull wires.

2. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals until the time for pulling in conductors.

3.02 Installation

A. All conduits shall be as specified in Section 1.01B.

B. Each conduit shall be identified at each end with a permanent non-corrosive metal marker. Designation shall be pressure stamped into the tag. The conduit identification shall be the designated conduit number as shown.

1. Final Connection to Certain Equipment

   a. Make final connection to motors, wall or ceiling mounted fans and unit heaters, dry type transformers, valves, local instrumentation, and other equipment where flexible connection is required to minimize vibration or where required to facilitate removal or adjustment of equipment, with 36-inch maximum length liquid-tight, PVC-jacketed, flexible steel conduit.

   b. The flexible conduit shall be long enough to allow the item to which it is connected to be withdrawn or moved off its base. Use liquid-tight flexible metal conduit in outside areas, process areas exposed to moisture, and areas required to be oil free and dust-tight.

2. Special Locations:

   a. Use rigid steel conduit:

      1) Where conduit changes from underground and/or concrete embedded to exposed

      2) Under equipment mounting pads

      3) In exterior light pole foundations

C. Location, Routing, and Grouping:

1. Conceal or expose raceways as indicated. Group raceways in same area together. Locate raceways at least 12-inches away from parallel runs of heated piping for other utility systems.

2. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes to provide a neat appearance. Follow surface contours as much as possible. Conduit supports spaced not more than 8 feet apart.

3. No conduit shall approach closer than 6 inches to any object operating above the rated temperature of its cable temperature.
4. Conduit supported directly from the concrete structure shall be spaced out at least 1/4 inch using one-hole hot-dip galvanized malleable iron straps with nesting backs or, if three or more conduits are located in a parallel run, they shall be spaced out from the wall approximately 5/8 inch to 1 inch by means of framing channel. Runs of individual conduit suspended from the ceiling shall be supported with galvanized wrought steel pipe hangers. Where three or more conduits are suspended from the ceiling, suitable steel racks shall be constructed subject to submittal to the Engineer for review.
5. Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors in accordance with the structural section of these special provisions. Individual conduit supports may be similar to cast-in-place anchors, die-cast, rustproof alloy expansion shields or cast flush anchors. Wooden plugs, plastic inserts or gunpowder-driven inserts shall not be used as a base to secure conduit supports.
6. All conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating bushing constructed over the conduit end. All conduit entering NEMA 12 boxes shall be terminated with a rain-tight hub having an insulated liner. All surface mounted cast boxes and plastic enclosures shall have threaded hubs. All joints shall be made with standard threaded couplings or specified unions. Metal parts of plastic control stations and coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of all conduits shall be cut square, reamed and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Male threads on rigid steel conduit shall be coated with electrically conductive zinc rich paint. Threading shall be done with dies, with the guide sleeve bored out to allow for increased diameter or the PVC coated conduit. Conduit shall be made with the next larger bend or next larger shoe bushed for proper fit.
7. Avoid obstruction of passageways. Run concealed raceways with a minimum of bends in the shortest practical distance considering the building construction and other systems.
8. In block walls, do not run raceways in the same horizontal course with reinforcing steel.
9. In outdoor, underground, or wet locations, use watertight couplings and connections in raceways. Install and equip boxes and fittings so as to prevent water from entering the raceway.
10. Paint all threads of galvanized conduits with UL approved zinc-rich paint or liquid galvanizing compound before assembling. Touch up after assembly to cover nicks or scars.
11. Do not notch or penetrate structural members for passage of raceways except with prior approval of the Engineer or the Inspector.
12. Do not run raceways in equipment base foundations.
13. Locate above ground raceways concealed in poured concrete so that the minimum concrete covering is not less than 1-1/2-inches.
14. Except at raceway crossings, separate raceways in slabs not less than six times the raceway outside diameter
15. Raceways installed under slab floors shall lie completely under the slab with no part of the horizontal run of the raceway embedded within the slab.
16. Install concealed, embedded, and buried raceways so that they emerge at right angles to the surface. Provide support during pouring of concrete to ensure that raceways remain in position.

17. Allow a minimum of 7 feet headroom for conduit passing over walkways.
18. Communication and instrumentation conduits crossing power circuits shall be separated from such circuits by the minimum distance stipulated by the IEEE standards.
19. Welding, brazing or otherwise heating of the conduit is not allowed. Plumber's perforated tape shall not be used for any purpose.
20. Where required for ease of pulling and as necessary to meet code, the Contractor shall provide cast junction or pullboxes even though not shown on the drawings. The Contractor shall limit the number of equivalent 90-degree bends to three in any run between pull boxes. Runs shall be limited to 400 feet, less 100 feet for each equivalent 90-degree bend in the run. Bends and offsets shall be avoided where possible, but where necessary, shall be made with an approved hickey or conduit bending machine, or shall be factory preformed bends.
21. All conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating bushing constructed over the conduit end. All conduit entering NEMA 12 boxes shall be terminated with a rain-tight hub having an insulated liner. All surface mounted cast boxes and plastic enclosures shall have threaded hubs. All joints shall be made with standard threaded couplings or specified unions. Metal parts of plastic control stations and coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of all conduits shall be cut square, reamed and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Male threads on rigid steel conduit shall be coated with electrically conductive zinc rich paint. Threading shall be done with dies, with the guide sleeve bored out to allow for increased diameter or the PVC coated conduit. Conduit shall be made with the next larger bend or next larger shoe bushed for proper fit.
22. Conduit constructed in concrete slabs or walls shall be placed in the middle third of the slab or wall. Conduit rising through a slab shall be protected by a formed concrete pad approximately 6 inches in diameter and 4 inches above the finished floor or the conduit shall come up through the equipment pad. Clearances equal to the conduit trade diameter, but not less than 1-1/2 inches, shall be maintained between conduits encased in slabs. Clearances of less than 1-1/2 inches at conduit crossing and terminating locations may be allowed at the discretion of the Engineer.
23. Flexible conduit shall not be used as a general purpose raceway but shall be provided in locations requiring flexibility with the approval of the Engineer.
24. Liquid-tight conduit shall be used for all motor connections as detailed. Where flexibility is required for electrical raceways on equipment, liquid-tight conduit shall be used in accordance with JIC standards, these special provisions, and the local codes. The maximum length of flexible, liquid tight conduit shall be 36-inches. The terminating fitting and sealing shall be as shown in the motor details.
25. The Contractor shall exercise the necessary precautions to prevent the lodging of dirt, concrete or trash in the conduit, fittings and boxes during the course of construction.

D. Support:

1. Support raceways at intervals not exceeding NEC requirements unless otherwise indicated. Support multiple raceways adjacent to each other by ceiling trapeze. Support individual raceways by wall brackets, strap hangers, or ceiling trapeze, fastened by toggle bolts on hollow masonry units, expansion shields on concrete or brick, and machine screws or welded thread studs on steelwork.
2. Threaded studs driven in by a powder charge shall not be accepted.
3. Support all raceways from building structural members only.

4. Do not use nails anywhere or wooden plugs inserted in concrete or masonry as a base for raceway or box fastenings. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.

E. Bends:

1. Make changes in direction of runs with symmetrical bends. Make bends and offsets of the longest practical radius. Do not heat metal raceways to facilitate bending.
2. Make bends in parallel or banked runs of raceways from the same center or centerline so that bends are parallel and of neat appearance. Make field bends in parallel runs.
3. For PVC conduits, use factory made elbows for all bends 30 degrees or larger. Use acceptable heating methods for forming smaller bends.
4. Make no bends in flexible conduit that exceed 90 degrees or allowable bending radius of the cable to be installed or that significantly restricts the conduits flexibility.

F. Bushing and Insulating Sleeves:

1. Where metallic conduit enters metal equipment enclosures through conduit openings, install a bonding bushing on the end of each conduit. Install a bonding jumper from the bushing to any equipment ground bus or ground pad.
2. If neither exists, connect the jumper to a threaded bolt connection to the metallic enclosure.
3. Use manufacturer's standard insulating sleeves in all metallic conduits or insulated bushings terminating at an enclosure.

G. Expansion Joints:

1. Provide suitable expansion fittings for raceways crossing expansion joints in structures or concrete slabs, or provide other suitable means to compensate for expansion and contraction.
2. Provide for the high rate of thermal expansion and contraction of PVC conduit by providing PVC expansion joints as recommended by the manufacturer and as required.

H. PVC Conduit:

1. Solvent weld PVC conduit joints with solvent recommended by the conduit manufacturer. Follow manufacturer's solvent welding instructions and provide watertight joints.
2. Use acceptable PVC terminal adapters when joining PVC conduit to metallic fittings.
3. Use acceptable PVC female adapters when joining PVC conduit to rigid metal conduit.

I. PVC Coated Rigid Steel Conduit:

1. Install in strict accordance with the manufacturer's Instructions.
2. Touch up any damage to the coating with conduit manufacturer acceptable patching compound.
3. PVC boot shall cover all threads.
4. Where belled conduits are used, bevel the un-belled end of the joint before joining. Leave no metallic threads uncovered.
5. PVC coated conduit shall be tightened, with strap wrenches, and the plastic overlap shall be coated and sealed in accordance with the manufacturer's recommendations. Pipe wrenches and channel locks shall not be used for tightening plastic coated conduits. All damaged areas shall be patched, using manufacturer's recommended material. The area to be patched shall be built up to the full thickness of the coating. Joints in multiple conduit runs shall be staggered.

6. Threading:

    a. Plasti-Bond can be threaded with any standard threading tool. Larger model power threaders with open die heads require no modification beyond optional grip inserts for PVC coated conduit.

    b. If a threader with a tight-fitting die head is to be used, like many hand-held models, it is necessary to machine out the interior diameter of the stationary guide approximately 12/100ths of an inch to allow for clearance of the PVC coating. Prior to machining the pipe guide take note of the sequence in which the dies are removed; then replace dies in the proper sequence.

    c. If conduit is to be threaded manually it must be pencil cut before threading to enable the die teeth on the threader to engage the conduit. In the same manner as sharpening a pencil with a knife, cut away 1/4" of the exterior coating from the end to be threaded. This allows the pipe guide to ride up and over the PVC coating enabling the removal of the coating and threading in one operation.

    d. Before threading, by any method, a series of cuts should be made in the PVC coating along the longitudinal axis of the conduit. The thread protector attached to one end of the conduit can be used to gauge the length of the cuts. Make a slit up one side of the thread protector with a knife and remove it from the conduit. Push the thread protector over the cut end of the conduit to be threaded and place a mark on the PVC coating at the end of the protector. With a knife, cut around the circumference of the conduit at the mark, through the PVC coating, to the metal. This cut will indicate the starting point for the longitudinal cuts and it will give an even ending to the PVC coating removed during threading. The longitudinal cuts will allow the PVC coating to be removed in small pieces instead of long strips that can foul the die head causing the conduit to collapse.

    e. Use a good quality thread cutting oil to flush away the metal and PVC chips. After threading use a degreasing spray to thoroughly clean the threads and the interior of the pipe. Use care not to contaminate the cutting oil with the degreasing spray. Degreasing is important in order to insure that the touch up compound will adhere to the unprotected steel. Bare steel is the most vulnerable area to corrosion in any conduit system, therefore, touch up compound must be used on all field cut threads and internal reams. These specially formulated interior and thread touch-up compounds are available in 4 ounce and quart cans. When an access fitting or coupling is attached to the newly threaded conduit a colored band red for Plasti-Bond), will form at the end of the sleeve. This indicates proper installation procedures have been followed

J. Penetrations:

1. Seal the interior of all raceways entering structures at the first box or outlet with electrical duct sealant per NEC 505.17, (D)(2) to prevent the entrance into the structure of gases, liquids, or rodents.

2. Dry pack with non-shrink grout around raceways that penetrate concrete walls, floors, or ceilings aboveground, or use one of the methods specified for underground penetrations.

3. Where an underground conduit enters a structure through a concrete roof or a membrane waterproofed wall or floor, provide an acceptable, malleable iron, watertight, entrance sealing device. When there is no raceway concrete encasement specified or indicated, provide such a device having a gland type sealing assembly at each end with pressure bushings which may be tightened at any time. When there is raceway concrete encasement specified or indicated, provide such a device with a gland type sealing assembly on the accessible side. Securely anchor all such devices into the masonry construction with one or more integral flanges. Secure membrane waterproofing to such devices in a permanently watertight manner.

4. Wherever conduits penetrate concrete wall panels to outdoors or as shown, the Contractor shall detail the required mountings. He shall locate and use a galvanized pipe sleeve for passage of the conduit. A compression type seal shall be used to form a complete watertight installation. The installation design shall be submitted to the Engineer.
5. Where an underground raceway without concrete encasement enters a structure through a non-waterproofed wall or floor, install a sleeve made of Schedule 40 galvanized pipe. Fill the space between the conduit and sleeve with a suitable plastic expandable compound, or an oakum and lead joint, on each side of the wall or floor in such a manner as to prevent entrance of moisture. A watertight entrance sealing device as specified may be used in lieu of the sleeve.
6. Where raceways penetrate fire-rated walls, floors, or ceilings, fire stop openings around electrical penetrations to maintain the fire-resistance rating
7. Raceways passing through roofs shall be flashed.
8. Provide conduit seals where required by Article 500 of the NEC.

K. Underground Conduits, Direct Burial raceways:

1. Unless otherwise indicated, all underground conduits shall PVC coated rigid steel.
2. Coordinate installation of underground raceways with other outside and building construction work. Maintain existing outside utilities in operation unless otherwise authorized by the Engineer.
3. Remove entirely and properly reinstall all raceway installations not in compliance with these requirements.
4. Do not use union type fittings underground.
5. Provide a minimum cover of 2-feet over all underground raceways unless otherwise indicated. Warning tape as specified in Article 2.11A shall be placed no less than 12 inches above conduit and duct bank.
6. Do not backfill underground direct burial raceways until they have been inspected by the Engineer.
7. Warning Tapes: Bury warning tapes approximately 8-inches below grade and above all underground conduit runs or duct banks. Align parallel to and within 12-inches of the centerline of runs.
8. When the contract drawings indicate underground PVC conduits then a transition shall be provided. The transition shall be made from PVC Schedule 80 conduit to PVC coated rigid galvanized steel conduit at all stub-ups and when entering equipment. The transition shall consist of a PVC coated rigid galvanized conduit. Conduits shall be laid with a minimum grade of 2 inches per 100 feet from structure to manhole or from high point to manholes.
9. Ducts shall be of the dimensions and materials and with reinforcing as shown. They shall have a uniform continuous slope with no low points to entrap water. All duct runs shall be placed on an undisturbed excavated soil base wherever possible. Where duct runs pass through backfilled areas, the soil base shall be a backfill of loam, placed in layers. Each layer shall be solidly tamped or rolled, as required, to obtain complete compaction to the elevation and pitch of the bottom of the duct run shown. The compaction shall be as specified in the structural section of these special provisions.
10. Plastic spacers shall be manufactured by the conduit supplier and shall be located 5 feet on centers. Wire ties shall be made at each spacer location and shall be securely anchored. Duct runs shall be watertight. When the termination of duct is not detailed on the duct run drawing, a coupling shall be installed.

11. The ends of all conduits shall be suitably plugged, capped and protected from damage during construction. Ends of conduits which are not to be used for long periods shall be protected from dirt, rodents, etc., by plugging at the ends with manufactured plugs. A non-setting compound may be used on the plug to make it adhere to the conduit end. A 1/4-inch hole shall be drilled in the lower portion of the plug to provide drainage of the plugged conduit.
12. A No. 5/8 mule tape shall be pulled through each high voltage, 480-volt power feeder, and branch feeder conduits as the conduit sections are laid and the tape shall be securely fastened at each end of the finished duct run. When ducts are reserved for future use, the mule tape shall also be used and secured.
13. A mule tape shall always be attached to the rear end of the swab or mandrel to replace the wire being pulled out. When not in use, this tape shall be securely fastened at both ends of the duct.
14. Each conduit in a manhole, handhole, or pull box shall be identified with a stamped aluminum or brass tag bearing the conduit number. The tags shall be permanently attached to conduits by means of 316 stainless steel or nylon tie wrap. Install conduit couplings and cap ends of all spare underground conduits at each handhole/manhole.
15. Each conduit shall be identified at each end with a permanent non-corrosive metal marker. Designation shall be pressure stamped into the tag. The conduit identification shall be the designated conduit number as shown.
16. Separation and Support:
    a. Separate parallel runs of two or more raceways in a single trench with preformed, nonmetallic spacers designed for the purpose. Install spacers at intervals not greater than that specified in the NEC for support of the type raceways used, and in no case greater than 10-feet.
    b. Support raceways installed in fill areas to prevent accidental bending until backfilling is complete. Tie raceways to supports, and raceways and supports to the ground, so that raceways will not be displaced when concrete encasement or earth backfill is placed.
17. Arrangement and Routing:
    a. Arrange multiple conduit runs substantially in accordance with any details shown on the Drawings. Locate underground conduits where indicated on the Drawings.
    b. Make minor changes in location or cross-section as necessary to avoid obstructions or conflicts. Where raceway runs cannot be installed substantially as shown because of conditions not discoverable prior to digging of trenches, refer the condition to the Engineer for instructions before further work is done.
    c. Where other utility piping systems are encountered or being installed along a raceway route, maintain a 12-inch minimum vertical separation between raceways and other systems at crossings. Maintain a 12-inch minimum separation between raceways and other systems in parallel runs. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the Engineer for instructions before further work is done.
    d. Provide insulated grounding bushings on all metallic raceways entering manholes. Provide bell-ends flush with manhole walls on all nonmetallic raceways entering manholes.
    e. In multiple conduit runs, stagger raceway coupling locations so that couplings in adjacent raceways are not in the same transverse line.
    f. Provide markers at grade to indicate the direction of underground conduits provided under this Contract. Provide markers consisting of double-ended arrows, straight for straight runs and bent at locations where runs change direction. Provide markers at all bends and

at intervals not exceeding 100-feet in straight runs. Use markers made of sheet bronze not less than 1/4-inch thick embedded in and secured to the top of concrete posts. Use markers not less than 10-inches long and 3/4-inch wide and marked ELECTRIC CABLES in letters 1/4-inch high incised into the bronze to a depth of 3/32-inch.

g. All conduits shall enter maintenance holes and structures at right angles.

18. Raceway Coating:

a. At couplings and joints, coat metallic underground direct-burial conduits with Koppers Bitumastic No. 505 or equal, or wrap with Scotchwrap No. 51, or equal plastic tape with 1/2-inch overlap.

19. Direct Earth Burial Conduit Zone Backfill Installation:

a. Backfill material for the conduit zone of direct burial conduit trenches may be selected from the excavated material if it is free from roots, foreign material, and oversized particles.

b. Use material with 3/4-inch maximum particle size and suitable gradation for satisfactory compaction. Remove material if necessary to meet these requirements.

c. Imported 3/4-inch minus gravel or sand may be used in lieu of material from the excavation.

d. After conduits have been properly installed, backfill the trench with specified material placed around the conduits and carefully tamped around and over them with hand tampers. Final, tamped conduit cover shall be 4-inches minimum.

20. Backfill Installation above Conduit Zone of Direct Burial Conduit:

a. Backfill material above the conduit zone of direct burial conduit may be selected from the excavated material, if it contains no particles larger than 3-inches in diameter and is free from roots or debris. Imported material meeting these same requirements may be used in lieu of material from the excavation. Compact backfill in maximum 12-inch layers to at least 95 percent of the maximum density at optimum moisture content as determined by ASTM D 1557.

L. Wireways:

1. Mount wireways securely in accordance with the LAEC and manufacturer's instructions. Locate removable cover or hinged cover on accessible vertical face of wireway unless otherwise indicated.

M. Empty Raceways

1. Certain raceways will have no conductors pulled in as part of this Contract. Identify with tags at each end and at any intermediate pull point the origin and destination of each such empty raceway. Where a raceway has been identified with a name (number) in the Raceway Schedule, use that name on the tag in lieu of origin and destination. Provide a removable permanent cap over each end of each empty raceway. Mandrel and provide a nylon pull cord in each empty raceway.

