INVITATION FOR BIDS

FOR CONSTRUCTING

LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT

CONTRACT NUMBER
C02192

ISSUED BY

CAPITAL PROJECTS ENGINEERING DIVISION

CITY OF SANTA ROSA, CALIFORNIA

2022

Last Updated: March 1, 2016

A T T E N T I O N
Prebid Conference
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City of Santa Rosa

STATE OF CALIFORNIA

INVITATION FOR BIDS

CONTAINING:

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CONTRACT

FOR

LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT

Contract No. C02192

LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT

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CITY OF SANTA ROSA
STATE OF CALIFORNIA

NOTICE TO BIDDERS

➢	For technical questions regarding this project, contact Richela Maeda at (707) 543-3812.
➢	For direct access to plans, specifications and planholders' 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.

- IMPORTANT –

REVISED BIDDING PROCEDURES

All bids shall be submitted and opened according to the following procedure:

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., May 31, 2022, for Laguna Treatment Plant Emergency Generator Fuel Tank and Fleet Fueling Station Replacement, Contract No. C02192. (Engineer's Estimate: $951,483).

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.

Bid Opening Teleconference Call

Prospective bidders, subcontractors, and materials suppliers are invited to attend the Bid opening teleconference call scheduled to be held at 2:00 p.m., May 31, 2022. The teleconference can be accessed by dialing 1 (707) 543-4700, participant code 949-5581#.

Project Description/Scope of Work

The project includes demolishing an existing below-grade 15,000-gallon diesel fuel storage tank that serves the Laguna Treatment Plant's Emergency Generator. The existing tank will be replaced with an above-ground 20,000-gallon diesel fuel storage tank. An existing diesel fuel dispensing station will be demolished and replaced with a new dual fuel (gasoline/diesel) dispensing unit. A new above-ground 1,500-gallon dual compartment gasoline/diesel storage tank will be installed to supply the new fuel dispensing unit.

Pre-Bid Meeting In-Person OR Teleconference

Prospective bidders, subcontractors, and materials suppliers are invited to attend a pre-bid meeting on May 17, 2022, at 1:00 pm, in the Aquatic Room at Laguna Treatment Plant located at 4300 Llano Road, Santa Rosa, CA 95407. In-person attendees are encouraged to participate in a site walk after the meeting. Alternately, prospective bidders, subcontractors, and materials suppliers may attend the meeting via teleconference which can be accessed by dialing 1 (707) 543-4700, participant code 840-9515#.

Prospectivie bidders, subcontractors, and materials suppliers seeking to arrange a separate visit at the Project site must request permission from the City by contacting at least three (3) working days in advance to:

Richela Maeda, Associate Civil Engineer
City of Santa Rosa
Capital Project Engineering
69 Stony Circle
Santa Rosa, CA 95401
707-543-3812

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.

CITY OF SANTA ROSA
C02192 - LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT
ESTIMATED QUANTITIES

Item No.	Description	Quantity	Units
1	UTILITY CLEARANCES	1	LS
2	HOT ASPHALT MIX	210	TON
3	DEMOLITION	1	LS
4	GROUNDWATER MANAGEMENT ALLOWANCE	1	LS
5	UNDERGROUND STORAGE TANK REMOVAL	1	LS
6	CONTAMINATED GROUNDWATER AND SOIL MANAGEMENT	1	LS
7	FUEL STORAGE TANKS AND DISPENSING EQUIPMENT	1	LS
8	ELECTRICAL AND INSTRUMENTATION	1	LS
9	PIPELINE AND GEAR PUMP INSTALLATION	1	LS

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 C02192 Laguna Treatment Plant Emergency Generator Fuel Tank and Fleet Fueling Station Replacement 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 bonds.

TRACY DUENAS
Supervising Engineer

5/24/2022
Date

SPECIAL PROVISIONS

General Specifications

CITY OF SANTA ROSA, CALIFORNIA

LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT

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 22 sheets entitled Laguna Treatment Plant Emergency Generator Fuel Tank and Fleet Fueling Station Replacement, 2022-0008
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 2010 (Standard Specifications), and
6. State of California Department of Transportation Standard Plans 2010 (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 any and all claims and disputes arising under this contract.

2 BIDDING

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 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.

2-1.31 Examination of Project Plans, Specifications, City Standards, Invitation for Bids and Work Site: Prior to submitting a bid, the bidder shall carefully examine the Project Plans, 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 **96** 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. A copy of such addendum will be mailed or faxed to each Planholder. The City will not be bound by any other explanations or interpretations of the Contract Documents.

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 Guaranty Information and Bidder's Information and Signature
6. Bid Guaranty (Bid Bond or alternate security)

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.

2-1.33B 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.

2-1.33C 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.

2-1.33E 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 Bid Guaranty: 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 Disqualification of Bidders: 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 bidder within sixty 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. 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 one-half 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 one-half 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.

3-1.07 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 (if the City determines, in its sole discretion, that the project involves environmental hazards)	$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.

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.

3-1.20 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.

3-1.21 Return of Bid Guarantees: 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.

3-1.22 Subcontractors: The successful bidder shall furnish a list of all subcontractors as required under Sections 2-1.33C. 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 conform to the provisions of Section 9-1.06 of the Standard Specifications, except as modified herein.

5 CONTROL OF WORK

5-1.02 Contractor's Copies of 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 22 sheets entitled Laguna Treatment Plant Emergency Generator Fuel Tank and Fleet Fueling Station Replacement, 2022-0008
3. City Standards
4. City Specifications
5. Standard Specifications
6. Standard Plans

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: Contractor is directed to Section 5-1.17 of the Standard Specifications which states:

> "If any subcontractor or person employed by the Contractor shall appear to the Engineer to be incompetent or to act in a disorderly or improper manner, he shall be discharged immediately on the request of the Engineer, and such person shall not again be employed 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 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. Contractor shall grant such forces access to the project area as is reasonable and necessary to transport materials and equipment to the site of operations by the other forces.

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:

a. Stockpiling of equipment and/or materials;

b. Staging of construction;
c. Placement of work trailers or mobile offices;
d. Storage of trench spoils; or
e. Other construction related activities not specifically enumerated above.

5-1.26 Lines and Grades: Contractor shall carefully preserve all bench marks, 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.

5-1.27B 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.

5-1.36A 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, and any other improvements 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 a Contractor disputes the City's written response, or if the City fails to respond to a Claim within the time prescribed, the 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 the 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 the 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

6-2.01 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.

6-3.01 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.

6-3.01A 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.

6-3.05 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:

a. 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;

b. Contractor destroys markouts;
c. Contractor fails to perform hand digging or probing for utilities near markouts; or
d. 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: Unless otherwise specified, 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.

The City will not, under any circumstances, acknowledge or consider any offers to accept substitute materials or equipment between the dates of public notice of advertisement and the bid opening.

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. When requested, these prevailing wage reports must be redacted by the Contractor prior to providing them to 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:

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

    1. Material that the 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;
    2. Subsurface or latent physical conditions at the site differing from those indicated in the Invitation for Bids; and
    3. 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.

b. 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.

c. 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(2)(a) 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:

260 WORKING DAYS

8-1.05 Time: 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.

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*., 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.