N. Firestops:

1. The Contractor shall furnish adequate firestops and seals for cables, conduits, trays, and wireways, etc., passing through building floors or wall openings.

2. Products which utilize intumescent compounds capable of being leached out by water shall not be used.

3. Flamenastic 71A, Vimasco No. 1-A, or equal, shall be used for this purpose and shall be applied in accordance with manufacturer's recommendations.

O. Painting

1. Paint raceway systems in accordance with and as specified in Section 09900 - Protective Coating Systems.

3.03 Field Quality Control

A. Provide raceway systems meeting or exceeding the requirements of the NEC.

3.04 Adjusting / Cleaning / Protection

A. Following installation, protect products from the effects of moisture, corrosion, and physical damage during construction. Keep openings in conduit and tubing capped with manufactured seals during construction.

****END OF SECTION****

SECTION 16120
WIRE AND CABLES, 600 VOLTS AND BELOW

PART 1 - GENERAL

1.01 Summary

A. Scope: This section provides specifications for all wire and cable used for electrical current conductors.

B. Type: All conductors shall be copper, type B stranded, unless otherwise noted. The minimum size of conductors shall be No. 12 AWG.

1.02 References

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these special provisions.

Reference	Title
ICEA S-61-402/NEMA WC-5	Thermoplastic - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
ICEA S-19/NEMA WC-3	Rubber - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
S-68-524/NEMA WC-7	Cross Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
S-68-516/NEMA WC-8	Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NFPA	National Fire Protection Association
UL 62	Flexible Cord and Fixture Wire
UL 83	Insulated Wires and Cables
UL 486A	Wire Connectors and Soldering Lugs for use with Copper Conductors
UL 486B	Wire Connectors for use with Aluminum Conductors
UL 510	Insulating Tape
UL 1277	Electric Power and Control Tray Cables with Optical Fiber Members
UL 1449	Safety Transient Voltage Surge Suppressors
NEMA WC-55	Instrumentation Cables and Thermocouple Wire
NEMA WC-57	Control Cables
ASTM B8	Standard Specifications from Concentric Lay Standard Copper Conductors, Hard, Medium-Hard or Soft
Title 8	Industrial Relations, Subchapter 5, Electrical Safety Orders, California Code of Regulations

1.03 Definitions

A. Cable: Multi-conductor, insulated, with outer sheath.
   1. May contain either building wire or instrumentation wire

B. Instrumentation Cable: Multiple conductors, insulated, twisted with outer sheath, intended for transmission and distribution of low current (4-20 mA DC) or low voltage (0-10 V DC) analog signals, No. 16 AWG and smaller. Commonly used types are defined in the following:
   1. TWP: Twisted pair without shield.
   2. TWSP or TSP: Twisted shielded pair.
   3. TWST: Twisted-shielded triad.

C. Wire: Single conductor, insulated, with or without outer jacket depending upon type

1.04 Submittals

A. Shop Drawings shall include:
   1. Product technical data including:
      a. Acknowledgement that submitted products meet requirements of standards
      b. Catalog cuts and other brochures depicting conductor characteristics
      c. Manufacturer’s recommended splicing, testing, and installation procedures and practices and Manufacturer’s installation instructions
   2. Manufacturer’s certified test records, factory test procedures and test Reports.
   3. Samples

B. Field testing using attached Cable Test Data Form, HI-POT and Megger tests including certified test reports. Also, include splicing personnel qualifications.

1.05 Quality Assurance

A. The wire and cable shall be of premium quality suitable for installation in Water facilities.

B. All Conductors furnished by the Contractor shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated (UL).

C. The construction and installation of all electrical equipment and materials shall comply with all provisions of the CAL OSHA Safety Orders Title 8 CCR, as applicable), State Building Standards, and applicable local codes and regulations

1.06 Delivery, Storage, and Handling

A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable with City Representative, secure from weather or accidental damage.

PART 2 - PRODUCTS

2.01 Manufacturers

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the General Requirements.

B. Building wire, power and control cable:

1. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
    a. Alpha Wire Corporation
    b. American Insulated Wire Corporation
    c. Belden Wire and Cable
    d. Carol Cable Company
    e. General Cable
2. Conform to UL 444, Communications Cable, NEC type CMP, tinned copper conductors, 100 percent shield coverage, single TSP, Teflon insulated with Teflon jacket in all applications except small diameter.
3. Multiple conductor, small diameter instrumentation cable shall be used where existing conduits limit conduit space as called out on drawings:
    a. Plenum type single or multi paired, twisted pairs, overall shield with drain wire
    b. FEP or FPR insulation and jacket
    c. Moisture and flame resistance
    d. Jacket thickness 0.015 IN minimum
    e. Maximum outside diameter:
        1) 1 PR – 0.125 IN
        2) 2 PR – 0.180 IN
4. Telephone cable:
    a. Solid conductors, tinned copper, No. 24 AWG
    b. 150 volt, vinyl insulated
    c. UL listed 2576

2.02 Equipment and Materials

A. Unless otherwise indicated, provide stranded conductors, except provide solid conductors where No. 10 AWG and No. 12 AWG are designated for branch circuit power wiring in lighting and receptacle circuits.

B. For all direct burial and aerial conductors and cables, provide conductors with UL labeling "TYPE USE" and RHW insulation with heavy-duty, black, neoprene sheath meeting the physical requirements and minimum thickness requirements of ICEA S-19-81 and NEMA WC 3.

C. Where flexible cords and cables are specified, provide Type SO, 600-volt, with the number and size of copper conductors indicated.

D. Insulation
    1. All conductors shall be rated at 600 Volts unless noted otherwise within this special provision section.
    2. All conductors shall be type RHW-2 unless otherwise noted within this special provision section.
    3. All conductors shall be sized for operation at 75 degrees C maximum operating temperature.
    4. For power conductors, provide all single conductors and individual conductors of multi-conductor power cables with integral insulation pigmentation of the designated colors, except

conductors larger than No. 6 AWG may be provided with color coding by applying a heat shrink tube of the appropriate color.

E. Conductors

1. Unless specifically noted otherwise herein, all conductors for general wiring shall be a minimum of 98% conductivity, stranded, soft drawn copper. Aluminum or aluminum alloys are not acceptable.
2. 120 Volt control, indicator, signal and metering conductors may be #14 AWG, and shall be stranded.

F. Instrumentation Signal Cables

1. Instrumentation signal cables shall be of the type used for process control with twisted shielded pairs or triads with polyvinyl jacket an overall shield over the multiple pairs or triads.
2. The instrumentation cable shall be rated 600 Volts at 90 degrees C or better.
3. The size of the instrumentation cable shall be AWG No. 16 with seven strands minimum.
4. All instrumentation cables shall be UL listed. Belden 8719 (Pairs), Belden 8618 (Triads) or equal.

G. PLC Communications Cables

1. Communication cables for remote I/O connections and for PLC high speed data communications shall be as recommended by the manufacturer of the PLC equipment.

H. Ethernet Communications Cables

1. Ethernet communication cables shall be Industrial Grade Cat 6, shielded Twisted Pair (STWP) for building interiors, Belden DataTuff or equal.
2. Ethernet communication cables shall be Industrial Grade gel filled outdoor rated Cat 6e, shielded Twisted Pairs for site and building exteriors and no more than 50 feet into building interiors, Belden DataTuff or equal.

I. Control Cable:

1. Control cable shall be Type SO extra flexible and shall consist of No. 16 copper conductors insulated for 600 volt service. The overall jacket shall consist of 7/64-inch neoprene minimum. The number of conductors shall be as shown on the drawings.

J. Grounding Wire

1. Ground wires, no. 1/0 AWG or larger tinned stranded bare copper cable. All smaller ground wires shall be insulated with green color insulation.

2.03 Components and Accessories

A. Connections

1. Wire nuts for joints, splices and taps for conductors #8 and smaller shall consist of a cone shaped expandable coil spring insert, insulated with a Teflon or plastic shell. Threaded or crimp types will not be accepted. Use "Skotchlock", "Hydent", or equal.
2. Terminals for stranded conductors #8 and smaller shall be a pre-insulated crimp type.
3. Lugs and connectors for conductors #6 and larger shall be compression types of one piece tubular construction with flat rectangular tongues. Two-hole lugs shall be used for sizes 4/0 and larger. Fittings for copper conductors shall be tin-plated copper.

B. Wire and Cabling Termination and Splicing

1. Subject to compliance with Contract Documents, the following manufacturers are acceptable.

a. Burndy Corporation

b. Ideal

c. Minnesota Mining and Manufacturing Co

d. Penn Union

e. Thomas and Betts

f. Or Equal

2. Splicing of cables and wires in the manholes and handholes shall be kept at a minimum. Where it is possible to pull cables or wires directly through the manholes or handholes, splicing shall be moisture-proof and encapsulated using insulating sealing compound. Splicing kits similar to 3M Company 82A or 8500 Series shall be utilized.

C. Labeling

1. Provide complete power and control conductor identification system so that after installation, circuits can be easily traced from origin to final destination.

2. Conductor labels shall be white PVC tubing with machine printed black marking. Tubing shall be sized to fit conductor insulation. Adhesive strips are not acceptable. Machine printed markings, directly on conductors, will be accepted. Panduit, Thomas & Betts, or equal.

3. Tag conductors using a three-segment conductor numbering scheme which defines the origin of the conductor, the function of the conductor, and the destination of the conductor.

a. Example: MCCA-P-MCCB where MCCA is the origin, P is the function identification (P = power, C = control, S = signal, etc.), and MCCB is the destination.

b. For conductors with one point of origin and two or more destinations, expand the function identification number, e.g., PA, PB, etc.

c. Make the origin and destination identification the specific names for the equipment used in the Contract Documents. Make the instrumentation and control identification names exactly as designated, i.e., FT-S-121.

4. Sleeves shall be yellow or white tubing, sized to fit the conductor insulation, with machine printed black marking capable of accepting 24 machine printed character per sleeve label. Adhesive strips are not acceptable.

D. Pulling Lubricant

1. All cables shall be properly coated with pulling compound recommended by the cable manufacturer before being pulled into conduits so as to prevent mechanical damage to the cables during installation.

2. Other lubricants to be substituted must be accompanied by a statement from the cable manufacturer as to its acceptable use with the cable being installed.

E. Electrical Tape

1. Pressure sensitive vinyl

2. Premium grade

3. Heat, cold, moisture, and sunlight resistant

4. UL listed

5. Thickness, depending on use conditions: 7, 8.5, or 10 mil

6. For cold weather or outdoor location, tape must also be all-weather rated

7. Comply with UL 510

2.04 Fabrication

A. Electrical conductors shall be delivered to the job site plainly marked or tagged on 24 inch centers as follows:

1. Underwriters' Label
2. Gauge
3. Voltage
4. Kind of Insulation
5. Name of Manufacturer
6. Trade Name

2.05 Source Quality Control

A. Phase A, B, C implies the direction of positive phase rotation.

PART 3 - EXECUTION

3.01 Examination

3.02 Preparation

A. Color Coding and Labeling. Provide color coding throughout the entire network of feeders and circuits (600 volts and below) as follows:

DESCRIPTION	PHASE/CODE LETTER	WIRE OR TAPE COLOR
480 V, 3 PHASE	A	BROWN
	B	ORANGE
	C	YELLOW
208/120 V, 3 PHASE, 4 WIRE	A	BLACK
	B	RED
	C	BLUE
240/120V, 3 PHASE. 4 Wire	A	BLACK
	B	ORANGE (if High Leg)
	C	BLUE
240 / 120 V, 1 PHASE	L1	BLACK
	L2	RED
120 VAC UPS POWER	L1	ORANGE
DC CONTROL		LIGHT BLUE
NEUTRAL	N	WHITE
GROUND	G	GREEN
SHIELDED PAIR	+	BLACK

DESCRIPTION	PHASE/CODE LETTER	WIRE OR TAPE COLOR
	-	CLEAR
PLC DI AND DO, 120 VAC		BLUE (NOTE 1)
LOW VOLTAGE CONTROL		**VIOLET (NOTE 2)**

Note 1 - Low voltage control electrically direct connected to PLC DI or DO points. Only the wire between the PLC DI or DO and its first landing point shall be BLUE. Wire between this point and other terminations or field devices shall be VIOLET.

Note 2 - Low voltage control not electrically direct connected to PLC DI or DO points. Low voltage includes 120 volts AC or DC and below. Control wiring includes wires, which follow control devices such as switches, or relays and which are not directly connected to power sources, fuses or circuit breakers.

B. In addition to color coding, all power, control, and alarm wiring shall be numbered and identified by means of wire markers at all service pedestals, motor control centers, panelboards, auxiliary gutters, junction boxes, pull boxes, receptacle outlets, light outlets, manholes, disconnect switches, and circuit breakers. These markers shall correspond to numbers on shop drawings, wiring diagrams and interconnection wiring diagrams. Wire markers shall consist of machine engraved numbers applied by an approved marking device.

C. Care shall be exercised in pulling wire and cable into conduit or trays so as to avoid kinking, putting undue stress on the cables, or otherwise abrading them. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii. No grease will be permitted in pulling wire or cable. Where pulling compound is used, use only UL listed compound compatible with the cable outer jacket and with the raceway involved. Contractor shall perform and submit pulling calculation per manufacturer’s recommendation to ascertain that there is no overstrain to the cable. The raceway construction shall be complete and protected from the weather before cable is pulled into it.

D. Single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations shall be wrapped together by arc and fireproofing tapes, and shall be bundled throughout their exposed length with nylon, self-locking, releasable, cable ties placed at intervals not exceeding 18 inches on centers.

E. Incoming wire in service pedestals, panels, and motor control centers, No. 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6 inches, and neatly spread into tees and connected to their respective terminals. Sufficient slack shall be allowed in cables for alterations in terminal connections. Lacing shall be done with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for wire runs, lacing is not necessary when the wire is properly installed in the ducts. Slack shall be provided in junction and pull boxes and in handholes and manholes. Amount of slack shall be equal to the largest perimeter dimension of the box.

F. Wires crossing hinges shall be made up into groups not exceeding 12 and shall be so arranged that they will be protected from chafing when the hinged member is moved.

G. Electrical Tape Usage:

1. For insulating connections of #8 AWG wire and smaller: 7 mil vinyl tape.
2. For insulating splices and taps of #6 AWG wire or larger: 10 mil vinyl tape.
3. For insulating connections made in cold weather or in outdoor locations: 8.5 mil, all weather vinyl tape.

H. Pulling:

1. No oil, grease or similar substances shall be used to facilitate the pulling in of conductors. Use a specifically approved wire pulling compound.

2. No wire or cable shall be pulled in until all construction which might damage insulation or fill conduit with foreign material is completed.
3. Wire shall be pulled into conduits with care to prevent damage to insulation, using basket pulling grips to avoid slipping of insulation on conductors. Nylon rope or other "soft" surfaced cable must be used for pulling in conduits other than steel.

I. Connections:

1. Stranded conductors #8 and smaller shall be terminated with terminals of appropriate size where connected to screw type lugs.
2. Joints, splices and taps in dry locations for conductors #8 and smaller shall be made with twist-on connectors suitably sized for the number and gauge of the conductors.
3. Furnish and install proper lugs in all service pedestals, panelboards, motor control centers and gutters as required to properly terminate every cable. Where paralleled conductors, or conductors of large size are to terminate on a breaker, a short length of copper cable (of capacity of the breaker) shall be connected to the breaker, and the proper compression type lug installed to connect this cable to the feeder cable. The cutting of cable strands to fit the breaker will not be permitted.
4. Only crimping tools approved by the manufacturer of the terminals or lugs shall be used.
5. Uninsulated lugs and wire ends shall be insulated with layers of plastic tape equal to insulation of wire and switchboards, with all irregular surfaces properly padded with insulating putty prior to application of tape. Wire in service pedestals, panels, cabinets, pullboxes and wiring gutters shall be neatly grouped together and laced with #12 standard lacing twine, or cable ties.
6. In underground location, joints, splices and taps shall be insulated by the "Skotchcast" epoxy-resin method. In-line splices may be insulated by approved waterproof "shrink tube" method.
7. In service pedestals, panels, pull boxes, gutter, etc. conductor shall be neatly fanned out and tagged with wire markers.
8. At outlets, junction boxes, pull-boxes, fittings, etc., conductors shall be looped or pigtailed to extend at least six inches without splice beyond such wiring enclosures, and where used, pigtails added to loops for connection to fixtures or devices shall be at least six inches long.
9. Conduit shall be capped during construction by means of manufactured conduit seals or caps to prevent entrance of water or debris, and shall remain closed until ready for use.

3.03 Installation

A. Install all wiring in raceway unless otherwise indicated on the drawings.

B. Power Feeder, power branch, control and instrumentation circuits shall be not combined in conduit, wireway, junction or pull boxes; except as permitted in the following:

1. Where specifically indicated on the drawings or field conditions dictate and written permission is obtained from the Engineer.
    a. Feeder and branch circuits shall be isolated from each other and from all control and instrumentation circuits.
    b. Control circuits shall be isolated from feeder, branch and instrumentation circuits.
    c. 12 VDC, 24 VDC and 48 VDC may utilize a common raceway.
    d. 125 VDC shall be isolated from all other AC and DC circuits.

e. AC control circuits shall be isolated from all DC circuits.

C. Instrumentation circuits shall be isolated from feeder, branch and control circuits.

D. Ground the drain wire of shielded cables at one end only.

E. Maintain electrical continuity of the shield when splicing twisted shielded conductors.

F. Make splices and taps only at pull or junction boxes.

G. Terminate instrumentation and control wiring, including spare wires, at control panels and motor control centers on terminal boards mounted inside the equipment.

1. Contractor shall supply terminal boards as required.
2. Do not field wire directly to devices.
3. Ground both ends of spare wires.

H. All conduits containing conductors shall be sealed as the conduit enters pull boxes and electrical vaults and manholes. Power conductor, control conductors, and instrumentation conductors shall be bundled and supported separately and independently in pullboxes, vaults and manholes.

I. Cables:

1. Do not splice without permission of the Engineer. Locate splices, when permitted, only in readily accessible cabinets or junction boxes using terminal strips. Splices will not be permitted unless deemed necessary by approved pulling tension calculations.
2. Where connections of cables installed under this section are to be made under Division Instrumentation and Controls, leave pigtails of adequate length for neat bundled type connections.
3. Instrumentation, computer, and control cables run under infinite access floors in control rooms may be installed under the floor without protection. Run individual wires, pairs, or triads in flex conduit under the floor or grouped into bundles at least ½ inch in diameter.
4. Maintaining the integrity of shielding of instrumentation cables is essential to the operation of the control systems. Take special care in cable installation to ensure that grounds do not occur because of damage to the jacket over the shield.
5. Cables entering manholes, handholes or vaults shall be sealed using an expanding foam product approved for the purpose.

J. Conductor Arc and Fireproofing Tapes

1. Use arc and fireproofing tapes on all 600-volt single conductors and cables except those rated Type TC at splices in all maintenance holes, handholes, vaults, cable trays, and other indicated locations. Wrap together as a single cable all conductors entering from each conduit.
2. Follow tape manufacturer's installation instructions. Secure the arc and fireproofing tape at frequent intervals with bands of the specified glass cloth electrical tape. Make each band of at least two wraps of tape directly over each other.
3. Wrap together as far as possible, conductors carrying phases A, B, and C of the same feeder. Do <u>not</u> wrap together conductors carrying only two of the three phases.
4. The cables shall be trained as closely as possible to their final positions.
5. The cables shall be cleaned of all oil, grease, and cable pulling compounds using suitable solvents and cleaners non-injurious to cable and then wiped completely dry.
6. Any projecting surfaces such as fittings, ground connectors or bonding connections shall be covered with an insulating compound to present a smooth continuous surface for taping.

7. Fireproofing tapes shall be submitted as shop drawings for approval. Tapes shall be 3-inch width half-lapped and extend a minimum of 6-inches into the raceway. Use ¾" glass tape at three foot intervals to hold tape in place.