TECHNICAL SPECIFICATIONS

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SEALS PAGE

TECHNICAL SPECIFICATIONS
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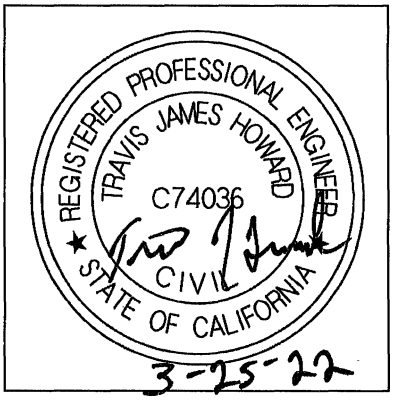
SECTION 26, AGGREGATE BASE
SECTION 39, HOT MIX ASPHALT
SECTION 73, CONCRETE CURBS AND SIDEWALK
DIVISION 31 – EARTHWORK



Travis J. Howard

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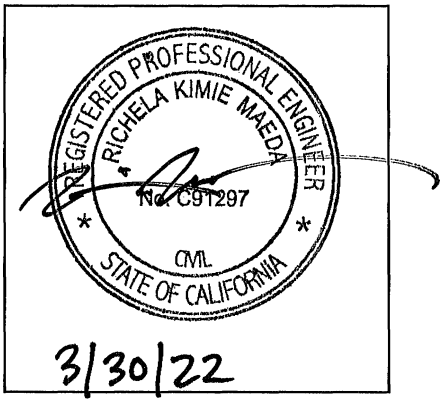

Richela Maeda

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TECHNICAL SPECIFICATIONS
SECTION 90, CONCRETE
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Chad R. Burke

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SECTION 40 80 01, PROCESS PIPING LEAKAGE TESTING
SECTION 44 42 56.06, GEAR PUMPS

Daniel Robillard

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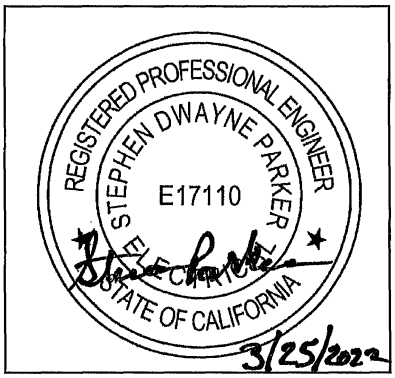

Stephen D. Parker

END OF SECTION

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10 DUST CONTROL

10-5.01 Dust Control: Sweeping, covering stockpiles, applying water, and/or dust palliative, to control dust caused by public traffic is not change order work.

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.

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

At the end of each workday, you shall thoroughly sweep all streets affected by the project to minimize airborne dust.

At the end of each work week, you 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.

10-5.01A PAYMENT: Full compensation for conforming to the provisions of Section 10 Dust Control shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

13 WATER POLLUTION CONTROL

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

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.

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.

13-1.01B Definitions: **Construction phase:** The construction phase starts at the start of job site activities and ends at Contract acceptance.

13-1.01C(4)(c) Water Quality Monitoring Reports: If the project is less than 1 acre you shall complete and sign the Storm Water Correction Notices (below) with the City as part of the Storm Water Permit.

STORM WATER CORRECTION NOTICE

FAILURE TO CORRECT BY DUE DATE MAY RESULT IN STOP WORK NOTICE!

PROJECT NAME: _____

JOB ADDRESS: _____

PROJECT / PERMIT #: _____ DATE: _____

☐ No storm water deficiencies identified.

I HAVE INSPECTED THIS PROJECT SITE. THE FOLLOWING ISSUES AND DEFICIENCIES HAVE BEEN IDENTIFIED AND REQUIRE CORRECTIVE ACTION:

STORMWATER BMPs:

☐ **Storm Drain Protection:**	Install	Maintain	Replace
☐ **Perimeter Controls:**	Install	Maintain	Replace
☐ **Housekeeping:**	Sweep	Clean	Remove Garbage & Debris
☐ **Stockpiles:**	Cover	Perimeter Controls	Remove
☐ **Debris Bins:**	Cover	Perimeter Controls	
☐ **Tracking:**	Clean-Up	Install Tracking Controls	
☐ **Portable Toilet:**	Secondary Containment Required		
☐ **Concrete:**	Install BMPs for Pumper or Concrete Truck Cover / Maintain Concrete Washout Containers		
☐ **Sediment & Erosion:**	Install Appropriate Controls		Dust Controls
☐ **Other:**			

***ALL DEFICIENCIES MUST BE CORRECTED PRIOR TO NEXT RAIN EVENT OR NO LATER THAN DUE DATE, WHICHEVER IS SOONER.**

DATE REQUIRED (SEE NOTE*):

INSPECTOR: _____ PH #: (___) _____

CONTRACTOR SIGNATURE: _____ DATE: _____

Inspection Type: ▫ **Monthly** (Oct 1st-April 30th) ▫ **Deficiency Re-Inspection**

▫ **Pre-Rain** (Sept 1st-Oct 1st) ▫ **Following First 0.25" Rain** (within 2 business days)

13-2 Water Pollution Control Program

13-2.01C 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.

13-3 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: You shall also comply with CASQA Spill Prevention and Control (BMP WM-4). If a spill occurs at the construction site and you do 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 you hereunder.

In the event there are insufficient amounts owed to you 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(3): Stockpile Management: You shall also comply with CASQA Stockpile Management (BMP WM-3). Do not block storm water flows.

13-4.03D(1): General: You shall also comply with Waste Management/CASQA Solid Waste Management (BMP WM-5). You shall dispose of all trash, rubbish, and waste materials of any kind generated by you, subcontractor, or any company hired by you on a daily basis.

13-4.03D(3): Concrete Waste: You shall also comply with 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: You shall also comply with 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:
You shall also comply with CASQA Water Conservation Practices (BMP NS-1 and NS-2).

13-4.03E(3): Vehicle and Equipment Cleaning:
You shall also comply with CASQA Vehicle and Equipment Cleaning (BMP NS-8).

13-4.03E(4): Vehicle and Equipment Fueling and Maintenance:
You shall also comply with CASQA Vehicle and Equipment Fueling (BMP NS-9), and CASQA Vehicle and Equipment Maintenance (BMP NS-10).

13-4.03E(7): Paving, Sealing, Saw cutting, 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 street 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: You shall also comply with CASQA Street Sweeping and Vacuuming (BMP SE-7).

13-6 Temporary Sediment Control

13-6.03C Temporary Drainage Inlet Protection: You shall also comply with CASQA Storm Drain Inlet Protection (BMP SE-10).

13-7 Temporary Tracking Control

13-7.01A: General: You shall also comply with Stabilized Construction Entrance and Exit (BMP TC-1), Entrance Outlet Tire Wash (BMP TC-3).

13-7.01C Construction: You shall also comply with CASQA Stabilized Construction Site Entrance / Exit (BMP TC-1).

13-10.04 PAYMENT: Full compensation for conforming to the provisions of Section 13 Water Pollution Control shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

[Revised: 03/30/21 CDA STD2018]

14 ENVIRONMENTAL STEWARDSHIP

14-10.01 General: You 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. All other excess materials from the project shall become the property of you and shall be disposed of by him, at his expense.

14-10.02 Solid Waste Disposal and Recycling Report: 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.

You shall provide receipts verifying delivery and approximate quantity (in tons) of the material delivered to a material recycler.

14-10.02D Payment: Full compensation for conforming to the provisions of Section 14 Environment Stewardship shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

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. You shall be responsible for any damage caused by your operations and any needed repairs shall be completed to the Engineer's satisfaction.

Existing storm drains found to reside in excavated areas shall be supported, removed, or replaced at your option and at no additional cost to the City. You shall be responsible for maintaining the existing line and grade of the storm drains. If you elect 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.

15-2.02C Traffic Stripes and Pavement Markings: All traffic stripes, pavement markings or any other traffic markings shall be removed by you to the satisfaction of the Engineer and in accordance with Sections 84 of the Standards, and the Plans.

15-2.02D Pavement Markers: All raised pavement markers shall be removed by you to the satisfaction of the Engineer and in accordance with Sections 82 of the Standard Specifications, City Standards, and the Plans.