K. Labeling

1. Each power and control circuit conductor shall be identified as shown at each terminal to which it is connected with a legible permanent coded marking sleeve. This includes all wring terminations whether field terminations or interior wiring within switchboards, motor control centers, control panels, equipment, and junction panels and boxes.
2. In each manhole, handhole and pull box, each conductor shall be similarly marked with a split sleeve, machine marked so the identification can be made using groups of letters and numbers.
3. Each wire and conductor shall be labeled with a wire label that corresponds and matches the wire labels shown on the approved interconnect drawings, loop drawings or elementary wiring diagrams.
4. For neutral wires such as jumpers between adjacent relay coil neutral terminal that are less than 7 inches in length, the wire label may be omitted if there isn't sufficient space for the labels.
5. Wire numbering shall be compatible and consistent with existing system and shall be approved by the engineer.
6. For general lighting and 120 volt powered receptacles, the wire labels shall be installed at each device with a label that consists of the panelboard name and the circuit number. For example, the Circuit Breaker located in the number 1 position of Panelboard "OPL2 would have its associated wiring labeled as "PNLOPL2-L1 (line power) and "PNLOPL2-N1 (Neutral).

L. Wire and Cabling Termination and Splicing

1. Power and control conductors shall be terminated in terminal blocks with solderless box lugs. Signal leads shall be terminated in terminal blocks with saddle-type pressure connectors capable of receiving two No. 16 AWG or smaller conductors on each point.
2. Splices in power wiring shall be made with two compression lugs bolted together. Splices in stranded control wiring or lighting circuits may be made with compression connectors. Splices in signal wiring shall be soldered. Splicing shall not be considered as a normal method of construction. Splicing shall be used only when no practical alternative exists to using terminals or point-to-point wiring. When utilized, splicing of 600 V or less insulated wire shall be made only in junction boxes. No splicing shall be permitted in conduit fittings.
3. Solid wire shall not be lugged nor shall electrical spring connectors be used on any wiring. Lugs and connectors shall be installed with a compression tool recommended by the lug manufacturer for the particular lug used. Pulling tensions shall not exceed the cable manufacturer's recommendations.
4. All conductors shall be tagged at each end in motor control centers, control panels, service pedestals and control stations with a legible permanent coded wire-marking sleeve. All conductors shall be identified in each manhole, handhole or pull box. Field conductors shall be similarly tagged at each end, except that each conductor termination shall have its marking sleeve imprinted with terminal identification for both ends of the conductor. A schedule shall be provided with the record drawings correlating these wire markings.
5. All splices and terminations for No. 1/0 AWG cable, and larger, shall be inspected by the Engineer prior to and after insulation is applied. Terminations at polyphase motors shall be made by bolt connecting the lugged conductors and then applying rubber filler tape and two 2-lapped layers of vinyl tape to equal or exceed the thickness of conductor insulation.

M. Grounding

1. A grounding system shall be installed in accordance with the National Electrical Code and special provision section 16450. All grounding surfaces shall be thoroughly cleaned before connecting the grounding electrodes. All conduit shall be grounded directly or through equipment frames and ground buses to the grounding system.
2. In addition to the conduit system, all equipment having 480 volt, 120/208 volt or 120/240 volt supply shall be grounded to the supply source ground bus by a green insulated code sized ground conductor installed in the conduit with the phase cables. Ground conductors for small panels and equipment shall be of same size as associated conductors.

3.04 Adjusting / Cleaning / Protection

A. Tighten all screws and terminal bolts using torque type wrenches and/or drivers to tighten to the inch-pound requirements of the NEC and UL.

B. All debris and moisture shall be removed from both new and existing raceways, boxes, and cabinets before installing wire or cable

****END OF SECTION****

SECTION 16200
OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 Summary

A. Scope: This section provides specifications for all molded case overcurrent protective devices including circuit protective devices, ground fault circuit interrupters, and motor circuit protectors.

B. Type: The overcurrent protective devices shall be molded case type with adjustable trip settings.

1.02 References

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these special provisions.

Reference	Title
FS W-C-375	Federal Standard – Circuit Breakers, Molded Case, Branch Circuit and Molded Case Switches
NEMA AB 1	Molded Case Circuit Breakers

1.03 Submittals

A. Submittals shall comply with the provisions set forth in 16010.

1.04 Quality Assurance

A. Performance Requirements

1. The frame sizes for overcurrent protective devices shall be as indicated on the contract drawings. The overcurrent protective devices shall be either thermal magnetic or fully magnetic depending on whether the device is protecting a feeder or a motor starter.
2. The circuit breakers shall be shall be UL listed. An electronic trip unit shall be provided for:
    a. Manual Transfer Switch (MTS)
    b. Generator
3. Molded case circuit breakers shall be provided with current ratings and pole combinations as indicated on the contract drawings.
4. The molded case circuit breakers for protecting feeders shall be thermal magnetic type that provides inversed time delay overload and instantaneous short circuit protection. The molded case circuit breakers in combination type starters shall be fully magnetic type that provides instantaneous short circuit protection. In addition, the circuit breakers shall be ambient temperature compensated. The minimum interrupting rating of the breakers shall be at least equal to the available short circuit current at the line terminal.

B. Operating Requirements: The interrupting ratings for circuit breakers shall be in accordance and meet or exceed the minimum requirements established by the Short Circuit Study. Lighting panel circuit breakers shall have an interrupting rating of no less than 22,000 amperes rms (symmetrical) at the applied voltage. All other molded case circuit breakers shall be rated at 600 volts, shall meet or exceed the minimum requirements established by the Short Circuit Study and provide the selective coordination requirements demonstrated by the Protective Device Evaluation. For any

circuit breakers not covered by Protective Device and Coordination Study, the following minimum interrupting ratings shall be met:

Frame Designation (b)		Maximum Continuous Amperes	Minimum Interrupting Rating	
CH	GE		480 volts sym. Amps	240 volts sym. Amps
HFD	TEL	100	65,000	100,000
HFD	TEL	150	65,000	100,000
HFD	THFK	225(a)	65,000	100,000
HLD	THJK4	400(a)	65,000	100,000
HMC	TPSS	800(a)	65,000	100,000
HNC	TPSS	1,200(a)	65,000	100,000
PB	TPSS	1,600(a)	100,000	100,000

Notes:
Interchangeable trips shall be provided.
Frame sizes as shown are Cutler Hammer (CH), General Electric (GE), or equal

1.05 Equipment and Materials

A. Circuit breakers shall be of the frame sizes indicated and their ratings shall not be less than the sum of the continuous load plus the non-continuous load. The trip ratings shall be based on the total minimum loads that are summation of the continuous load and non-continuous load. The wire used shall be 90 degree C applied at the 75 degree C capacity. Feeder conductor ampacity shall be equal to or greater than the non-continuous load plus 125% of the continuous load. The circuit breaker units shall have an auxiliary set of double throw contacts to indicate the status of the circuit breakers. Circuit breakers shall be Cutler-Hammer, or approved equal.

B. The unit shall have solid state trips, current monitors, long time delay, short time delay ground fault trips and instantaneous trip. The circuit breaker shall have an auxiliary set of double throw contacts to indicate the status of the circuit breakers. For mechanical testing, a push-to-test button shall be provided

C. Molded Case Circuit Breakers

1. Molded case circuit breakers shall be fully enclosed in a molded case and circuit breakers with non-interchangeable trips shall have their covers sealed. Contacts shall be made from a non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes that consist of a metal grid mounted in an insulated support.

2. Molded case circuit breakers with current limiting fuses shall be one complete assembly consisting of a molded circuit breaker and current limiting fuse. The above current limiting fuses shall be coordinated with the circuit breaker element for selective operation. The circuit breaker shall not reset until current limiters which have functioned have been replaced and covers fastened. The current limiters shall have visual indicators to indicate which unit needs replacement.

3. The fully magnetic type circuit breakers shall be adjustable trip magnetic type designed to meet NEC requirements for such devices. The adjustment shall provide instantaneous trip settings in the range of 700 percent to 1300 percent of the lowest full load current for which the unit is rated. Each unit shall be adjusted to the circuit breaker manufacturer's recommended

setting for the particular motor full load current. All other characteristics shall be in accordance with the special provisions for molded case circuit breakers. The interrupting rating shall be not less than 65,000 amperes symmetrical. Where short circuit current exceeds 65,000 amperes an integrally mounted current limiter shall be provided. Refer to one-line diagrams for available short circuit duties.

D. Ground Fault Circuit Interrupters

1. Ground fault circuit interrupters (labeled GFI on diagrams) shall be provided in the locations as shown in the panelboards. The circuit interrupters shall be UL listed for the application and shall trip at 5 milli-amperes to protect personnel from electrical shock hazard. The unit shall be of the plug-in type and shall be of the same manufacturer and shall match the other circuit breakers in the panelboard in space requirements and general appearance, except that a test pushbutton shall be provided on the face of each unit and be accessible from the front (similar to the accessibility of the circuit breaker toggle handle).
2. The neutral for each circuit that is ground fault protected shall be individually brought back with the live leg of the circuit and connected to the neutral pigtail or terminal of the interrupter unit. All wiring in GFI circuits shall be 3/64-inch insulated XHHW No. 12 AWG minimum. In general, the GFI monitored circuits will be those feeding receptacles in the shop, laboratory, restrooms, operating and outdoor areas of the plant or station and as otherwise noted.

PART 2 - EXECUTION

2.01 Installation

A. Testing: After the completion of installation, each protective device shall be individually tested to ensure that the device is properly installed, connected and operates as specified and as required.

****END OF SECTION****

SECTION 16208
STANDBY GENERATOR & ACCESSORIES

PART 1 - GENERAL

1.01 Summary

A. Scope: This special provision covers requirements for providing a factory built, factory tested, field tested, complete and operable standby power generating system including all devices and equipment specified hereinafter. All materials and equipment shall be new and of current production of a national firm which manufactures the engine-generator set as a matched unit. The manufacturer, together with its authorized representative, shall have full responsibility for the performance of the generator set and accessories.

B. Type: The generator shall be EPA Tier 3 emissions compliance capable of producing a continuous source of power for the duration of any normal power interruption. The system shall include diesel powered engine driven electric generator with rail-mounted engine-driven radiator fan, sound attenuated enclosure, sub-base fuel tank, microprocessor based controller, starting batteries, battery charger, battery racks, circuit breaker with electronic trip, cables, a complete exhaust system, and all other required items for a complete system. The exhaust system shall include type 316 stainless steel critical muffler, type 316 stainless steel exhaust piping, vent pipes, and flexible exhaust connectors. The unit shall be designed for outdoor installation.

1.02 References

A. Codes and Standards: All equipment and materials, including their fabrication, assembly testing and installation shall meet the applicable requirements of the following codes and regulations.

Reference	Title
AIEE Standard 606	Speed Governing of Engine Generator Units
CAC, Title 19	California Administrative Code Title 19, Public Safety
IEEE 446	Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
NEMA MG1	Motors and Generators
NFPA 37	Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbine
NFPA 70	National Electrical Code. Equipment suitable for use in systems compliant to Articles 700, 701 and 702
NFPA 110	Standard for Emergency and Standby Power Systems, Latest Edition
BAAQMD	Bay Area Air Quality Management District Standard for Steel Above Ground Tanks for Flammable and combustible Liquids
UL 142	

1.03 Submittals

A. Submittals shall be prepared as specified in Section 16010.

B. Performance Data: The following performance related documents shall be submitted:

1. Manufacturer's standard specification sheets

2. Horsepower curves
3. Generator curves
4. Fuel Consumption curves showing 75% and 100% load
5. Torsional stress analysis and mass elastic system
6. Motor starting curves
7. Radiator cooling curves
8. Warranty certificates

C. Documents and Shop Drawings: The following equipment descriptive data, operation and installation data, and shop drawings shall be submitted in accordance with the provisions set forth in Section 16010 within 60 days of contract award.

1. Complete Bill of Materials listing equipment furnished and vendor catalog numbers.
2. Catalog sheets of every major component, marked in such a manner that it identifies the equipment.
3. Outline drawings of the standby generator showing overall dimensions, air intakes and exhaust openings, door dimensions, total weight and the sound rating design criteria.
4. Assembly drawing detailing the following:
    a. Overall width, length and height
    b. Fuel connections
    c. Fuel tank dimensions
    d. Fuel tank instrumentation
    e. Electrical connections including breaker location
    f. Total weight of the engine-generator set
    g. Exhaust piping and connections
5. Complete electrical schematics, description of operation, and control schematics of the automatic operation-manual operation, including the following:
    a. All A.C. and D.C. schematics
    b. Control panel layout
6. A copy of the procedure that will be followed for field testing. The temperature and rating of this equipment is required by the purchaser.
7. Seismic calculation and anchoring requirements as specified in Section 16010, 1.07B.
8. Vibration Isolators
9. All warranty sheets

D. The operation and maintenance manual shall include:

1. Complete As-Built drawings of the submittal package.
2. Complete Bill of Materials with all applicable part numbers listed.
3. Complete operator's guidebook(s) detailing engine-generator / load bank operation and maintenance procedure required including a lubrication and maintenance chart.
4. Complete maintenance, calibration, and repair instruction manuals on all major components, electrical schematic, and trouble shooting guide.

5. Complete parts book detailing all components of the engine-generator set and load bank.
6. A complete list of recommended consumable parts, their availability and current cost
7. List of special tools, instruments, accessories, and special lifting devices required for periodic maintenance repair, calibration, and adjustment.
8. Complete technical and catalog data including product brochures, giving specified information on performance and operating curves, ratings, capacities, characteristics, efficiencies and other data to fully describe items such as the engine, generator, batteries, battery charger, exhaust components, cooling system, jacket water heater, and output circuit breaker. Vendor shall include the name, address, and telephone number of the service organization for the electric generating equipment.

E. Certified Data: The Vendor shall submit certified copies of factory test reports of the generator. Copies of the factory test reports shall be certified by the manufacturer

1.04 Quality Assurance

A. Unit Responsibility: The engine-generator and all ancillary equipment shall be manufactured by manufacturers currently engaged in the production of such equipment. All materials and parts in the unit shall be new and unused, of current manufacture and of the highest grade. The equipment shall be manufactured by a single manufacturer who has been regularly engaged in the production of engine-generator sets for a minimum of ten (10) years for this package (radiator, engine, generator, and control panel configuration). The electric generating system shall be factory built, factory tested, and shipped by a single manufacturer so there is one source of supply and responsibility for warranty, parts, and service.

B. Manufacturer's Qualifications: The manufacturer is herein defined as a company that offers standard production equipment assembled, tested and supported by authorized dealers. The manufacturer shall have available actual test data on the same configuration of the major components of the package and shall provide, upon request by the Engineer, a list of five (5) installations of such model equipment with the same major components.

C. Service Location: The manufacturer shall have a local authorized dealer located in City or within 150 mile radius from the project site that can provide factory trained service representatives, required stock of replacement parts, and technical assistance. The dealer must have a service department with twenty-four hour, seven days per week availability.

D. Safety Standard: The electric generator system provided must meet all requirements of NFPA 110-2016 including design specifications, prototype tests and one step full load pickup. The responsibility for performance of this special provision in the entirety cannot be split among individual suppliers of components comprising the system but must be solely assumed by the supplier of the system. The manufacturer shall furnish schematic and wiring diagrams for the engine-generator set.

E. Standard of the Manufacturer: The engine generator set shall be the manufacturer's standard commercial product with any added features needed to comply with the requirements. All controls shall be the standard of the manufacturer and control parts shall be identified by numbers of the manufacturer. Control systems that are supplied by a sub-vender or subcontractor and not incorporated in the documentation drawings of the generator manufacturer are not acceptable. Additional or better features which are not specifically prohibited by this special provision, but which are part of the manufacturers' standard commercial product shall be included in the generator set being furnished.

F. Torsional Vibration and Critical Speeds: The mass electric system consisting of engine, flywheel, generator, intermediate couplings and accessories attached to the power train as well as all associated supports and frames shall be designed to be free of dangerous torsional vibrations and critical speeds from 15 percent below idling to 15 percent above the units operating synchronous

speed. In addition, the system will have no first, second, third, or half-order critical speeds within plus of minus 20 percent of governed speed. All necessary torsional calculations and evaluations of the mass elastic system shall be under the supervision of a registered professional engineer routinely engaged in this type of work. The engineer shall produce a report providing the results of the analysis and recommendations, if any, for controlling torsional vibration and critical speeds or prototype test results for unit of same type.

G. Bay Area Air Quality Management District (BAAQMD) Permit

1. The engine generator shall be equipped with all necessary devices to meet current BAAQMD requirements for the operation of a standby diesel engine-generator. The vendor shall obtain engine data from the manufacturer to provide to the Contractor and do all the necessary work to help the Contractor to submit a complete permit application. The vendor shall coordinate with the Contractor to begin the permit application process as soon as the Engineer has approved the System submittal.
2. The Contractor shall pay permit fees and coordinate with the vendor to obtain “Authority to Construct” and “Permit to Operate” (in City’s name) from BAAQMD. Contractor shall include the permit fees in its original Bid Price.
    a. Vendor shall provide engine emissions data sheets demonstrating compliance with the current standards of the BAAQMD.
    b. Vendor shall assist the Contractor in obtaining the “Authority to Construct” and “Permit to Operate” application forms from BAAQMD and fill in all information pertaining to emissions and engine-generator set. The Contractor shall forward original copy of partially completed application to the City. The City shall complete remaining portion of the application and return to the Contractor.
    c. Contractor shall pay for and obtain BAAQMD approval and shall forward original copies of the “Authority to Construct” and “Permit to Operate” to the City prior to delivery of engine-generator set to the project site.
    d. Contractor shall install engine-generator set in compliance with conditions in permits, pay any remaining fees, and obtain field approval of BAAQMD inspector. Contractor shall forward original copies of the “Authority to Construct” and “Permit to Operate” to the City. Contractor shall coordinate and verify if any additional BAAQMD requirements for new generator is required. No additional compensation shall be made for delays.

H. Santa Rosa Fire Permit

1. A separate fire permit is required from the Santa Rosa Fire Department for this proposed diesel fuel generator conversion. Submit complete plans to the Santa Rosa Fire Department for review and approval prior to issuance of fire permit.

1.05 Delivery, Storage, and Handling

A. Refer to Section 16010 – General Electrical Provisions, 1.06 for requirements.

B. The standby generator system shall be installed as shown on the Drawing.

1.06 Project / Site Conditions

A. The generator shall be suitable for use up to 500 feet above mean sea level. The ambient temperature of the area is expected to vary between 10 degrees F and 110 degrees F and the relative humidity is expected to range between 20 and 100 percent.

1.07 Warranty

A. The standby power engine-generator unit, and all other equipment items provided under this section shall be guaranteed by the vendor against defects in materials and workmanship, covering

100 percent parts, labor, and travel expenses for a period of five (5) years. The vendor shall be capable of administering the warranty service on all components of the emergency generator system specified herein.

1.08 Maintenance

A. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the maintenance log of repairs made and function tests performed on all systems.

B. Spare Parts

1. Provide the following new spare parts in the manufacturer's original packaging for future maintenance requirements. Deliver all spare parts to City when the operational startup testing is conducted. Group related parts together in an organized manner. Provide a "Bill of Material" type inventory transmittal form.
2. Provide a separately tabbed section in the O & M Manual with a "Bill of Materials" listing of all common field replaced spare parts. Provide the following spare parts:

Quantity	Description
2 Replacement Sets	Air Filter(s)
2 Replacement Sets	Fuel Filter(s)
2 Replacement Sets	Oil Filter(s)
2 Replacement Sets	All light bulbs, or indicating lamps
2 Replacement Sets	All belts
1 Replacement Set	Radiator Cap, Thermostat & Gasket

PART 2 - PRODUCTS

2.01 Manufacturers

A. Caterpillar, No Substitution.

2.02 Equipment and Materials

A. Engine Generator Set

1. The system shall include the following:

a. The generator shall be rated for a minimum continuous standby operation at 125 kW (150KVA), 0.8 PF, 60 HZ, 3 phase, 4 wire, and 480VAC on a continuous standby basis at 1800 RPM.

b. Fuel tank shall be sub-base double walled fuel tank with storage capacity of 24 hours at full load operation of the generator.