15-2.02N Asbestos Cement Pipe: You are advised that asbestos cement pipe (ACP) will likely be encountered on the project and must be cut, handled, and disposed of according to your State Licensing Law and all other applicable laws and regulations.

15-2.04G Reconstruct Sidewalk Drain: Reconstruct sidewalk drain shall be done in conformance with requirements of Section 73 of the City Specifications, City STD-406 and as directed by the Engineer.

You shall remove portions of existing curb, gutter, and sidewalk, and the existing sidewalk drain and install new sidewalk drain, curb, gutter and sidewalk at the location designated and as directed by the Engineer.

15-2.08A General: Reset existing City facility boxes and lids to grade. The City will furnish at no cost to you new material to replace existing boxes and lids that do not comply with current City Standards or damaged prior to Contractor's operations.

15-2.10B Adjust Frames, Covers, Grates, and Manholes: Existing manhole frames and covers, valve boxes, mainline cleanouts and monuments adjusted to grade shall conform to City Standards.

You shall accurately locate and record the location of existing and new manholes, valve boxes, mainline cleanouts, and monuments to be adjusted to grade and shall furnish the Engineer a copy of said record prior to starting construction.

All facilities on active systems shall be accessible at all times to City personnel unless otherwise stated in these Special Provisions or approved by the Engineer.

After placement of the finish course of asphalt concrete, you shall mark all overlaid manholes, valve boxes, mainline cleanouts and monuments, whether new or existing, with white paint by the end of that working day.

All new and existing manholes, valve boxes, mainline cleanouts and monuments shall be accessible within 48 hours after they are covered.

Final grade adjustments and installation of concrete collars shall be done on the same working day. Final paving around manholes, valve boxes, mainline cleanouts and monuments shall be completed the following working day.

All silt and debris shall be removed from finished structures. This shall include all existing silt and debris plus material caused by Your operation.

If new or existing water valve riser pipe needs to be extended after paving to conform to City STD-877, you shall use either a slip x slip glued PVC coupling or a transition coupling with sheer bands as directed by the Engineer. Upsizing the existing riser pipe to 8-inch will not be required unless otherwise directed by the Engineer. Any added extension must be a minimum of 12 inches. The lower section of riser pipe shall be adjusted to accommodate this requirement.

In the event that you encounter water valve boxes with round lids or sanitary sewer frame and covers with open pick holes which must be adjusted to grade. You are to provide a count to the Engineer a minimum of two days prior to paving to obtain replacements that complies with current City Standards. The City will provide replacements provided You are not required to replace them as part of the contract or due to damage by Your operations. Valve boxes and frames and covers on facilities to be abandoned shall not be included in the count provided to the Engineer. You shall be responsible for delivery of new frames, boxes, and covers from the City warehouse to the job site. Prior to removal of an existing manhole frame, a platform shall be constructed in the manhole above the top of the sewer to prevent any dirt or debris from falling into the sewer. The platform shall remain in place until all work on the manhole has been completed and the asphalt concrete has been placed around the manhole. Prior to the removal of the platform from the manhole, all dirt and debris shall be removed.

All grade rings shall be set in cement mortar the same day they are placed. All joints shall be smoothly plastered inside and out.

Existing grade rings removed in the adjustment of manhole frames shall become the property of You and if undamaged and thoroughly cleaned of mortar may be reused in the work. If not so used, they shall be disposed of away from the site of work at your expense.

Manhole frames shall be reinstalled to align directly over the grade rings. Any frames misaligned by more than ½ inch shall be removed and reinstalled.

Existing Monuments adjusted shall conform to City Standards 280 to 284 and 78-2 Survey Monuments, of the specifications.

15-3.03 Construction: All removed concrete shall become the property of You and shall be immediately off-hauled. None of the removed concrete shall be dumped or stockpiled on the work site. You 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.

Concrete removal includes removal of any reinforcing steel embedded in the concrete and no additional allowance will be made for the removal of such steel.

Where new concrete is to join existing concrete, remove enough concrete to allow splicing of new reinforcement. Protect existing reinforcement to be incorporated into the new work from damage.

Irrigation facilities may be encountered during concrete removal and replacement. You 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.

15-7 Utility Clearances: *All items noted in this Section shall take place prior to any other construction activities.*

Pothole information provided on the Project Plans shall be for reference use only and shall not be considered as accurate information for any other areas within the project limits.

Contractor shall investigate, confirm and/or determine the exact locations of existing utilities, and verify clearances between existing and proposed utilities at crossings and/or known potential conflicts. You shall determine elevations and alignments of existing utilities at connection points.

You shall provide all relevant information in writing to the Engineer immediately upon discovery of any conflict. Any delay in notification to the Engineer may delay direction and/or corrective action and a delay claim due to this reason shall not be considered by the City. You shall not proceed with any work that is in conflict until direction is provided by the Engineer and shall redirect crews to other contract work. All the information required to be obtained per this Section and any other information not noted but relative to the project shall be provided to the Engineer on a set of Plans when the investigative effort is complete.

15-7.01 Payment: Utility Clearances shall be paid for at the contract **lump sum** price, which price shall not exceed 5% of the contract amount and shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all the work involved in verifying utility clearances, including but not limited to: potholing to verify potential conflicts, grades and alignments of existing facilities to be connected to; excavation; backfill; notification; and coordination and redirection of crews to other contract work *if required*, as specified herein, and no additional allowance will be made therefor.

Full compensation for conforming to the provisions of Section 15 Existing Facilities, not including Utility Clearance, shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

19 EARTHWORK

19-1 General

19-1.01 General:

1. Non-contaminated site: See Section 19-2.03B, Surplus Material, of these Technical Specifications.

19-1.01A Summary: Earthwork shall also include excavation for trenching.

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. Processing of unsuitable subgrade material is not allowed. The areas to be stabilized will be marked in the field by the Engineer after roadway 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: Full compensation for conforming to the provisions of Section 19 Earthwork shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

19-2.03A General: The Engineer shall provide reference points and cut sheets for the excavation of the roadway. You shall furnish an excavation and paving plan and a qualified grade setter to ensure the subgrade conforms to the lines and grades established by the Engineer.

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

Roadway excavation and asphalt concrete base paving shall be completed for half the street width before beginning excavation of the remaining street.

Your operation, including the size of the grinding equipment, shall be such, so as to ensure 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 jackhammering and removal of existing pavement and base materials by hand, or by use of smaller grinding equipment.

Where tree roots are encountered during roadway excavation, you 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: You shall be responsible for the removal and disposal of surplus materials. You shall notify the City of the disposal location before the start of construction. Surplus material, including removal of existing bituminous pavement and base materials will be paid for as roadway excavation.

19-5 Compaction

19-5.03B Relative Compaction: 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.

19-6 Embankment Construction

19-6.02A

Embankment material must be imported. No native backfill material is allowed.

19-10.02 Materials: Subgrade enhancement geotextile (aka 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.

Prior to placement of soil stabilization fabric, you shall remove all loose dirt left from excavation operations.

Soil stabilization fabric shall be placed over the entire subgrade area. 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.

[Version: 08/17/21 CDA STD2018]

25 AGGREGATE SUBBASE

25-1.02 Materials

25-1.02C Class 4 Aggregate Subbase: Aggregate subbase shall be Class 4 conforming to and placed in accordance with the requirements of Section 25 of the City Specifications, with the following modifications and additional requirements.

Aggregate subbase shall be Class 4 with a minimum sand equivalent value of 21, a minimum R-value of 50 and shall conform to the following gradings:

Sieve Size	Percent Passing
3"	100
1-1/2"	90-100
3/4"	50-90
#4	25-55
#200	2-11

The material contained on the #4 screen shall consist of 100 percent crushed particles.