2. The engine generator set as described with all the accessories in place and operating shall meet the following performance requirements:

a. The steady state voltage shall be within 15% of 480 volts under all loads and ambient conditions.

b. The steady state frequency shall be within 1.5 % of 60 Hz under all load and ambient conditions.

c. The voltage shall remain within plus and minus a percentage value, as listed below, of 480 volts when starting motors as required by the special provisions and drawings. The voltage shall recover to and remain within the steady state value in 5 seconds after any transient.

d. The frequency shall remain within plus or minus 10% of 60 Hz under all load conditions when starting motors as required by the special provisions and drawings. The frequency shall recover to and remain within the steady state value in 5 seconds after any transient.

e. The engine generator set shall be capable of providing power for the following starting scenario (refer to single line diagram for any specific electrical requirements):

Steps and Loads (Listed in Starting Sequence)	**Starting Method**	**Code Letter**
Step 1		
Control Panel UPS		
Site Lighting		
Misc Power		
Sewage Pump 1	soft start	
Step 2		
Sewage Pump 2	soft start	

B. Engine

1. The engine-generator driver shall be a liquid-cooled, diesel fueled engine designed for use with No. 2 diesel fuel. The engine shall be capable of driving the generator with all accessories in place and operating at rated kW at project site conditions.

2. The design shall be 4 cycle compression ignition diesel, direct injection, turbocharged, and intercooled. Two cycle engines will not be considered. The engine shall be equipped with fuel, lube oil, and intake air filters, lube oil cooler, fuel transfer pump, fuel priming pump, service meter and gear-driven water pump.

3. The engine shall be capable of driving the generator at this rating on a continuous basis for the duration during the normal utility source interruptions per SAE J1349 conditions.

4. The engine shall be certified by the engine manufacturer as capable of developing the required horsepower at 1800 RPM and driving a generator yielding a kW rating as specified herein.

5. The engine equipment shall include the following:

a. An electric starter(s) as required by the manufacturer.

b. Gear type, positive displacement, full pressure lubrication oil pump; full flow spin on lubrication oil filters with replaceable spin on canister elements; dipstick oil level indicator.

c. Fuel filter with replaceable spin on canister elements and an engine driven mechanical, positive displacement fuel pump all mounted on the engine.

d. The engine speed shall be governed by an electronic governor to maintain governed by an electronic governor to maintain governed speed at precise isochronous control for rated frequency operation. The frequency at any constant load, including no load, shall remain within a steady band width of plus or minus 0.25% of rated frequency.

e. Engine protection devices shall have sensing elements located on the engine to initiate the following preliminary and engine shutdown alarms:

1) Low coolant temperature alarm

2) Low lubrication oil pressure alarm

3) High coolant temperature alarm

4) Low lubrication oil pressure shutdown

5) High coolant temperature shutdown

6) Overspeed shutdown

7) Overcrank lockout

8) Engine running time hour meter

f. Provide low coolant level shutdown which will activate high engine temperature lamp and shutdown.

g. Engine starter battery charging alternator, with solid state voltage regulator

h. Provide engine mounted, thermostatically controlled water jacket heater for engine to aid in quick starting. For the Generator, heater shall be rated 120V single phase and 90 to 120 degrees F. Water heater shall include UL label and be readily accessible.

i. Vendor shall provide an oil drain line with valve and hose extension for ease of routine oil changes.

C. Engine Cooling System

1. The generator set shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 85 degree F ambient air without derating the unit and 50/50 anti-freeze mixture.

2. The engine cooling system shall be filled with a minimum concentration of 50% ethylene glycol upon delivery. Flexible cooling water connections shall be furnished for each cooling connection to the engine.

3. The radiator shall be provided with a duct adaptor flange permitting the attachment of an air discharge duct.

D. Engine Fuel System

1. Generator set supplier shall provide all fuel system, which shall be flexible hose for connection and shall be sized for proper fuel flow to engine.

2. The generator set supplier shall provide a UL listed, painted double-wall skid mounted fuel tank with tank capacity to supply fuel to the engine for a minimum of 24 hours operation at 100% of rated load.

3. Supply piping connections for fuel suction/return lines to fuel storage tank, fuel supply/return lines to engine, and emergency vent. Include local fuel fill, tank drain connection, removable

inspection plate with gasket, ‘press to test”, switch, and fuel level gauge. The following accessories shall be provided; steel rupture basin to contain 150% capacity, fuel in rupture basin switch, high/low fuel level switches for remote annunciation & PLC Input, fuel level transmitter with 4-20mA output, UL 508 control module and fuel strainer.

4. Fuel Filter – In addition to the standard fuel filters provided by the engine manufacture, there shall also be installed a primary fuel filter/water separator in the fuel inlet line to the engine.
5. All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping shall be permitted.
6. Flexible fuel lines shall be rated 300 degrees F and 100 PSI.

E. Engine Exhaust System

1. Vendor shall provide exhaust silencer of the super critical type sized to assure full load operation without excessive back pressure. It shall be mounted within the sound attenuated housing as recommended by the generator set manufacturer. It shall be mounted so that the weight of the silencer is not supported by the engine.
2. The manufacturer shall provide test data certifying that the furnished silencer is in compliance with this performance criteria.
3. The silencer shall be arranged for horizontal mounting with side or end inlet and end outlet. Vendor shall provide a 316 stainless steel bellows type flexible exhaust connector at the engine exhaust outlet to allow for pipe expansion and contraction. Exhaust piping shall be 316 stainless steel.

F. Exhaust System Accessories:

1. One 1- inch insulation blanket on all exposed surfaces of the silencer and exhaust piping
2. Exhaust stack rain cap.
3. Condensation drain trap with manual valve.
4. The engine exhaust manifold, turbocharger, and turbocharger elbow shall be provided with an insulating blanket supplied and installed by the generator set manufacturer.
5. Brackets, rods, fasteners, and other items to secure the silencer in place. Insulation shall be provided at points of contact with combustible materials to prevent heat radiated by any hanger rods from posing a fire hazard.

G. Generator

1. The AC generator shall be brushless, revolving field type, coupled to the engine flywheel through a flexible deriving disc for positive alignment. The generator housing shall bolt directly to the engine flywheel housing. The generator housing shall have a single ball bearing support for the rotor. The rotor shall be dynamically balanced up to 25% overspeed. The generator shall be 12 lead synchronous, four pole, drip-proof, and air cooled.
2. The stator windings shall have skewed laminations of electrical grade steel. The stator winding shall be of 2/3 pitch design to eliminate the third harmonic wave form distortion and minimize the harmful neutral circulating current when operating in parallel. The wave form harmonic distortion shall not exceed 5 percent total RMS measured line to line at rated load and single harmonic maximum of 3 percent of rated voltage.
3. The rotor shall be layer wound mechanically wedged winding construction with thermo-setting epoxy between each layer plus a final coat of epoxy for moisture and abrasion resistance. Amortisseur windings shall be integral with the rotor support. The rotor shaft bearing shall be shielded type with provisions for easy servicing through grease pipes which extend to the

exterior of the generator frame. The bearing shall be designed for a minimum B-10 bearing life of 40,000 hours.

4. The rotating brushless exciter shall incorporate a full wave, three-phase, and rotating rectifier with hermetically sealed, metallic type, silicon diodes to supply the main field excitation. A multi-plate selenium surge protector shall be connected across the diode network to protect it against transient conditions.
5. Sub-transient reactance shall not exceed 10 percent.
6. Radio interference: Alternator and voltage regulator shall meet the provisions of BS 800 and VDE Class G and N.
7. All system components including the rotor, stator, and exciter shall be Class H as recognized by NEMA. The temperature rise measured by resistance at full load shall not exceed 80 degree's F. The main generator and exciter insulation shall be suitably impregnated for operation in severe environments of sand, salt water, and sea spray.
8. A manual reset exciter circuit breaker sensing overload or short circuit in each of the generator output legs shall be mounted on the generator to protect the generator from any over-current condition.
9. Current boost: Provide Permanent Magnet Generator (PMG) for excitation power, isolation and 300% current for 10 seconds.
10. If a short circuit occurs, the generator shall be capable of supporting 300% rated current for 10 seconds for selective tripping of down line protection devices. A current sensing magnetic breaker will protect the exciter and trip after 10 seconds during the current boost condition. Current boost systems using electronic means or CT's are not acceptable.
11. AC output leads shall be brought out to the field connection bus bars through removable plates on either side of sheet metal output box and terminated on the output circuit breaker.
12. The generator shall be furnished with an end mounted, ventilated load connection box such that the load connectors can enter the bottom of the junction box.

H. Voltage Regulator

1. The voltage regulator shall be of solid state construction, with three phase RMS sensing, asynchronous pulse width modulated, temperature compensated with over-voltage and over excitation protected. Over-voltage protection shall shut down the regulator output on a sustained over voltage of one (1) second. Over-excitation protection shall shut the regulator output if overloads exceed ten (10) seconds. The regulator shall allow frequency output to decline to 58-59 Hertz before correcting the output voltage. It shall be mounted inside the generator terminal box or in the control cabinet. A built in voltage adjusting rheostat shall provide 5% voltage adjustment.
2. The voltage regulation shall be plus or minus 0.5% of rated voltage for any constant load from no load to rated load. The regulator printed circuit board and power control diodes shall be hermetically sealed for moisture protection.
3. For any addition of load up to and including a 75 HP code G motor, the voltage dip shall not exceed of rated voltage. The voltage shall recover to and remain within the steady bank in not more than 4.5 seconds.
4. The frequency regulation from no load to rated load shall be in accordance with that defined by the engine governor performance. For any addition of load up to 90% of rated load, the frequency shall recover to the steady state frequency band within 7.0 seconds.
5. The balanced telephone influence factor (TIF) shall not exceed 50

2.03 Components and Accessories

A. Generator Control Panel

1. The generator NEMA 1 control panel shall be mounted on the generator complete with: recessed front panel hinged at the bottom, rubber isolation vibrators, and grommeted control wire exit hole. The control panel shall have surge suppression for protection of solid state components. Vendor shall supply a front control panel illumination lamp with ON/OFF switch, alarm horn and silence switch. Control panel accessories shall include the following instruments:
   a. A.C. voltmeter, 2% accuracy, 2-1/2", 0-480 V
   b. A.C. ammeter, 2% accuracy, 2-1/2", 0-600 A
   c. Dial type frequency meter, 0.5% accuracy.
   d. Ammeter, voltmeter phase selector switch with OFF position.
   e. Phase selector switch with OFF position for meter display of current and voltage in each generator phase.
   f. D.C. running time meter, non resettable
   g. D.C. battery charging voltmeter
   h. Engine water temperature gauge
   i. Shutdown indicators for low oil pressure
   j. High water temperature
   k. Engine over-speed
   l. Solid state voltage adjustment with +/- 5%
2. The engine-generator control shall have automatic remote start capability. A three position switch (RUN-STOP-AUTO) shall start the engine in the RUN position, stop the engine in the STOP position, and allow the engine to start and run by closing a remote contact, and stop when opening the remote contact in the AUTO position.
3. The engine-generator control shall include a cranking cycle consisting of three cranking cycles with rest periods. Failure to start after three attempts (75 seconds) shall shut down and lock out the engine.
4. The engine-generator control shall shut down and lockout the engine upon:
   a. Overcrank
   b. Overspeed
   c. Low oil pressure
   d. High engine temperature
5. The control panel shall be provided with a DC powered twelve light monitor labeled as follows:
   a. Run: Red
   b. Low oil pressure (pre-alarm): Amber
   c. High engine temperature (pre-alarm): Amber
   d. Low engine temperature: Amber
   e. Low oil pressure (shutdown): Red
   f. High temperature (shutdown): Red

g. Overcrank: Red

h. Overspeed: Red

i. Not in automatic: Red

j. Circuit breaker trip/open: Red

k. High battery voltage: Red

l. Low battery voltage: Red

6. Panel mounted switches shall be provided which will reset the engine-generator monitor and test all lamps, operation of the shut down circuits shall be independent of the pre-alarm circuits.

B. Starting and Utilities

1. The engine shall be equipped with a 24 Volt electric starting system of sufficient capacity to crank the engine-generator unit at a speed which will allow satisfactory starting of the engine.

2. Lead acid batteries shall be furnished having sufficient capacity for nine (9) cranking attempts and capable of craning the engine for at least 40 seconds at firing speed in the ambient temperature of 110 degree F. A battery rack and necessary gravity of the fully charged battery "acid" shall not exceed 1.220 at 77 degree F. Provide insulated stranded copper conductors connecting the battery to the generator electric starting motor.

3. An automatic float/equalize type battery charger shall be provided, installed, and wired on the generator set. Connections to the battery shall be solid wired (clip on type not acceptable). Input voltage shall be 120 volts AC. Charger shall be UL listed. Output capacity shall be 10amps at 24 volts DC. Features shall include the following:

   a. Low battery voltage alarm contacts, set to close if the battery voltage drops below 24 volts

   b. Neon light to indicate the selector switch is in the "equalize" range

   c. DC voltmeter

   d. DC ammeter

   e. AC circuit breaker on input line

   f. DC circuit breaker on output

   g. Battery failure alarm contacts, set to close if AC power is lost to charger. Battery charger enclosure shall be NEMA 1 construction and arranged for convection cooling.

   h. Battery disconnect switch

4. Provide 100% rated main output circuit breaker, amp rating as shown on the single line diagram, UL, 65,000 AIC, 600 Volt, molded-case, solid state type with inverse time delay trip overload and instantaneous trip on overcurrent. Circuit breaker shall be installed and wired include breaker trip and breaker open contacts.

5. Air Restriction Indicator: The air cleaner restriction indicator shall indicate the need for maintenance of the air cleaners.

6. Block Heater: The block heater shall be thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

7. Crankcase Emission Canister: The engine shall have a crankcase emission canister. The emission canister prevents crankcase oil vapor from escaping into the air to prevent environmental pollution and fouling of the radiator.

8. Dry Contact Kit: The 10 Dry Contact Kit shall provide normally open and normally closed, gold-plated contacts in a form C configuration to activate warning devices and other customer-provided accessories allowing remote monitoring of the generator set. Typically, lamps, audible alarms, or other devices signal faults or status conditions.
9. Duct Flanges: A radiator duct flange to provide a convenient connection to duct work for the radiator discharge air shall be included.
10. Failure Relay:
    a. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, overcrank, and overspeed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
    b. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
    c. Once energized the relay shall remain latched until the system is reset by the main controller switch

2.04 Fabrication

A. Fuel Storage System

1. The Fuel Storage System shall be capable of supplying 24 hours of continuous full load operation.
2. The Contractor shall provide a UL listed double containment skid mounted fuel storage tank with fuel level transmitter, low fuel level switch and fuel storage tank leak sensor for monitoring by the station control panel. Fuel Tank Instrumentation shall terminate in the generator control panel with terminal blocks for each signal for connection to the station control panel PLC.

B. Custom-Built Weather-Proof, Sound Attenuated Enclosure

1. The complete engine-generator set and all components shall be mounted in a custom-built weatherproof, flat roofed, and rodent protected enclosure, with pad-lockable doors designed so the unit can operate at full load without overheating and with all the doors closed. The enclosure manufacturer shall be regularly engaged in the design and manufacture of generator housings and shall have an acoustical engineer on staff.
2. The enclosure shall be designed so that the muffler will mount horizontally inside the enclosure, and radiator air will be provided with a suitable rain shield to prevent the entry of rain water into the house interior.
3. The enclosure shall be constructed to be sound attenuated to max. 75 dBA at 23 feet from the enclosure with the generator running at full load. Enclosure design shall include a vertically directed exhaust to minimize sound.
4. The wind loading shall be 125 MPH.
5. Seismic Rating IBC Rated –Reference Section 16010 Project Site Conditions.
6. The enclosure shall be painted, have hinged doors, and shall be constructed of 12 gauge steel. The generator enclosure skin material will be carbon steel. The enclosure frame material will be A-36 carbon steel structural tubing and channels. Outer walls will be 4” consisting of 4 lbs. per ft^3 density mineral wool with 2 mil poly liner.
7. Baffles will include intake acoustical silencer and discharge acoustical silencers of Galvanneal Construction.
8. The enclosure shall include external drain extensions with valve for coolant and lubricating oil.
9. Backdraft Damper Discharge end, gravity type

10. Door shall be 36” Wide Double seal with stainless steel hinges and bolting hardware.
11. Chrome plated refrigerator type latches w/ inside release.
12. Space shall be provided in front of the housing for a cable reel. A door suitable for outdoor conditions shall be provided over this space

PART 3 - EXECUTION

3.01 Preparation

A. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

B. Design Prototype Tests - Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:

1. Maximum power (kW)
2. Maximum motor starting (kVA) at 35% instantaneous voltage dip
3. Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
4. Governor speed regulation under steady-state and transient conditions
5. Voltage regulation and generator transient response
6. Harmonic analysis, voltage waveform deviation, and telephone influence factor
7. Three-phase short circuit tests
8. Alternator cooling air flow
9. Torsional analysis to verify that the generator set is free of harmful torsional stresses
10. Endurance testing

C. Factory Testing

1. Perform factory tests prior to shipment to jobsite. Include the following:
   a. Demonstrate proper operation of all safety devices and test alarm and shutdown circuits by simulating fault conditions.
   b. Conduct load tests utilizing resistive load banks as follows:

LOAD	HOURS
1/2	1
3/4	1
Full	4

   c. At the end of two hours at full load, the engine-generator shall be block loaded from no load to full load a total of two times, and the voltage dip and frequency dip shall be recorded by a strip chart recorder. Record current, voltage, frequency, water temperature, lube oil pressure, and lube oil temperature every 15 minutes.
2. The Engineer shall witness the factory test of engine-generator set. The Contractor will be responsible for all travel costs for personnel witnessing factory tests that are required outside of a 100 mile radius from the project site. Provide a written notification to the Engineer at least

ten (10) working days in advance of the factory test. Written notice shall include a written test procedure.

3. Submit three copies of the Factory test report to Engineer

3.02 Installation

A. The unit shall be installed in accordance with the manufacturer's directions.

B. The Contractor shall provide field disassemble and reassemble of engine-generator set by a manufacture authorized service provider as required. The work shall not cause any change or interruption of the original manufacturer warranty coverage.

C. The Contractor shall be responsible to install the engine-generator set utilizing the existing structure and structure's opening. Any modification to the existing structure to accommodate the installation shall be at the Contractor's expense.

D. The Contractor shall coordinate the construction of engine-generator set foundations and piping systems with the generator set manufacturer's written requirements.

E. Foundation, anchor bolt layouts, and piping may have to be modified from those shown on the plans. Such work shall be at the Contractor's expense. Anchor bolts and support for exhaust system shall be determined by the required structural calculations.

F. Installed location of unit shall comply with the required working clearances in front of circuit breakers, load bank controls and other electrical equipment that will require service while energized per the NEC.

G. Load bank design and installed position shall allow the removal and replacement of individual elements without removal of radiator, or ductwork.

H. Grounding and bonding shall be completed as required by applicable sections of the NEC.

I. Battery cables shall be sized by calculations or catalog data showing wire gauge and maximum length of battery cables for the cold cranking amp rating of the engine-generator set.

J. Installation of exhaust system shall be coordinated to avoid conflict or heat exposure to lights and fire detection or suppression systems. Exhaust insulation blankets shall be installed.

K. Check torque of bolted connections.

L. Check electrical connections for proper phase relationship.

M. Fill cooling system with an antifreeze and water solution per the manufacturer's recommendation.

N. Fill the tank with No. 2-D diesel fuel meeting ASTM 975-60T. After field testing is complete, refill the tank.

O. Piping - Pitch horizontal runs of exhaust pipe away from the engine. Provide condensate traps with petcocks or valves at low spots in the exhaust system.

P. Contractor shall provide an installation report stating that all installation items noted under Section 3.02 are complete including copy of structural calculations, battery cable calculations, torque settings used for bolted connections, and proper phase relationship.

3.03 Field Quality Control

A. Manufacturer's Representative

1. The services of a qualified representative of the manufacturer shall be furnished to inspect the installation, place it in operation, make any necessary adjustments, and instruct the plant personnel in its operation and maintenance. A minimum of four hours training shall be provided.

B. Start-Up and Field Testing

1. Submit operation and maintenance manuals to Engineer at least ten (10) working days prior to the start-up and field testing.
2. Schedule: Provide written notice to the Engineer of the scheduled start-up and field test date at least ten (10) working days prior to test date. Startup and field testing shall be conducted only on a Tuesday, Wednesday, or Thursday. All field tests shall be witnessed by Engineer. Written notice shall include a written test procedure.
3. On completion of the installation the manufacturer's distribution representative shall perform an installation check, startup, and building load test and who shall thoroughly inspect, operate, test, and adjust the equipment. The inspection shall include the soundness of all parts, the completeness of all details, and proper operation of all components with special emphasis on safety devices, the correctness of settings, proper alignments, and correct phase rotation to match other sources. Provide a report of all necessary adjustments, corrections, or findings. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
    a. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
    b. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, etc.
    c. Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
    d. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test
4. Emissions Cold Start Test: Test time and conditions shall be coordinated to include exhaust emissions startup test witnessed by Field Inspector from local Air Quality Management District. Emissions test shall be done first to be at cold start conditions.
5. Inspection Report: On completion of the installation, the initial start-up shall be performed by a factory-trained service representative of the engine supplier, who shall thoroughly inspect, operate, test, and adjust the equipment. The inspection shall include the soundness of all parts, the completeness of all details, and proper operation of all components with special emphasis on safety devices, the correctness of settings, proper alignments, and correct phase rotation to match other sources. Inspection shall also be conducted by City Inspector per Fire Code. Provide a report of all necessary adjustments, corrections, or findings.
6. Field Power Failure and Transfer Test: Simulate power failure by tripping the main breaker and demonstrate complete manual and automatic start, load, unload, and stop sequence of the engine-generator. Conduct test 2 times.
7. The Generator Field Test Checklist in Appendix A shall be filled out by the Generator manufacturer and given to the Engineer at the end of the field test.

C. Training

1. Provide 4 hours of training conducted by factory-trained service representative of the engine supplier. Provide written notice to the City of the scheduled training date and including an agenda of training topics at least five (5) working days prior to test date.

APPENDIX A

GENERATOR FIELD TEST CHECKLIST

The Following (minimum) Installation Checks Must Be Made by Service Representative Before Start-Up in addition to those recommended by Generator Manufacturer:

NOTE: This form is to be used as a general guide, follow the manual supplied with generator along with reference to any applicable codes or standards. Ultimate compliance must be with applicable generator manual and codes and standards.

___ 1. Adequate clearance on all sides to allow ease of maintenance?
___ 2. Proper construction and leveling of mounting bases?
___ 3. Adequate incoming and outgoing?
___ 4. Radiator duct flange properly sized and connected?
___ 5. Cooling system properly filled?
___ 6. Proper level of specified oil in crankcase?
___ 7. Adequate/dedicated fuel supply?
___ 8. Flexible sections installed in cooling water lines?
___ 9. Manually-operable fuel and cooling water valves installed, allowing manual operation of, or bypass of solenoid valves, when used?
___ 10. Flexible fuel lines installed between engine and fuel piping?
___ 11. Fuel tanks and piping installed in accordance with applicable codes and standards?
___ 12. Proper size exhaust line and flexible connector(s)? Flexible connector(s) should not be bent.
___ 13. Exhaust line condensate trap with drain installed?
___ 14. Exhaust line installed with proper downward outgoing incline?
___ 15. Proper-specified muffler installed with hangers and mounts tight?
___ 16. Exhaust line free of excessive bends and restrictions? Back pressure under specified limit?
___ 17. Exhaust line protected from entry by rain, snow, and animals?
___ 18. Battery(ies) of proper size and voltage?
___ 19. Battery(ies) filled with electrolyte and properly connected to charger?
___ 20. Battery charger AC circuit properly connected and charger operational?
___ 21. Battery(ies) properly mounted with adequate ventilation?
___ 22. Starting cables of proper length and gauge?
___ 23. Battery disconnect switch installed?
___ 24. Starting cables properly connected to battery(ies)?
___ 25. Generator load conductors of proper ampacity, and properly connected to circuit breakers, and/or emergency side of transfer switch?
___ 26. Load conductors, engine start leads, battery and heater power source leads installed in separate conduits?
___ 27. Nameplate voltage and frequency of both generator set and transfer switch matching normal/utility source ratings?
___ 28. Transfer switch AC conductors properly connected (Normal to NL1, NL2, NL3; Emergency to EL1, EL2, EL3; Load to LL1, LL2, LL3)?
___ 29. Transfer switch switching mechanism free from binding? NOTE: Disconnect all AC sources, and operate manually to check.
___ 30. All other wiring, including customer added options, connected properly?
___ 31. Earthquake rated anchoring adequate for equipment and support systems?

Tested by: _____ Witnessed by: _____

Date of Test: _____

****END OF SECTION****

SECTION 16261
AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 Summary

A. Scope: Furnish and install an automatic transfer switch (ATS) with number of poles, amperages, and voltages, withstand and close-on ratings in a NEMA 3R enclosure as shown on the Contract Drawings (Drawings). The automatic transfer shall consist of a mechanically held power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. The transfer switch and control panel shall be the product of the same manufacturer.

B. The ATS shall be mounted as shown on the Drawings.

1.02 References

A. The automatic transfer switches and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL and NEMA as follows:

Reference	Title
UL 508	Industrial Control Equipment
UL 1008	Transfer Switches
UL 991	Test for Safety-Related Controls Employing Solid State Devices
NFPA 70	National Electrical Code
NFPA 99	Essential Electrical Systems of Health Care Facilities
NFPA 110	Emergency and Standby Power Systems
NEMA ICS 10	AC Transfer Switch Equipment
IEEE 446	Recommended Practice for Emergency and Standby Power Systems
IEC 947-6-1	Low-voltage Switchgear and Controlgear; Multifunction equipment; Automatic Transfer Switching Equipment
IEC 60801-2	Electromagnetic Compatibility for Industrial-Process Measurement and Control Equipment, Electrostatic Discharge Requirements
IEC 60801-3	Electromagnetic Compatibility for Industrial-Process Measurement and Control Equipment, Radiated Electromagnetic Field Requirements
IEC 60801-4	Electromagnetic Compatibility for Industrial-Process Measurement and Control Equipment, Electrical Fast Transient/Burst Requirements
IEC 60801-5	Electromagnetic Compatibility for Electrical and Electronic Equipment, Surge Immunity Requirements
CISPR 11	Industrial, Scientific, and Medical Radio-Frequency Equipment – Electromagnetic Disturbance Characteristics – Limits and Methods of Measurement
	Compliant with FCC Part 15, Subpart B, Class A

1.03 Submittals

A. Submittals shall be as specified in Sections 16010.

B. The following information shall be submitted to the Engineer:

1. Front view and plan view of the assembly
2. Schematic diagram
3. Conduit space locations within the assembly
4. Assembly ratings including:
    a. Withstand and Closing rating
    b. Voltage
    c. Continuous current rating
    d. Short-Time rating if applicable
    e. Short-circuit rating if ordered with integral protection
5. Cable terminal sizes
6. Product Data Sheets
7. Wiring diagrams
8. Certified production test reports
9. Installation information
10. Seismic certification as specified.

1.04 Quality Assurance

A. Qualifications

1. The manufacturer of the assembly shall be the manufacturer of major components and control modules installed within the assembly.
2. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
3. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of Section 16010, 1.07B.
4. The manufacturer of the ATS shall also have a national service organization that is available throughout the contiguous United States and is available on call 24 hours a day, 365 days a year.
5. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years

B. Manufacturer’s Certification

1. A qualified factory-trained manufacturer’s representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer’s recommendations.
2. The Contractor shall provide three (3) copies of the manufacturer’s representative’s certification.

C. Withstand and Closing Ratings

1. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans.
2. The ATS shall be UL listed in accordance with UL 1008 and be labeled in accordance with that standard's 1½ and 3 cycle, long-time ratings. ATSs which are not tested and labeled with 1½ and 3 cycle (any breaker) ratings and have series, or specific breaker ratings only, are not acceptable

D. Tests and Certification

1. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the special provision requirements.
2. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this special provision including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the special provisions, other than those stipulated at the time of the submittal, shall be included in the certification.
3. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001

1.05 Delivery, Storage, and Handling

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment

1.06 Warranty

A. Refer to Section 17506 for requirements

1.07 Maintenance

A. Refer to Section 17506 for requirements.

B. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 - PRODUCTS

2.01 Manufacturers

A. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these special provisions in their entirety. Products in compliance with the special provision and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

   a. ASCO 7000 Series, Automatic Delayed Transition. No substitutions.

2.02 Equipment and Materials

A. General

1. The transfer switch shall be rated for the voltage and ampacity as shown on the plans and shall have 600 volt insulation on all parts in accordance with NEMA standards

2. The current rating shall be a continuous rating when the switch is installed in an unventilated enclosure, and shall conform to NEMA temperature rise standards
3. The unit shall be rated based on all classes of loads, i.e., resistive, tungsten, ballast and inductive loads. Switches rated 400 amperes or less shall be UL listed for 100% tungsten lamp load.
4. As a precondition for approval, all transfer switches complete with accessories shall be listed by Underwriters Laboratories, under Standard UL 1008 (automatic transfer switches) and approved for use on emergency systems
5. The withstand current capacity of the main contacts shall not be less than 20 times the continuous duty rating when coordinated with any molded case circuit breaker established by certified test data. Refer to required withstand and close ratings as detailed in this special provision.
6. Temperature rise tests in accordance with UL 1008 shall have been conducted after the overload and endurance tests to confirm the ability of the units to carry their rated currents within the allowable temperature limits.
7. Transfer switches shall comply with the applicable standards of UL, cUL, CSA, ANSI, NFPA, IEEE, NEMA.
8. The transfer switches shall be supplied with a microprocessor based control panel as detailed further in these special provisions

B. Sequence of Operation

1. The ATS shall incorporate adjustable three phase under and over-voltage and three phase under and over-frequency sensing on the normal source.
2. When the voltage of any phase of the normal source is reduced to 80% or exceeds 110% nominal voltage, or frequency is displaced 2 Hz from nominal, for a period of 0-10 seconds (programmable) a pilot contact shall close to initiate starting of the engine generator.
3. The ATS shall incorporate adjustable three phase under and over-voltage and three phase under and over-frequency sensing on the emergency source.
4. When the emergency source has reached a voltage value within +/- 10% of nominal and achieved frequency within +/- 5% of the rated value, the load shall be transferred to the emergency source after a programmable time delay.
5. When the normal source has been restored to not less than 90% of rated voltage on all phases, the load shall be re-transferred to the normal source after a time delay of 0 to 30 minutes (programmable). The generator shall run unloaded for 5 minutes (programmable) and then automatically shut down. The generator shall be ready for automatic operation upon the next failure of the normal source.
6. If the engine generator should fail while carrying the load, retransfer to the normal source shall be made instantaneously upon restoration of proper voltage (90%) on the normal source.
7. Inspection and operational tests shall be conducted by the contractor in the presence of the engineer, to indicate that the switch satisfies the special provisions.
8. The transfer switch shall be equipped with a microprocessor based control panel. The control panel shall perform the operational and display functions of the transfer switch. The display functions of the control panel shall include ATS position and source availability
9. The digital display shall be accessible without opening the enclosure door and shall be provided with a 4 line by 20 character LCD display screen with touch pad function and display menus. The programming functions shall be pass code protected.

10. The control panel shall be provided with menu driven display screens for transfer switch monitoring, control and field changeable functions and settings.
11. The control panel shall be opto-isolated from electrical noise and provided with the following inherent control functions and capabilities:
    a. Multipurpose display for continuous monitoring and control of the ATS functions and settings. All field changeable functions shall be pass code protected and accessible through the keypad.
    b. Built-in diagnostic display that includes the capturing of historical data, such as number of transfers and time on emergency power source, for ease of troubleshooting.
    c. Capability for external communication and network interface.
    d. Touch pad test switch with Fast Test/Load/No Load positions to simulate a normal source failure.
    e. Time delay to override momentary normal source failure prior to engine start. Field programmable 0-10 seconds (adjustable by increments of 0.1 second) factory set at 3 seconds.
    f. Time delay on retransfer to normal source, programmable 0-60 minutes (adjustable by increments of 0.1 minute) factory set at 30 minutes. If the emergency source fails during the retransfer time delay, the transfer switch controls shall automatically bypass the time delay and immediately retransfer to the normal position.
    g. Time delay on transfer to emergency, programmable 0-5 minutes, factory set at 1 second.
    h. Time delay on transfer in either direction in the center-off position, programmable 0-2 minutes, factory set at 5 seconds.
    i. Terminals for remote test/peak shave operation and transfer inhibit to the emergency source.
    j. Auxiliary contacts (1 N.O.) shall be provided to indicate normal and emergency source availability.
    k. A load/no load clock exerciser shall be incorporated within the microprocessor and shall be programmable to start the engine generator set and transfer the load (when selected) for exercise purposes on a weekly basis. The exerciser shall contain a lithium battery for memory retention during an outage.
    l. A timed auxiliary contact (1 N.C.) adjustable 0-60 seconds shall be provided to allow motor loads to be disconnected prior to transfer in either direction.
    m. Provide a momentary pushbutton to bypass the time delays on transfer and retransfer and programmable commit/no commit control logic.

C. Construction and Performance
1. The automatic transfer switch shall be a double throw switch operated by a reliable dual electrical mechanism momentarily energized.
2. The transfer switch shall incorporate a timed, center-off position for motor load decay. Transfer time shall be adjustable from 0-10 seconds. A mechanical interlock shall be provided to ensure that both sets of contacts cannot be closed at the same time.
3. For switches installed in systems having ground fault protective devices, and/or wired so as to be designated a separately derived system by the NEC, a 4th pole shall be provided. This additional pole shall isolate the normal and emergency neutrals. The neutral pole shall have the same withstand and operational ratings as the other poles and shall be arranged to break

last and make first to minimize neutral switching transients. Add-on or accessory poles that are not of identical construction and withstand capability are not acceptable.

4. The contact structure shall consist of a main current carrying contact which is a silver alloy with a minimum of 50% silver content. The current carrying contacts shall be protected by silver tungsten arcing contacts on all sizes above 400 Amps.
5. The transfer switch manufacturer shall submit test data for each size switch, showing it can withstand fault currents of the magnitude and the duration necessary to maintain the system integrity. Minimum UL listed withstand and close into fault ratings shall be as follows:

Size (Amps)	Any Molded Case Breaker* (RMS Symmetrical)
Up to 100	22,000
101 - 260	30,000
261 - 400	35,000
401 - 1200	50,000
1201 - 4000	100,000

Size (Amps)	Specific Coordinated Molded Case Breaker
Up to 100	22,000
101 - 260	42,000
261 - 400	50,000
401 - 800	65,000
801 - 1200	85,000
1201 - 4000	100,000

Size (Amps)	Current Limiting Fuse
Up to 4000	200,000

*All values 480 volt, RMS symmetrical, less than 20% power factor.

6. A dielectric test at the conclusion of the withstand and closing tests shall be performed.
7. The automatic transfer switch manufacturer shall certify sufficient arc interrupting capabilities for 50 cycles of operation between a normal and emergency source that are 120 degrees out of phase at 480 volts, 600% of rated current at .50 power factor. This certification is to ensure that there will be no current flow between the two isolated sources during switching.
8. All relays shall be continuous duty industrial type with wiping contacts. Customer interface contacts shall be rated 10 amperes minimum. Coils, relays, timers and accessories shall be readily front accessible. The control panel and power section shall be interconnected with a harness and keyed disconnect plugs for maintenance.
9. Main and arcing contacts shall be visible without major disassembly to facilitate inspection and maintenance.
10. A manual handle shall be provided for maintenance purposes with the switch de-energized. An operator disconnect switch shall be provided to defeat automatic operation during maintenance, inspection or manual operation.
11. The switch shall be mounted in a NEMA 3R enclosure unless otherwise indicated on the plans. The enclosure shall include strip heater to two both compartments.
12. Switches composed of molded case breakers, contactors or components thereof not specifically designed as an automatic transfer switch will not be acceptable.

13. The automatic transfer switch must be equipped with a solenoid protection scheme that removes any attempts of operating the solenoids after (3) consecutive trials until manual intervention by an operator

PART 3 - EXECUTION

3.01 Installation

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

C. The equipment shall be installed and checked in accordance with the manufacturer's recommendations.

3.02 Field Quality Control

A. Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and start-up of the equipment specified under this section for a period of two working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

B. The Contractor shall provide three (3) copies of the manufacturer's field start-up.

C. Performance Tests

1. Field test and calibrate timing and monitoring logic. All adjustment shall be within 5% of the previously specified set points.
2. Field test the transferring of loads between normal and emergency power sources as follows:
    a. Start loads located downstream of the ATS.
    b. De-energize the normal power source. Verify that the standby generator starts and the load is transferred to the standby source.
    c. Energize the normal source. Verify that after the selected time delay, the load is transferred to the normal power source. Verify that after the load is switched the generator continues to operate unloaded for the time specified. At the end of the period verify that the generator shuts off.
3. Field test and calibrate the in-phase monitor. Demonstrate that the switch transfers when source phase differences are within 20 degrees under varying generator speeds.
4. Notify the Engineer in writing 48 hours in advance of testing for witness.

3.03 Adjusting / Cleaning / Protection

A. Training

1. The contractor shall provide a training session for up to five (5) City's representatives for one 4-hour training at a jobsite location determined by the Engineer.
2. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers and major components within the assembly

****END OF SECTION****

SECTION 16320
SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 Summary

A. Scope: The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, ATS, busway (integrated within bus plug), or motor control centers (MCC).

1.02 References

A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable standards:

Reference	Title
ANSI/IEEE C62.62	Test Specifications for Surge Protection Devices for Low Voltage AC Power Circuits
ANSI/IEEE C62.41	Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits
ANSI/IEEE C62.45	Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000V and Less) AC Power Circuits
IEEE C62.43	Guide for the Application of Surge Protectors Used In Low –Voltage Data, Communications, and Signaling Circuits
IEEE C62.48	IEEE Guide on Interactions between Power System Disturbances and Surge-Protective Devices
FIPS Pub 94	Guideline on Electrical Power for ADP Installations
NEMA LS-1	Low Voltage Surge Protective Devices
NFPA 70	National Electrical Code
NFPA 780	Standard for the Installation of Lightning Protection Equipment
UL 96A	Installation Requirements for Lightning Protection Systems
UL 1449	Surge Protective Devices
UL 1283	Electromagnetic Interference Filters

B. International Standards Organization (ISO) Company certified ISO 9001 for manufacturing, design and service.

C. The systems individual units shall be UL Listed and labeled under UL 1449 Standard for Surge Protective Devices (SPD) and the surge ratings shall be permanently affixed to the SPD. The units shall also be listed and labeled to UL1283 Standard for Electromagnetic Interference Filters, and CSA Listed.

D. The specified system shall be thoroughly factory-tested before shipment. Testing of each system shall include but shall not be limited to quality control checks, "Hi-Pot" tests at two times rated

voltage plus 1000 volts per UL requirements, IEEE C62.41 Category B surge tests, UL ground leakage tests, and operational and calibration tests.

1.03 System Description

A. 480 Volt Connections

1. These special provisions are based on the Eaton's SPD Series or equal for use on the 480V power connection points indicated on the contract documents. Other manufacturers shall provide detailed compliance or exception statements to all provisions of this special provision to allow consideration.

B. 120/208 Volt Connections

1. These special provisions are based on the Eaton's SPD Series or equal for use on the 120/208 V power connection points indicated on the contract documents. Other manufacturers shall provide detailed compliance or exception statements to all provisions of this special provision to allow consideration.