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.

Class 4 aggregate subbase will be paid for at the contract price per square yard.

The contract price paid per square yard for Class 4 aggregate subbase shall include all compensation for 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.

25-1.03 Construction

25-1.03E Compacting: The surface of the finished aggregate subbase shall be firm and unyielding. Any visible movement vertically or horizontally of the aggregate subbase under the action of construction equipment or other maximum legal axle loads shall be considered as evidence that the aggregate subbase does not meet this requirement.

25-1.03F Grade Tolerance: The subgrade to receive aggregate subbase, immediately prior to spreading, shall not vary more than 0.05-foot above or 0.1-foot below the grade established by the Engineer.

25-1.04 Payment: Full compensation for conforming to the provisions of Section 25 Aggregate Subbase shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

26 AGGREGATE BASE

26-1.01 General

26-1.01A Summary: Aggregate base shall be Class 2 conforming to and placed in accordance with the requirements of Section 26 of the City Specifications.

Compacting 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.

26-1.02 Materials

26-1.02B Class 2 Aggregate Base: The minimum sand equivalent shall be 31 for any individual test.

26-1.03 Construction

26-1.03E 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: Full compensation for conforming to the provisions of Section 26 Aggregate Base shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

39 HOT MIX ASPHALT

39-1.01 General:

39-1.01A Summary: Section 39 includes specific specifications for producing and placing Hot Mix Asphalt (HMA){xe "Hot mix asphalt"}{xe "Pavement:hot mix asphalt"} by mixing aggregate and asphalt binder{xe "Asphalt binder"}{xe "Binder:hot mix asphalt"} at a mixing plant and spreading and compacting the HMA mixture.

39-1.01B Definitions: For these specifications, 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 specifications for HMA production and construction.

39-1.01C Description: Asphalt concrete shall be placed in separate lifts. Asphalt concrete base shall be placed first at 0.35-foot inches, asphalt concrete surface shall be placed at 0.2 inches.

Roadway excavation and asphalt concrete base paving shall be completed for half the street width before beginning excavation of the remaining street.

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 ensure 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. Tack coat applied to horizontal surfaces shall be applied with a tack truck, at a minimum residual rate of 0.02 gal/sqyd. 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-210, 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{xe "Tack coat"} must comply with the specifications for asphaltic emulsion or asphalts. Tack coat shall be diluted SS1 or SS1h.

39-1.02C Asphalt Binder: Asphalt binder{xe "Asphalt binder"}{xe "Binder:hot mix asphalt"} in HMA must comply with the specifications 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 1/2-inch Coarse HMA Type A
Base Course	3/4-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	--

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 Specifications.

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 specifications 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: **Hot Asphalt Mix** shall be paid for at the contract price **per ton**, which 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.

[Lab STD2010]

73 CONCRETE CURBS AND SIDEWALKS

73-1.01 General: This work shall consist of curbs, sidewalks, and their appurtenances, such as gutters, driveways, island paving, curb ramps, and gutter depressions.

73-1.02D 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 2 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 and gutter shall be constructed per City STD-241.

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 shall be constructed per City STD-242.

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 you may substitute 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 scoremark.

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, Island Paving (Median Curb), Curb Ramp, and Driveway Construction: Sidewalk, gutter depression, median curb, curb ramp, and driveway shall be constructed in accordance with per Section 73-1.07.
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 or as directed by the Engineer.

Soft or spongy base or subgrade 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 you 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 scoremark.

Gutter Depression shall be constructed in accordance with City STD-243 Standard Valley Gutter.

73-3.04 Payment: The payment quantity for minor concrete (curb ramp) includes detectable warning surface. Full compensation for conforming to the provisions of Section 73 Concrete Curbs and Sidewalks shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

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: Full compensation for conforming to the provisions of Section 90 Concrete shall be considered as included in the prices paid for under the various contract items of work and no additional allowance will be made therefor.