1.04 Submittals

A. Submittals shall comply with the provisions set forth in Sections 01300 and 16010.

B. Documentation

1. Equipment Manual: The manufacturer shall furnish an installation manual with installation, start-up, and operating instructions for the specified system.
2. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, component and connection locations, mounting provisions, connection details, and wiring diagram.
3. UL 1449 Ratings: Provide verification that the SPD complies with the required ANSI/UL 1449 4th Edition or later listing by Underwriters Laboratories (UL). Compliance may be in the form of a file number that can be verified on UL's website www.ul.org. The website should contain the following information at a minimum:
    a. Model number
    b. SPD Type
    c. System voltage
    d. Phases
    e. Modes of protection
    f. Voltage Protection Rating (VPR)
    g. Nominal Discharge Current ($I_{n)}$.
4. Spare Parts: A list of recommended spare parts shall be supplied at the customer's request

1.05 Quality Assurance

A. The specified system shall be tested at the component and fully assembled level, under surge conditions with AC power applied for a minimum of 1 hour. Testing shall include but not be limited to quality control checks, dielectric voltage withstand test per UL and CSA requirements, UL ground continuity tests and operational and calibration tests.

1. The manufacturer of the electrical distribution equipment shall be the manufacturer of the SPD within the listed electrical distribution equipment.

2. For the equipment specified herein, the manufacturer shall be ISO 14001 and ISO 9001 or 9002 certified.
3. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of twenty-five (25) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
4. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU and have a visible label showing compliance.
5. The SPD shall be UL 1449 current edition listed, 20 kA I_n Type 1 or Type 2 for use in UL 96A systems

1.06 Delivery, Storage, and Handling

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

B. Refer to Section 16010, 1.07 for additional requirements.

1.07 Warranty

A. The manufacturer shall provide a ten (10) year warranty (15 year warranty with registration) that covers replacement of the complete unit, including lightning, from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local electrical code.

PART 2 - PRODUCTS

2.01 Manufacturers

A. Eaton SPD Series, Liebert or approved equal.

1. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these special provisions in their entirety. Products in compliance with the special provision and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 Voltage Surge Suppression – General

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards. End of life mode to be open circuit. Unit with end of life short-circuit mode are not acceptable.
4. Unit shall operate without the need for an external overcurrent protection device (OCPD), and be listed by UL as such. Unit must not require external OCPD or replaceable internal OCPD for the UL Listing.

5. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

6. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA "I_n" rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an "I_n" less than 20kA shall be rejected.
7. ANSI/UL 1449 4th Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4th Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable single-mode modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each Type 2 unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this special provision shall not be accepted.
   a. Type 2 units with filtering shall conform to UL 1283 5th Edition
   b. Type 1 units shall not contain filtering or have a UL 1283 5th Edition Listing.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring features:

a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.

1) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.

2) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.

3) The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.

c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

1) The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Thermal MOV Protection.

a. The unit shall contain thermally protected MOVs. These self-protected MOVs shall have a thermal protection element integrated with the MOV and a mechanical disconnect with arc quenching capabilities in order to achieve overcurrent protection of the MOV. The thermal protection assembly shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. The use of plug in single-mode modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

8. Safety Requirements:

a. The SPD shall minimize potential arc flash hazards by containing no single-mode plug in user serviceable / replaceable parts and shall not require periodic maintenance. SPDs

containing items such as replaceable single-mode plug in modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.

2.03 System Application:

A. The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41, Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table.

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
Category	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Switchgear, MCC, Main Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

2.04 Switchgear, Switchboard, ATS, MCC and Busway Requirements

A. The SPD application covered under this section is for switchgear, switchboard, MCC, and busway locations. Service entrance located SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.

B. Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.

C. The SPD shall be connected through a disconnect (circuit breaker). The disconnect shall be located in immediate proximity of the SPD. Connection shall be made via bus, conductors, or other connections originating in the SPD and shall be kept as short as possible.

D. The SPD shall be integral to switchgear, switchboard, MCC, and/or bus plug as a factory standardized design.

E. All monitoring and diagnostic features shall be visible from the front of the equipment.

2.05 Service Entrance Requirements:

A. Service entrance located SPDs shall be tested and designed for applications within ANSI/IEEE C62.41 Category C environments.

PART 3 - EXECUTION

3.01 Installation

A. The installation of the SPD shall be factory installed integral to the distribution equipment. The Contractor shall install all distribution equipment per the manufacturer's recommendations, applicable electrical codes and the contract drawings.

B. 480 volt SPD units shall be provided for the automatic transfer switch panel noted on the contract drawings.

****END OF SECTION****

SECTION 16450
GROUNDING

PART 1 - GENERAL

1.01 Summary

A. Type: The equipment and material supplied under this section shall include ground rods, electrodes, conductors, and ground wires, to make a complete ground system.

1.02 References

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these special provisions.

Reference	Title
IEEE C2	National Electrical Safety Code
NFPA 70	National Electrical Code

1.03 Submittals

A. Submittals shall comply with the provisions set forth in 16010.

1.04 Quality Assurance

A. Performance and Design Requirements: The grounding system shall bond together and effectively ground all exposed non-energized metal surfaces containing energized parts, devices or conductors, all building steel, all metallic electrical raceways and the neutrals of all transformers.

B. Inspection: All ground connection shall be inspected by the Engineer prior to backfill or placing of the concrete

PART 2 - PRODUCTS

2.01 Equipment and Materials

A. Ground Rods: Ground rods shall be one piece, 3/4-inch in diameter by 10 feet in length and shall be copper clad steel. The copper exterior shall be molten welded to the steel core. The rod heads shall be chamfered to prevent mushrooming during driving.

B. Ground Wires: Ground wires shall be bare copper wires with Class B stranding. Size shall be as shown.

C. Connections

1. All ground connections below grade for copper shall be made by the exothermic weld process. They shall be Cadweld, Thermoweld, or equal, made with Cadweld, Thermoweld, or equal, molds and clamps. All connections in the ground wells shall be made with a bolted ground clamp and shall be Copperweld Type "AB" with hex head set screw, Weaver Type W, or equal.

2. All connections above grade to equipment ground buses and flat copper bars shall have a 2 bolt pad and shall be bolted with nonferrous hexagon head bolts and nuts with spring lock washers. They shall be Burndy Type "QA-B," Thomas & Betts Lock-Tite, or equal. All connections to motor shall be as shown.

3. Connections to miscellaneous boxes, cabinets, panels, etc., shall be Burndy type "KC" servitposts, Thomas & Betts split bolt connector, or equal.

D. The utility service entrance switchboard ground bus shall be tied to an area ground grid consisting of a ground ring with ground rods as shown on the contract drawings.

E. The grounding system shall be as shown and as required by codes and regulations and shall include the following as applicable:

1. Metallic conduits supplemented with a ground wire installed in the conduit for all circuits except control circuits.

2. An equipment grounding conductor installed in all nonmetallic conduit carrying power to any equipment.

F. All ground conductors entering handholes, manholes, pull boxes, terminal boxes, or any other enclosure shall be bonded together and shall be bonded to the enclosure if it is metallic and to all metallic raceways within or terminating at the enclosure. An insulated grounding bushing shall be installed with a code size equipment grounding conductor bonded to the equipment frame for all conduits terminating under an enclosure containing no metal floor plate, or at sheet metal panels which are not fastened to the equipment frame solidly enough to provide an effective ground connection. This will commonly be the case with switchgear, switchboards and MCCs.

G. Cable shielding, metallic conduits, wireways, metal enclosure of bus ways, cable boxes, electrical equipment housings, and all noncurrent-carrying metallic parts of the installation shall be grounded. The conduit system shall be used for equipment and enclosure grounding but not as a system ground conductor. A code sized green insulated copper grounding conductor shall be included in all nonmetallic and flexible conduits.

H. System neutral conductors shall be grounded at the point of service ahead of the main disconnect to a grounding electrode and to a domestic cold water main as required by code. Transformer neutral shall be grounded from the neutral bushing and solidly grounded to earth. If metallic domestic water system is greater than 100 feet remote, furnish a system ground conductor in conduit to the established system grounding electrode.

I. All conduit stub-ups shall be grounded, and where multiple stub-ups are made within an equipment enclosure, such as a service pedestal, they shall be equipped with grounding bushings and bonded together and to the enclosure and the enclosure ground bus.

J. All services and feeder runs (and branch circuit wiring excluding light circuits) in nonmetallic or flexible conduit shall carry one green THWN/XHHW insulated code sized ground conductor per conduit.

K. Bonding devices, fittings, or jumpers shall be provided at expansion fittings, isolation sections, or wherever continuity of ground is broken.

2.02 Fabrication

A. Grounding Techniques

1. The grounding electrode shall consist of a combination of the following systems as required to accomplish a resistance to ground not to exceed 5 ohms.

a. The utility service entrance switchboard ground bus shall be tied to an area ground grid consisting of a ground ring with ground rods as shown on the contract drawings.

b. Bare Wire under Foundations

1) The preferred method shall be a 20-foot length of bare No. 4/0 copper wire extended its full length below ground level and embedded along the bottom of the concrete foundation footing which is in direct contact with the earth and supported in such a

manner that it cannot be less than 3 inches from the bottom or side of the concrete when the foundation concrete is poured. A loop at the approximate center of this grounding electrode shall be brought out at the top of the foundation and a No. 4/0 copper ground conductor shall be connected to this loop with a pressure-type solderless connector and extended to the service equipment and to the metallic cold water system and properly connected thereto.

PART 3 - EXECUTION

3.01 Examination:

A. The existing grounding system shall be evaluated and tested by the contractor. Where deemed acceptable, the existing grounding system components may be used to used to meet criteria required by this special provision where approved in writing by the Engineer. As a minimum, the existing grounding system shall be connected with the new grounding system components required by this special provision.

3.02 Installation

A. All grounding system components shall be installed in accordance with the contract drawings, NEC, and the manufacturer's recommendations and instructions.

B. Provide a separate grounding conductor in each raceway, securely grounded to equipment at each end of the raceway.

C. Contractor shall not cover or conceal any ground connections until the Engineer has established that every grounding connection conforms to the Contract Drawings and Special provisions. Contractor shall provide a form to sign off each grounding connection and shall obtain signature from the Engineer.

D. Electrical Equipment Grounding

1. Metal conduits shall be bonded together to the enclosure grounding bus.
2. Lightning arresters or suppressors shall be directly connected to the ground system using copper conductors sized in accordance with NEC requirements.
3. The secondary neutrals of transformers shall be directly connected to the ground system using copper conductors sized as per NEC or as indicated on the contract drawings.
4. All motors shall be grounded by bonding the grounding conductor within the raceway to the motor frame. Motors as shown on the contract drawings shall also have a supplemental grounding conductor bonded to the ground grid in the immediate area of the motor.

E. Each panelboard shall have a ground bus that is secured to the interior of the enclosure. The bus shall be equal to panelboard neutral bus amp rating and shall have adequate lug quantity of lugs. No more than two grounding conductors shall be installed per lug.

3.03 Field Quality Control

A. Performance Tests

1. The existing and new grounding system components shall be tested per this special provision section.
2. The Contractor shall test each ground rod, ground mat and water pipe, structure or other major system grounding connection to determine the ground resistance. The grounding check shall be made by the "fall of potential" method utilizing a commercial ground test instrument such as the Biddle Model 593 "megger" ground check or the Associated Research Vibroground Model

225, or equal. A plot of ground resistance readings for each isolated ground rod or ground mat shall be submitted to the Engineer. The current reference rod shall be driven at least 100 feet from the ground rod or grid under test, and the measurements shall be made at 10-foot intervals beginning 15 feet from the test electrode and ending 75 feet from it, all in direct line between the ground rod or center of grid and the current reference electrode.

3. Any grounding system that shows greater than 5 ohms resistance for the flat portion of the plotted data shall be considered inadequately grounded. The Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurements meet the 5 ohms requirement. Use of salts, water or compounds to attain the specified ground resistance is forbidden.

3.04 Adjusting / Cleaning / Protection

A. At no additional expense to the City, provide any necessary work to correct improper installations.

****END OF SECTION****

SECTION 17010
GENERAL REQUIREMENTS, INSTRUMENTATION

PART 1 - GENERAL

1.01 Summary:

A. Scope: General requirements for Instrumentation and Control System (ICS) design, procurement, delivery, and implementation as shown on the Contract Drawings (Drawings) and as specified in these Specifications.

B. The contactor shall retain the service of a System Integrator. The System Integrator will purchase, assemble, configure, prepare submittal material and prepare Operations and Maintenance Manuals for all of the components that make up the ICS. In addition, the System Integrator shall modify the existing Station Control Panel for integration of the new input/output control points. The System Integrator shall provide the custom-built ATS/MTS panel and conduct associated Factory Acceptance Testing and Site Acceptance Testing noted.

C. The following System Integrators have been pre-approved and pre-qualified for this project:

1. Tesco Controls, Sacramento, CA
2. Or Approved System Integrator prior to Bid Opening and as noted by Addendum.

D. Approved System Integrator Prior to Bid Opening:

1. Prior to Bid Opening, the Contractor may submit the qualifications of a System Integrator not listed as pre-approved and pre-qualified for consideration by the City. If the City accepts the System Integrators qualifications and issues an addendum prior to bid, then the System Integrator is considered acceptable for the project. The qualifications must be submitted 10 days prior to Bid Opening to be considered.
2. The Contactor may submit qualifications package for a System Integrator for approval by the City. Any qualifications package that does not include all of the following information will automatically be considered unresponsive and will be rejected. Only one submission per System Integrator shall be allowed.
3. To be considered the System Integrator must meet the following pre-conditions.
    a. System Integrator Facility is located within 150 miles of the project site.
    b. System Integrator is certified by Control System Integrators Association (CSIA)
4. The qualifications package shall include the following:
    a. An introduction letter including the following:
        1) Actual distance from project site not to exceed 150 miles
        2) Copy of CSIA certification
        3) System Integrator Company Information
            a) Company Name
            b) Company Address
            c) Company Internet Website
            d) Company Telephone Number
            e) Company Fax Number
            f) Project Contact Name, E-mail address and telephone number

4) Number of years in business – the system integrator shall have been in business performing control, integration, and configuration and programming activities for at least 15 years.

b. Provide the names and resumes of the System Integrator's programmer or programming team that have a minimum of 5 years experience in the design, coordination, and supply of computer-based monitoring, control and data acquisitions systems.

1) Shall have programming and configuration experience with Tesco PLC

2) The submitted and approved programmer(s) shall provide all programming associated with this project. The programmers assigned to perform the scope outlined in this contract may not be replaced without submitting additional qualified resumes and obtaining written approval from the Engineer

E. System Integrator must be pre-approved by the Engineer in order to submit a bid for this project. Any bid listing a System Integrator that has not been pre-approved will be automatically disqualified.

F. Interpretation of Drawings

1. General: Any error or omissions of details in either the Drawings or Specifications shall not relieve the System Integrator from correctly installing all materials necessary for a complete and operating ICS.

2. Site Verification: The System Integrator shall inspect the project site and verify all measurements and conditions and shall be responsible for the correctness of final installation. No extra compensation will be allowed because of differences between work shown on the Drawings and measurements at the site.

3. Drawings: The Instrumentation Drawings are diagrammatic but shall be followed as closely as existing conditions and work of OTHERS will permit. All deviations from the Drawings required to make the work conform to structures as constructed, and to the work of OTHERS, shall be made at the System Integrator's own expense.

4. Coordination: The System Integrator shall examine the architectural, structural, mechanical and manufacturer's drawings for all equipment to coordinate and determine the exact routing and final terminations of all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.

5. Accessibility: The Drawings do not show the exact locations of equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Engineer reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.

G. Manufacturer's Directions

1. Manufacturer's directions shall be followed in all cases where manufacturers furnish instructions covering points not shown on the Drawings or specified in these Specifications.

H. Inspection

1. The System Integrator and Contractor shall cooperate with the Construction Manager and shall provide assistance at all times for the inspection of the instrumentation work. Remove covers, or perform any reasonable work, which in the opinion of the Construction Manager will be necessary to determine the quality or adequacy of the work.

2. If any material does not conform to these Specifications the Contractor shall, within three (3) days after being notified by the Construction Manager, remove the materials from the premises.

3. Work shall not be closed in or covered before inspection and approval by the Construction Manager. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor.

I. Supervision and Workmanship

1. The Contractor shall employ a competent instrumentation foreman on the job throughout the entire period of construction to see that his work is carried on without delay and completed as rapidly as possible.
2. Before the start of construction and in conjunction with the schedule of others, the Instrumentation Sub-Contractor shall furnish to the General Contractor a tentative construction schedule showing the order of the work, the process control panel shop drawings submittal dates and the anticipated delivery dates of all instrumentation equipment.

J. Cooperative Work with Others

1. The System Integrator and Contractor shall cooperate with others, with due regard to their work, towards promotion of rapid completion of project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provision in time by System Integrator or the Contractor, then it shall bear expense of such changes as necessary to be made in work of others.
2. Labor and materials, including templates, sleeves, anchors, concrete inserts and the like shall be furnished in ample quantities at such times as necessary to ensure uninterrupted progress of work.
3. The Contractor shall cease work at any particular point temporarily and transfer its operations to such points or execute such portions of work as directed, when in the judgment of the Construction Manager it is necessary to do so.

K. Quality of Materials

1. All instrumentation components used on this project shall be new and free from defects.
2. All instrumentation components used on this project shall conform where applicable, to the Codes and Standards in Section 1.02, References.
3. Each type of material shall be of the same manufacturer and quality throughout the work.

L. Substitutions

1. No substitutions shall be allowed unless specifically noted as "or equal" or as "or approved equal." Specific brand names and catalog numbers are used to describe materials in order to establish standards of performance and quality.
2. The decision of the Engineer or Construction Manager shall govern as to what is equal to the item specified. Equality will be judged on the basis of the following:
    a. Conformance to description or performance required
    b. Equality in quality
    c. Comparable in appearance and artistic effect where these are considerations
    d. Comparable operation, maintenance and performance
    e. Equal in longevity and service under conditions of climate and usage
    f. Conformance with space allocations and requirements for operations from mechanical or electrical services provided without necessitating changes in details and construction or related work

3. If the Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Engineer.
4. Any material, article, or method judged by the Engineer equal to that specified will be approved, provided the Contractor submit a single written request, in triplicate, to the Construction Manager, within 30 days after contract award, with the following information for each item:
    a. Complete data substantiating compliance of proposed substitution with Contract Documents.
    b. Product Identification including trade or brand name including type, model, style, and/or catalog number
    c. Manufacturer's literature marked to indicate specific model, type, size, and options to be considered
    d. Size or capacity rating
    e. Names and addresses of a minimum of three (3) references for similar installations to this Contract
    f. Manufacturers' statements that proposed products are equal or superior in all respects to that specified.
5. The System Integrator assumes full responsibility for including complete and correct data in its request for substitution. The System Integrator shall also attach complete referenced diagrams and technical data sheets for the Engineer's review and determination of equality or suitability of any substitution item. Only one such request may be submitted. The Engineer's rejection of any substitute shall automatically require the System Integrator furnish the specified item without further discussion or delay.

1.02 References

A. General: The work shall comply with the most recent Codes and Standards as published at the date of the Contract and as listed in the Specifications.

Reference	Title
NFPA 70	National Electrical Code – Latest Edition
NFPA 101	Life Safety Code - Latest Edition
UBC	Uniform Building Code - Latest Edition
ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
ASME	American Society of Mechanical Engineers
IEEE	Institute of Electrical and Electronic Engineers
ISA	Instrument Society of America
JIC	Joint Industrial Council
NEMA	National Electrical Manufacturers Association
OSHA	Occupational Safety and Health Administration
SAMA	Scientific Apparatus Makers Association

Reference	Title
UL	Underwriters' Laboratories, Inc
EIA	Electronic Industries Association
	Local Mechanical and Electrical Codes
	Any additional codes effective at the job site

B. Additional Requirements: The System Integrator shall furnish without extra charge any additional material and labor which may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in the Specifications or shown on the Drawings.

C. Permit Requirements: The Contractor shall apply and pay for all permits required by any of the legally constituted public authorities for the installation or construction of the work included in these Specifications. The Contractor shall arrange and pay for any inspections or examinations so required and deliver certificates of all such inspections to the Construction Manager. When these Specifications call for materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of the Specifications shall take precedence.

1.03 System Description

A. General: Furnish all necessary labor, materials, equipment and incidentals required to install a complete and operational Instrumentation and Control System in accordance to the intent of these Specifications and Drawings.

B. Itemized Work: The following list shall be considered major work items, but not an inclusive and complete description of the scope of work. The Drawings in conjunction with the Specifications shall be used to determine the complete ICS work. The general scope of work includes the furnishing, installing, programming, testing, and commissioning of the following items:

1. Instrumentation and Control System. This Item includes:
    a. Programming and configuration of the existing Programmable Logic Control (PLC) systems, and Operator Interface terminal.
    b. Programming and configuration of the existing Programmable Logic Control (PLC) systems and SCADA to include new standby generator and ATS controls and signal.
2. Coordination with vendors or subcontractors (others) to interface with the control systems provided by others. This Item includes all interconnection wiring required for interfacing with such control systems to the pump station PLC as shown on the contract drawing.
3. All supports, bases, anchors, sleeves, hangers, conduit seals, and the like.
4. Shop Drawings and Operation and Maintenance (O&M) manuals.
5. Control Panels including all control components required for proper operation of the control system.
6. All power supplies, transformers, pushbuttons, pilot lights and selector switches.
7. Instrumentation system including but not limited to level transmitters, level switches, pressure transmitters, pressure switches, pressure gauges, flow meters, flow switches, smoke detectors and intrusion switches.
8. Interconnection wiring diagrams.
9. Factory Acceptance Tests

10. Site Acceptance Tests

11. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions specified elsewhere in these Specifications.

12. Throughout this Contract, follow manufacturer's recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in indoor locations that are clean and dry. Items that are subject to corrosion under damp conditions and items containing electrical insulation, such as control panels, conductors, instrumentation and controls, shall be stored in clean, dry, indoor, heated locations. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in control panels, and instrumentation which do not have space heaters.

13. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. Energize all space heaters furnished with equipment

1.04 Submittals

A. Requirements: The submittal package for each individual equipment or groups of related equipment shall include all the required data and information and shall be complete. As a condition to the review of submittals required under these specifications, the System Integrator shall furnish the manufacturer's statement for the equipment accepting the unit responsibility. The purpose of this provision is to ensure compatibility of all components specified under the specific Technical Specifications; and to provide sole source responsibility for system performance and maintenance. Notwithstanding these provisions, however, the System Integrator is not relieved of his responsibility for the indicated portions of the work. The following submittal data shall be provided for each item of equipment. Additional data specific to individual equipment specified under individual Specifications shall be submitted in addition to the following.

B. Contract Drawings: The Drawings are generally diagrammatic unless detailed or dimensioned. Structural conditions, physical interference and locations of terminations of equipment shall govern the exact locations and routing of wiring, conduit and pipe. The Contractor and System Integrator shall examine the architectural, structural, mechanical, electrical and instrumentation plans and shop drawings for the equipment to determine the exact routing and final terminations of conduit, cables and pipes. Conduits and pipes shall be stubbed as near as possible to equipment terminals.

C. Deviations from Specifications: Should the System Integrator's proposed system specifications deviate from these Specifications, such deviation shall be documented and submitted to the Engineer for approval. All deviations shall be stated on the submittal transmittal sheet.

D. Organization and Binding of Submittals: The initial and subsequent submittals of drawings and data for review shall be organized and bound so that eventually they may be used as guides for preparing the required maintenance manuals. The submittal shall be organized in three (3) parts, not including preliminary administrative material such as table of contents, as follows:

   1. Part 1 shall consist of a series of sections, one for each process control system. Each section shall be divided by a tab and shall include the material specified below.

   2. Part 2 shall include outline dimension drawings for panels, cabinets, consoles and the like, as specified below.

   3. Part 3 shall include data on miscellaneous parts and accessories not included in Part 1.

E. Data Sheets: Data sheets shall be in a standardized format and shall include the following:

   1. Components name used herein and on the drawings,

   2. Manufacturer's model number or other product designation,

   3. Project tag number,

4. System of which the component is a part,
5. Location or assembly at which the component is to be installed,
6. Input and output characteristics,
7. Scale range and units (if any) and multiplier (if any),
8. Requirements for electric supply (if any),
9. Requirements for air supply (if any),
10. Materials of component parts to be in contact with, or otherwise exposed to, process media,
11. Reference to manufacturer's descriptive technical bulletin or brochure,
12. References to other features so that all specified features are stated on the data sheet,
13. Following each data sheet, a technical product bulletin, or brochure (or clear photocopy thereof) shall be inserted; this shall provide amplifying technical information on the construction, characteristics, and capabilities of the component described in the related data sheet. Elaborate and extensive technical details shall not accompany these bulletins. All bulletins shall be of the most recent issue,
14. Part 2 of the submittal shall include outline and dimension drawings for all enclosed assemblies including cabinets, panels, consoles and the like. These drawings shall show the arrangements of panel-mounted and internally mounted components to scale and shall include enough details to clearly establish the style and overall appearance of each assembly, and
15. Part 3 of the submittal shall consist of a series of data sheets for accessory components together with supporting catalog pages or bulletins (or clear photocopies thereof). These shall be arranged in a logical sequence and shall cover such items as:
    a. Control circuit devices, components and wiring
    b. Pneumatic components, fittings and tubing
16. Operation and Maintenance Manuals
    a. General: The System Integrator shall provide Operation and Maintenance (O&M) manuals in accordance with Section 01300.
    b. Content: A set of manuals shall include all the drawings and required data and shall be organized and bound as specified for the review submittals. These drawings and data shall be supplemented with installation, connection, operation, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the City with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.
    c. Format: In addition to the requirements set forth elsewhere, the O&M manuals shall consist of at least the following:
        1) Table of contents,
        2) Manufacturer’s or its representative’s contact information,
        3) Equipment complete model number for ordering,
        4) Spare parts with model numbers,
        5) Special tools with model numbers,
        6) System block and schematic diagrams,

7) Component schematic diagrams, and

8) Written step-by-step operating, troubleshooting and calibrating instructions for each of the systems and each of the components of each system

1.05 Quality Assurance

A. Performance and Design Requirements

1. Manufacturer's Qualifications: The equipment furnished under this division shall be the product of firms regularly engaged in the design and manufacture of the type of item specified, possessing the required technical competence, skill, resources and ability to complete the work specified herein with the requisite degree of quality in a timely and efficient manner. The Contractor shall be prepared to adequately document the qualifications of the manufacturers nominated to provide the equipment specified under this division. All documentation shall be submitted to the Engineer prior to design fabrication and shipment of any component specified herein. Nothing contained within these provisions shall be construed as relieving the Contractor of his responsibility for any portion of the work covered by this Section.

2. Arrangement: The drawings are generally diagrammatic and the location of instruments and control panels are approximate unless detailed or dimensioned. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences and the location of electrical terminations on equipment.

3. The Contractor shall examine the structural and mechanical plans and shop drawings for the various equipment to determine exact routings and final terminations for all raceways and cables. Conduits shall be stubbed up as near as possible to field instruments and shall be within the concrete base for the equipment or a separate concrete curb.

4. All conduit, instruments and control panels shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Control Panels, metering, transmitters and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, the Contractor shall submit proposed locations to the Engineer for review. Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to the City.

5. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.

6. Allowance has been made in the design for the number of raceways, cables and conductors considered adequate for feeding the various instruments and control panels. These circuits and diagrams are based on available data pertaining to the particular design of equipment and portray the systems, which the City has chosen to effect the required operation and level of control. Equipment provided by the Contractor (even though of the make and model specified) may differ in detail, arrangement, or connections from that shown. If the Contractor uses equipment which differs from the equipment shown in major aspects and requires modifications to power, control or other electrical service, the Engineer's acceptance of the equipment will be based upon the Contractor providing the modifications required, and they shall be of the same quality as shown and shall be provided at no additional cost to the City.

7. Protection of Equipment and Materials: The Contractor shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the work and until acceptable by the Engineer.

8. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.

9. The Contractor shall replace or have refinished by the manufacturer, all damaged materials or equipment, including face plates of instruments and control panels, at no expense to the City.
10. Tests: The Contractor shall make all tests required by Engineer or other authorities having jurisdictions as per applicable standards. All such tests shall be performed in the presence of the Engineer. The Contractor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation. Operational testing shall be performed on all equipment furnished and/or connected in other Sections of Division 16. Electrical and all other divisions specifying electrical items including furnishing of support labor for testing.
11. Standard test reports for mass-produced equipment shall be submitted along with the shop drawing for such equipment. Test reports on testing specifically required for individual pieces of equipment shall be submitted to the Engineer for review prior to final acceptance of the project.
12. Any test failure shall be corrected in a manner satisfactory to the Engineer.
13. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in these particular specifications or shown on the drawings.
14. The Contractor shall apply and pay for all permits required by any of the legally constituted public authorities for the installation or construction of the work included under this Division. The Contractor shall arrange and pay for any inspections or examinations so required and deliver certificates of all such inspections to the Engineer. When these specifications call for materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of the specifications shall take precedence.

1.06 Delivery, Storage, and Handling

A. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturer's recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as instruments, conductors, and control panels. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in control panels which do not bare space heaters.

B. Shipment: The major equipment items listed in this provision and furnished under this contract shall be shipped in sealed, weather-tight, enclosed conveyances in a manner designed to protect the equipment against damaging stresses during transport.

C. Inspection

1. The Contractor shall cooperate with the Engineer and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate machinery, or perform any reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality or adequacy of the work.
2. If any material does not conform to these specifications, the Contractor shall, within three days after being notified by the Engineer, remove the materials from the premises.
3. Work shall not be closed in or covered before inspection and approval by the Engineer. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor.

1.07 Field Quality Control

A. Tests and Instrument Calibration

1. Individual Component Calibration: Each instrument and final element shall be field calibrated in accordance with the manufacturer's recommended procedure.
2. Loop Tests: Each instrument loop shall be treated as an integrated system. This test shall be designed to verify that all components within the loop operate correctly and that the loop functions correctly.
3. Notify City in writing 48 hours in advance of testing for witness by City Inspector.
4. Submit written report of testing results to the Engineer

B. System Start-Up

1. General: When all systems and components have been successfully calibrated and tested, a date for the Plant start-up involving the Engineer shall be scheduled and agreed upon.
2. Procedure: The ICS shall be rechecked to verify proper operation. Final adjustments shall be made as required.
3. Report: Provide a written report to the Engineer verifying the operation of the ICS. Note any problems or concerns in this report.

C. Operator Training

1. General: Operator training shall be provided for the ICS after the System Startup has been successfully executed.
2. Format: The Plant operating personnel shall be instructed in the functions and operation of each system and shall be shown the various adjustable and set point features which may require readjustment, resetting, or checking and re-calibration by them from time to time. The O&M manuals in addition to the System Integrator's prepared materials shall be used for this training.

D. Duration: The training shall consist of a two (2) day course, a minimum of 16 hours total instruction, for up to five (5) students. This course shall be conducted at the jobsite on an agreed upon date independent of any testing or startup dates. A detailed outline of this course shall be submitted to the Engineer at least 10 days in advance of the training start date. The class shall be scheduled a minimum of 2 weeks in advance of the week it is to be held. Submit a course syllabus.

1.08 Components and Accessories

A. Power Meter

1. The power meter shall be a Shark 200 Power Monitor, no substitutions.
2. The meter shall support a power supply of 480 Volts AC
3. The meter shall be UL listed and CE marked.
4. The meter shall be designed for Multifunction Electrical Measurement on 3 phase power systems. The meter shall perform to spec in harsh electrical applications in high and low voltage power systems.
    a. The meter shall support 3-Element Wye, 2.5 Element Wye, 2 Element Delta, 4 wire Delta systems.
    b. The meter shall accept universal voltage input.
    c. The meter's surge withstand shall conform to IEEE C37.90.1.

d. The meter shall be user programmable for voltage range to any PT ratio.

5. The meter shall be a traceable revenue meter, which shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy.
6. The Option Cards shall provide the following features:
    1) 2 Relay outputs
    2) V3 option pack- Power Quality Harmonics
7. The meter shall have transformer loss, line loss, and total substation loss compensation.
    a. Substation losses shall be programmable for Watts and VARs, and for Ferris and Copper losses.
    b. The meter shall have CT and PT compensation to set compensation factors for errors in CTs and PTs connected to the meter.
8. Power meter shall be able to be stored in (-20 to +70) degrees C.
    a. Operating temperature shall be (-20 to +70) degrees C.
    b. The front of the power meter shall provide IP65, NEMA 4X protection degree.

B. Pilot Devices:

1. Indicating lights, pushbuttons, and selector switches shall be miniature oil-tight units. Time clocks in control circuits shall be NEMA IC1, B150, rated 5 amperes inductive at 120 volts AC. Contact blocks for signal circuits shall be rated at 0.06 amperes at 30 volts AC or DC and shall be hermetically sealed reed switches. Pilot lights for 120 volt AC circuits shall be full voltage LED type. Pilot lights of 24 volt circuits shall be rated 28 volts. Individual pilot light assemblies shall be "push-to-test" type.

C. Relays:

1. All relays used for instrumentation work shall be plug-in types utilizing EIA standard tube socket configuration plugs. Sockets shall be heavy-duty, surface mounted, industrial type with barrier protected screw type terminals and shall be a one-piece melamine plastic molding. Sockets shall be rated not less than 5 amperes at 125 RMS working volts.
2. As a minimum, relays for general purpose use shall have double-pole, double-throw (DPDT) contacts. They shall bear ratings of 10 amperes at 120 volts AC and 28 volts DC. Relay frames shall be constructed of laminated phenolic and shall be provided with a clear polycarbonate dust cover. Relays for switching high level signal circuits (4 to 20 mA) shall be similar to the above; except the contacts shall be rated 3 amperes and the relays shall be hermetically sealed.
3. Relays for switching power or control loads with in-rush currents in excess of 5 amperes shall be similar to the above except the contacts shall be single-pole, single-throw (SPST), double-break, rated 20 amperes at 120 volts AC and 28 volts DC, and 1 horsepower at 120 volts AC.
4. Relays shall be IDEC, or an approved equivalent.

D. Signal Isolator:

1. Signal isolators shall have complete isolation of input, output and power input. Signal input shall be 4-20 mA into 50 ohms maximum, signal output shall be 4-20 mA into 1000 ohms minimum. Power input shall be 24VDC. Span and zero shall be adjustable. Accuracy shall be plus or minus 0.1 percent of span. Units shall be surface or rack mounted. Signal isolators shall be Moore Industries Model SCT, Rochester Instrument Systems, AGM Electronics TA-4000, or equal.

E. Current Alarm Trip (Switches):

1. Current alarm trips shall be single- or multi-channel type as required. Units shall accept voltage or current input signals. Dead band shall be factory set at 1 percent of full span for single trips. Alarm trips shall be equipped with 10 AMP DPST contacts.
2. Alarm trips shall include setpoint dials calibrated 0-100 percent for each trip point. Single alarm trips shall include a dead band adjustment dial calibrated 0-100 percent.
3. Alarm trips shall be AGM Electronics Model TA-4030, Moore Industries Model DCA, or equal.

F. I/I Converters:

1. Current to Current (I/I) converters shall accept one 4-20 mA signal and convert to two (2) 4-20 mA DC signals with an uncertainty not exceeding 0.25 percent of full scale. Each output signal shall be independent of each other, and isolated from input signal. The units shall be AGM Series 4000 or equal.

G. TERMINAL BLOCKS AND WIRING

1. Terminal blocks shall be screw terminal type with box-clamp type pressure plates. Terminal blocks shall be rated minimum 300 volts. Each terminal block shall be identified by a distinct number (TB-1, TB-2, etc.) designated by the panel manufacturer. All terminal points shall be assigned a distinct number. All terminal points for “Common” bus shall be designated by “COM.” Terminal points dedicated for 120 VAC buses shall be identified by L-1, L-2, etc. Terminal points for the ground wires shall be labeled “GND.”
2. All interconnecting wiring between panels or between panels and field devices shall be connected to terminal blocks. All panel internal wiring shall be installed in plastic raceways (Panduit). Unless otherwise shown on the Drawings, all 120 VAC wiring shall be No. 14 AWG. All wiring for analog signals shall be No. 16 AWG. All wiring for 24 VDC discrete signals shall be No. 16 AWG. All wire shall be standard copper. Conductors shall be individually identified using colored thermoplastic insulation or distinct labels.
3. Conductor Identifications: Identify each conductor by a consecutive unique number, letter, or number-letter combination. Each conductor shall have the same identification at all terminals and tie points. Conductors connected to the same terminal or tie point shall have the same identification. Conductor identification shall be as shown below with modifications necessary to provide a unique conductor number for each interconnecting conductor:
    a. OPNLTB #T #/DPNLTB #T #/C #, where
        1) OPNL is Origination Control Panel, TB # is Terminal Block Number, T # is Terminal Number, DPNL is destination Control Panel, and C # is the three digit conductor sequential number. The following example is shown as the guidance for clarification:
            a) BBCPTB01T12/ASCPTB01T12/100, where
                (i) BBCP is Blower Building Control Panel, TB01 is Terminal Block 01, T12 is Terminal Point 12, ASCP is Activated Sludge Control Panel, and 100 is the conductor unique number.
                (ii) Use filed device Tag Numbers for connections between two filed devices and between a field device and a panel.
4. All relay contacts which will be connected to external panels or devices shall be wired to terminal blocks,

H. Accessories

1. Provide instruments with manufacturer's identification nameplate showing:
    a. Manufacturer's model number

b. Manufacturer's serial number

c. Range (English units)

d. Power supply requirement

I. Nameplates

1. Machine engraved laminated phenolic nameplates shall be provided for all panel mounted equipment. Nameplate engraving shall be as shown on the Drawings. The nameplates shall also include the instrument tag number in small size lettering on the last line of the nameplates. Nameplates shall be attached to the panel with a minimum of two self-tapping stainless steel sheet metal screws. Adhesive attachment is not acceptable. The Engineer reserves the right to review and change nameplates wording at no additional cost prior to the engraving. Machine embossed adhesive labels shall identify the tag number of instruments inside panels. All nameplates shall be included in CONTRACTOR's submittal for review and approval

****END OF SECTION****

SECTION 17512
SITE ACCEPTANCE TESTS

PART 1 - GENERAL

1.01 Summary

A. Scope: This section describes the requirements for the Site Acceptance Testing (SAT) at the project site.

B. Conduct a formal SAT prior to final commissioning of the project. The purpose of the SAT is to verify operation of the Instrumentation and Control System (ICS) of the new generator and ATS to ensure that the ICS perform in compliance with the design special provisions and control strategies and correct deficiencies.

C. The Contractor shall prepare a SAT Plan (SATP) for review and approval by the Engineer prior to scheduling the SAT. The Contractor shall correct any deficiencies from the field tests performed prior to the SAT to expedite the SAT process. All costs including test equipment, hardware and software of the SAT shall be included in the Contractor's original bid priced.

1.02 Submittals

A. Submittals shall be in accordance with Special Provisions, Section 17010 and requirements of this Section. All submittals of this Section shall be the responsibility of the Contractor.

B. Submit a SAT Plan (SATP) at least 30 days prior to the start of testing for review and approval by the Engineer. The SATP shall include all procedures, equipment, detailed schedule, Standards, personnel or subcontractors responsible for testing and Test Forms necessary for a complete SAT.

C. Within 15 days following completion of the site tests, submit the SAT report to the Engineer.

D. Include the following information in the submittal.

1. Calibration and testing information for all instruments throughout the Pump Station including the existing and new instruments
2. All instrument loop checkout schedule
3. Loop checkout procedures including sign-off forms
4. Loop tuning procedures
5. Control strategy test schedule arranged by unit process
6. Control strategy test procedures and sign off forms
7. Procedures and sign-off forms for all other tests specified

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Field Quality Control

A. Perform field-testing to verify the automation operations associated with the control systems and manual operations with the existing PLC system disabled. Perform field-testing sequentially and organize by unit process within each process area. Field tests shall include:

1. Power failure tests,
2. Control loop tests,

3. Control loop tuning,
4. Integrated system test,
5. Manual operation tests
6. Manual Transfer Switch (MTS)
7. Automatic Transfer Switch (ATS)

B. The Contractor shall be responsible for the following tests which shall be completed prior to joint Contractor - Engineer loop and end-to-end tests:
   1. Calibration of all instruments and final control elements, except those not provided by the Contractor
   2. All field wiring tests, including continuity, insulation resistance, and others specified elsewhere.
   3. Basic analog and discrete loop checkout of hardwired circuits, including:
      a. Verification that each field instrument is connected to the correct, tagged wires at each control panel
      b. Verification at each control panel that every field signal has correct voltage polarity
      c. Verification that the local panels and packaged systems supplied by the Contractor are completely and properly installed, and that all associated logic works properly

C. After the completion of instrument calibration as applicable, but prior to Integrated System Testing, perform the loop and end-to-end tests. To the extent practical, begin testing promptly after installation of each major subsystem. A subsystem is an integrated, fully operational subset of the control system and includes:
   1. Programmable logic controller (PLC)
   2. Communications equipment required for operation of the subsystem
   3. Field instruments, panels, termination cabinets, control devices and related interconnections provided for the plant area
   4. Each and every control and instrumentation circuit modified or replaced by the Contractor shall be tested
   5. These tests shall include all signals that are connected to the PLCs through digital networks. The test shall also include all hardwired input/output loops

D. Meet the following conditions prior to the start of any testing:
   1. Correct deficiencies noted during the factory testing
   2. Have documentation on-site pertinent to the part of the system being tested
   3. Have on-site, labeled, and properly stored spare parts, expendables and test equipment pertinent to the part of the system being tested
   4. Have Engineer approved test schedules and test procedures

E. Provide written notice 48 hours in advance of intent to commence the SAT procedures.
   1. Clearly identify sections of the SAT procedure to be conducted
   2. Failure to properly notify the Engineer of anticipated testing activities would not be considered an unavoidable delay or justification for compensation
   3. Process operational constraints, personnel availability, and other's work are valid reasons for re-scheduling testing.

F. Coordinate all field-testing through the Engineer on a daily basis

1. The Engineer may redirect testing from one unit process to another. Pre-negotiated price shall include, as a minimum, redirection of testing as follows:
    a. The redirection does not cause more than a two-hour interruption to the testing to move test equipment and test personnel to the new unit process.
    b. There is no change in the amount of test equipment or personnel requirements.
    c. The redirection is not arbitrary. Process operational constraints, personnel availability, and other's work are valid reasons for redirection.
    d. The redirection does not occur more than once in any workday subsequent to the daily scheduling meeting.
    e. Perform no testing that may affect plant operation without City concurrence.

G. Perform tests by following the operation and maintenance manuals word-for-word unless approved otherwise by the Engineer. Lack of complete, detailed manuals will be a cause for declaring the test to have failed regardless of the actual test results.

H. Make available for City's use loops and control strategies that have been verified to operate properly immediately subsequent to conclusion of the respective test.

I. The Engineer will witness all testing activities.

J. Loop Tests
    1. The Contractor shall be responsible for loop tests. The Contractor shall provide full-time staff to support and conduct these tests. The Contractor shall operate all field equipment, inject simulated field signals, record results observed in the field, check the proper operation of field equipment, and promptly correct any deficiencies or problems found with the Contractor-supplied equipment or work. The Contractor shall be responsible for performing all testing activities including test plans, test forms, test documentation, test reporting, and other test activities specified below.
    2. Check each loop from the end element to the respective control display. Include instruments, control devices, panels, termination cabinets, input/output cards and other devices in the loop to ensure proper operation and linkage to control station displays.
        a. Analog inputs shall be tested at a 0 percent, 25 percent, 50 percent, 75 percent and 100 percent of scale for proper receipt within tolerances.
        b. Discrete inputs shall be tested to verify proper state when the field device is switched between states.
        c. Discrete outputs shall be tested to verify equipment respond properly (start, stop, etc.).
        d. Verify the proper operation of each discrete control loop to insure the proper operation of motors, hand switches, interlocks, solenoid valves, other auxiliary devices, stratus lights, operator interfaces, and alarms.
        e. Test operation of the final control element through panels and through control stations for new or modified equipment. If a final control element is out of service or not released by the Engineer for testing simulate operation at the final control element location.
        f. Each analog network shall be tested by applying simulated analog or discrete inputs to the first element of an analog network. For networks that incorporate analog elements, simulated sensor inputs corresponding to 0, 25, 75, and 100% of span shall be applied, and the resulting element outputs monitored to verify compliance to calculated root-mean-square-summation accuracy tolerance requirements.

g. Verify the proper operation of each discrete control loop to insure the proper operation of motors, hand switches, interlocks, solenoid valves, other auxiliary devices, status lights, operator interfaces, and alarms.

3. Document loop checks and submit to the Engineer for review. The submittal shall include:
   a. Test Date
   b. Loop number
   c. Loop description
   d. Termination information
   e. Loop drawing reference
   f. Type of test(s) performed
   g. Problem description, if any
   h. Signature of tester and date
   i. Signature of Engineer and date
4. Summarize loops found to contain defective or inoperable equipment on separate sheets and submit to the Engineer.
   a. Correct and recheck these loops.

K. Control Loop Tuning

1. Control loop tuning including existing and new control loops is the responsibility of the Contractor.
2. Complete loop and end-to-end testing and problem correction prior to loop tuning. Perform preliminary loop tuning prior to strategy testing. Perform final loop tuning during the SAT.
3. Derive initial tuning parameters from open loop tests. Make final tuning parameter adjustments based on closed loop tests.
4. Submit loop tuning documentation to the Engineer which shall include:
   a. Date
   b. Loop number and description
   c. Problem description, if any
   d. Signature of tester and date
   e. Signature of Engineer and date
5. Operate tuned loops for a minimum of 24 hours prior to finalizing loop tuning documentation.

L. Control Strategy Tests

1. Control strategy testing is the responsibility of the Contractor. The Contractor shall provide full-time staff to support and conduct these tests. The Contractor shall operate all field equipment, inject simulated field signals, record results observed in the field, check the proper operation of field equipment, and promptly correct any deficiencies or problems found with Contractor-supplied equipment or work. The Contractor is responsible for performing all testing activities including test plans, test forms, test documentation, test reporting, and other test activities specified below.
2. Fully test control strategies to ensure specified operation. Include:
   a. Sequences

b. Alternate control modes

c. Dynamic gain adjustments

d. Contingency responses to device failures, where possible

e. Display and keyboard interaction

f. Messages

3. Prior to use on the process equipment, compare strategies with approved submittals to verify that as-built linkages and control logics agree with the documentation. Note and correct discrepancies.

4. Test as much of the logic as possible using process equipment.

5. Document strategy tests and submit to the Engineer. Include:

a. Date

b. Strategy identification

c. Tests performed

d. Logics which could not be tested and reasons

e. Copies of messages, displays and trends which verify operation

f. Problem description, if any

g. Signature of tester and date

h. Signature of Engineer and date

6. Annotate changes made during testing on the documentation to reflect final as-built conditions.

M. Integrated System Testing

1. Integrated system testing shall be the responsibility of the Contractor

2. The Engineer will monitor and participate in the test

3. Perform integrated system testing to verify the operation and performance of the complete, integrated control system

4. Begin integrated system testing after all other field tests have been completed

5. Provide full-time, on-site assistance during the business days and within four hours after call in for the test duration

6. Demonstrate the availability of 99.0 percent or better for the system. Percent availability is equal to:

(Test Duration - Downtime) / Test Duration] x 100

7. The system is down if:

a. An on-line PLC is not polled

b. Operator commands cannot be carried out to the PLC

c. Failure of equipment due to improper operation by the City or failures of equipment not supplied under this Contract shall not be counted as downtime

d. Failover to a backup device shall not be counted as downtime provided the backup device promptly assumes proper operation.

****END OF SECTION****

C I T Y O F S A N T A R O S A

STATE OF CALIFORNIA

FIRE-RELATED REPAIRS OF UTILITY STATIONS

The work to be performed and referred to herein is in the City of Santa Rosa, California and consists of improvements to be constructed in accordance with the provisions of the Invitation for Bids, containing the Notice to Bidders, the Special Provisions, the Project Plan(s), the Bid Forms and the Contract, all of which are by reference incorporated herein, and each Addendum, if any is issued, to any of the above which is also incorporated by reference herein.

TO THE AWARD AUTHORITY OF THE CITY OF SANTA ROSA

The undersigned, as bidder, declares that the only person or parties interested in this bid as principals are those named herein; that this bid is made without collusion with any other person, firm, or corporation; that Contractor has carefully examined the Project Plans, Invitation for Bids and conditions therefor, and is familiar with all bid requirements, that Contractor has examined this Contract and the provisions incorporated by reference herein, and Contractor hereby proposes, and agrees that if its bid is accepted by the City, Contractor will provide all necessary machinery, tools, apparatuses, and other means of construction, and to do all the work and furnish all the materials and services required to complete the construction in accordance with the Contract, the Special Provisions, the Project Plan(s), and Addenda to any of the above as incorporated by reference, in the time stated herein, for the unit prices and/or lump sum prices as follows:

NAME OF BIDDER: _____

Contract #: **C02208**

Project Title: **FIRE-RELATED REPAIRS OF UTILITY STATIONS**

Line #	Description	Units	Quantity	Unit Price	Total Price
1	MOBILIZATION/DEMOBILIZATION	LS	1	$_____	$_____
2	WATER POLLUTION CONTROL	LS	1	$_____	$_____
3	DEMOLITION	LS	1	$_____	$_____
4	SITE PREPARATION	LS	1	$_____	$_____
5	FENCES AND GATES	LS	1	$_____	$_____
6	MISCELLANEOUS CLEANING AND REPAIRS	LS	1	$_____	$_____
7	IRRIGATION SYSTEM	LS	1	$_____	$_____
8	POTABLE WATER PUMP STATION 1 - RETAINING WALL DRAINAGE SYSTEM	LS	1	$_____	$_____
9	POTABLE WATER PUMP STATION 1 - ANTENNA REPLACEMENT	LS	1	$_____	$_____
10	SEWER LIFT STATION 5 - GENERATOR ENCLOSURE	LS	1	$_____	$_____
11	SEWER LIFT STATION 1 - GENERATOR REPLACEMENT	LS	1	$_____	$_____
12	SEWER LIFT STATION 1 - ATS REPLACEMENT	LS	1	$_____	$_____
13	SEWER LIFT STATION 1 - ELECTRICAL INSTALLATION	LS	1	$_____	$_____

Total: $_____

In the case of any discrepancy between the unit price and the total set forth for the item, the unit price shall prevail; provided, however, that if the amount set forth as a unit price is ambiguous, unintelligible or uncertain for any reason, or is omitted, or in the case of lump sum items, is not the same amount as the entry in the "Total" column, then the amount set forth in the "Total" column for the item shall prevail in accordance with the following:

1. As to lump sum items, the amount set forth in the "Total" column shall be the unit price;

2. As to unit basis items, the amount set forth in the "Total" column shall be divided by the estimated quantity for the item and the price thus obtained shall be the unit price.

The Total Base Bid shall be the sum of the "Total" column. In case of discrepancy between the sum of the "Total" column and the amount entered as Total Base Bid, the sum of the "Total" column shall prevail. The bid comparison will be based on the sum of the "Total" column for each bidder.

If this Contract Bid is accepted by the City and the undersigned fails to execute the Contract and to give all the bonds required under the Contract, with a surety satisfactory to the Award Authority of the City of Santa Rosa, within ten calendar days after bidder has received the Notice of Award from the Engineer, then the Award Authority may, at its option, determine that the bidder has abandoned the Contract, and thereupon this bid and the acceptance thereof shall be null and void, and the forfeiture of the security accompanying this bid shall be in accordance with California Public Contract Code section 20172.

The undersigned understands and agrees that the City is not responsible for any error or omissions on the part of the undersigned in making this bid.

The bidder to whom the Contract is awarded agrees to execute the Contract in favor of the City, in the form attached, and to deliver any and all required bond(s) and insurance certificates within ten calendar days from the date of Contractor’s receipt of the Notice of Award. Following the award of the Contract, Contractor shall commence work within ten calendar days from the day authorized in the Notice to Proceed and diligently prosecute the same to completion in accordance with Section 8-1.05.

LIST OF SUBCONTRACTORS

NAME OF BIDDER: _____

The following is a list of each subcontractor who will perform work or labor or render services to the undersigned for the construction of the project in an amount in excess of ½ of 1% of the total amount of this bid.

The undersigned agrees that any portion of the work in excess of ½ of 1% of the total amount of this bid and for which no subcontractor is designated herein will be performed by the undersigned.

SUBCONTRACTOR NAME	SUBCONTRACTOR LICENSE NUMBER	SUBCONTRACTOR DIR REGISTRATION NUMBER	SUBCONTRACTOR BUSINESS ADDRESS	DESCRIPTION OF WORK (ITEM NO.)

LIST OF PREVIOUS SIMILAR JOBS

NAME OF BIDDER: _____

NONCOLLUSION DECLARATION
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:

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

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

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

NOTE: The above Noncollusion Declaration is part of the Contract Bid. Signing this Bid on the signature portion thereof shall also constitute signature of this Noncollusion Declaration.

BID BOND AFFIDAVIT AND BIDDER'S SIGNATURE PAGE

Accompanying this bid is a guaranty in the form of (Notice: Insert the words "cash $," "Cashier's Check," "Certified Check," or "Bidder's Bond" as the case may be):

_____

in an amount equal to at least ten percent of the total of this bid.

The undersigned further agrees that if Contractor does not execute the Contract and deliver the necessary bonds to the City within the period of time specified in this Invitation for Bids, the proceeds of the security accompanying this bid shall become the property of the City of Santa Rosa, California, and this bid and the acceptance thereof may, at the option of the City, be considered null and void.

The undersigned is licensed in accordance with an act providing for the registration of Contractors, License No. _____, Class _____, expiration date _____.

The undersigned in registered with the Department of Industrial Relations, Registration No. _____.

IMPORTANT NOTICE: If bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and manager of the corporation; if a partnership, state true name of partnership, also the names of all partners in the partnership; if the bidder is a sole proprietor, state the business name and the proprietor's name in full.

Secretary of State Business Entity Number: _____.

_____

_____

_____

_____

Business Address

_____

Telephone Number

I declare under penalty of perjury that the foregoing is true and correct.

BIDDER'S SIGNATURE: _____

TITLE: _____

DATE: _____

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions

This certification is required by the regulations implementing Executive Orders 12549 and 12689, 2 C.F.R part 180, Debarment and Suspension, and 2 C.F.R. § 200.213. Copies of the regulations may be obtained by contacting the person to which this proposal is submitted.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS FOR CERTIFICATION BELOW)

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals are presently debarred, suspended, proposed for disbarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Firm Name:

_____

Name and Title of Authorized Representative:

_____

Signature of Authorized Representative:

_____

Date:

_____

INSTRUCTIONS FOR CERTIFICATION

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out above.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the System for Award Management (SAM) database.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

CERTIFICATION REGARDING LOBBYING

The undersigned [Contractor] certifies, to the best of his or her knowledge, that:

No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

1. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Contractor,_____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, Contractor understands and agrees that the provisions of 31 U.S.C. § 3801 *et seq*., apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official:

_____

Name and Title of contractor's Authorized Official:

_____

Date:

_____

CONTRACT

CITY OF SANTA ROSA

CALIFORNIA

CITY CONTRACT NO. C02208
FEDERAL PUBLIC ASSISTANCE PROJECT CONTRACT NO. 36373/36375/37303
FIRE-RELATED REPAIRS OF UTILITY STATIONS

This Contract is made and entered into as of date to be added upon award at Santa Rosa, California, between the City of Santa Rosa (“City") and _____, of _____, California ("Contractor").

ARTICLE I - For and in consideration of the payment and agreement hereinafter mentioned, to be made and performed by City, and under the conditions expressed in the required bonds hereunto annexed, Contractor agrees that for the benefit of City, at its own cost and expense, to do all the work and furnish all the materials, except such as are mentioned in the Special Provisions to be furnished by City, necessary to construct and complete the work herein described in a good, workmanlike, and substantial manner. The work embraced herein shall be done in accordance with the State of California Department of Transportation Standard Specifications 2015 and Revised Standard Specifications 2015, insofar as the same may apply (Standard Specifications); in accordance with the City of Santa Rosa Construction Specifications for Public Improvements (City Specifications); in accordance with the City of Santa Rosa Design and Construction Standards, (City Standards); in accordance with the State of California Department of Transportation Standard Plans 2015 and Revised Standard Plans 2015 (Standard Plans), (collectively, “Contract Documents”) and in accordance with the Special Provisions hereinabove set forth, all of which are hereby incorporated into and made part of this Contract.

ARTICLE II - Contractor agrees to receive and accept the following prices as full compensation for furnishing all materials and doing all the work contemplated and embraced in this Contract; also for all loss or damages arising out of the nature of the work aforesaid, or from the acts of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered in the prosecution of the work until its acceptance by City and for all expenses incurred by or in consequence of the suspension or discontinuance of work, and for well and faithfully completing the work, and the whole thereof in the manner and according to the Project Plans and Invitation for Bids therefor, and the requirements of the Engineer under them to wit:

ITEM NUMBER	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
			$ _____	$ _____

TOTAL BASE BID (SUM OF "TOTAL" COLUMN) $ _____

BID ITEMS IN THIS SECTION WILL BE INSERTED UPON AWARD OF THE CONTRACT AND SHALL BE THE SAME AS THOSE BID UPON.

ARTICLE III - City and Contractor hereby promise and agree that Contractor shall provide the materials and do the work according to the terms and conditions herein contained and referred to, for the prices aforesaid, and City hereby agrees to pay for the same at the time, in the manner, and upon the conditions set forth; and the parties for themselves, their heirs, executors, administrators, successors, and assigns, do hereby agree to full performance of the covenants herein stated.

ARTICLE IV - By execution of this Contract, Contractor hereby represents and certifies that Contractor is aware of the provisions of Labor Code section 3700 which require every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of that Code, and Contractor hereby agrees to comply with such provisions before commencing the performance of the work of this Contract.

ARTICLE V - It is further expressly agreed by and between the parties hereto that the Invitation for Bids, containing the Notice to Bidders including any required Bonds, the Contract Documents, and any Addenda are all essential parts of this Contract and are specially referred to and by such reference made a part hereof. In the event of any conflict in the provisions thereof, the terms of said documents shall control each over the other, in the following order:

1. Special Provisions
2. Project Plans
3. City Standards
4. City Specifications
5. Standard Specifications
6. Standard Plans;

provided, that in the event of a conflict between any Federal Requirement in Section 10 of the Special Provisions and any other provision in the Contract Documents, the more stringent provision shall control and prevail.

ARTICLE VI - Contractor agrees to commence work pursuant to this Contract within ten calendar days from the date authorized in the Notice to Proceed and to diligently prosecute the same to completion in accordance with Section 8-1.05 of the Special Provisions.

This Contract shall not be transferred or assigned without the prior written consent of City, which may be withheld by City in its sole and absolute discretion.

If Contractor is a corporation, two corporate officers of Contractor, one from each of the following two groups shall execute this Contract: a) the chairman of the board, president or any vice-president; b) the secretary, any assistant secretary, chief financial officer, or any assistant treasurer. The name and title of the corporate officers shall be printed under the signature.

In witness whereof, the parties hereto have executed this Contract as of the date first written above.

City:

City of Santa Rosa,
a Municipal corporation

By: _____

Title: _____

ATTEST:
By: _____
Title: _____

Approved as to form:

By: _____
Office of City Attorney

Contractor:

Name of Contractor,
Type of entity

By: _____

Name: _____

Title: _____

By: _____

Name: _____

Title: _____