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.

SECTION A
FEES AND PERMITS

The Contractor shall obtain all necessary and required permits for the project.

The Contractor shall obtain permits for the Underground Storage Tank Removal and Aboveground Fuel Storage Tank Installation from the Santa Rosa Fire Department. Contact the Fire Prevention Bureau located at 2373 Circadian Way, Santa Rosa, CA 95407, or phone (707) 543-3500. The Contractor shall comply with the "Underground Storage Tank Removal Procedure". The Contractor shall comply with all requirements indicated in the "Santa Rosa Fire Department Fire Prevention Bureau Plan Review Checklist- Aboveground Storage Tank Installation". A copy of the AST Installation Plan Review Checklist can be found in Appendix A of the Section.

A Santa Rosa Fire Department Inspector must witness all tests as under the required for the Underground Storage Tank Removal and Above Ground Storage Tank Installation. Coordinate with City and call the Selectron Automated Request System at (707) 543-3006 to schedule each inspection at least 48 hours in advance. Inspections are scheduled Monday through Thursday.

July 1, 2010	SANTA ROSA FIRE DEPARTMENT FIRE PREVENTION BUREAU PLAN REVIEW CHECKLIST
City of Santa Rosa	SECTION A - APPENDIX A ABOVEGROUND STORAGE TANK INSTALLATION

Address:		**Permit #:**
Inspector:	**Date:**	**Status:**
Inspector:	**Date:**	**Status:**
		A-Approved; AC-Approved w/comments; I-Incomplete; D-Denied

This Checklist outlines general requirements. Information contained herein applies to typical instances and may not address all circumstances.

GENERAL INFORMATION

This checklist is applicable to installation of hazardous material aboveground storage tank systems (tanks and piping) within the boundaries of the City of Santa Rosa.

APPLICATION

	Y	N	
1.	☐	☐	Santa Rosa Fire Department plan review application
2.	☐	☐	A current State Contractor's License is on file
3.	☐	☐	Workmen's Compensation Insurance is on file
4.	☐	☐	A business license is on file
5.	☐	☐	Title 29CFR for each worker
6.	☐	☐	Underground Service Alert has been contacted and is marked
7.	☐	☐	Scope of work and timeline
8.	☐	☐	Electrical Permit
9.	☐	☐	Mechanical Permit
10.	☐	☐	Building Permit
11.	☐	☐	FEES – Permit fees entered in Permits Plus.

FILE REVIEW

12.	☐	☐	HISTORICAL SITE CONDITIONS – Review site specific conditions and history.

	Y	N	
13	☐	☐	ENVIRONMENTAL SITE ASSESSMENT –If required, a Phase I Environmental Site Assessment shall be approved prior to issuance of any grading, demolition or construction permits.

SUBMITTAL REVIEW

UL 2085 (Standard for Insulated Aboveground Tanks for Flammable Liquids),
CFC 22 Motor Vehicle Fuel Dispensing
CFC 34 Flammable and Combustible Liquids
CFC 27 Hazardous Materials

14. ☐ ☐ Minimum 2 sets scaled site plan. Including site map, property lines, structures with openings noted

15. ☐ ☐ Property use identified (Gas, bulk storage, government, utility, residential, school, emergency generator)

16. ☐ ☐ Project scope ("Scope of Work"): The project scope is a general description of the project, installation time lines, procedures and should include a description of associated areas where equipment, tanks, piping, hazardous materials storage will be located. Also include a description of operations, hazardous materials handling procedures and safety systems.

17. ☐ ☐ CFC 3404 The design, fabrication and construction of tanks shall be in accordance with recognized good engineering practice and nationally recognized standards. Each tank shall bear a permanent nameplate or marking indicating the standard used as the basis for design.

18. ☐ ☐ CFC 3404 Provide manufacturer's specifications, listing information and cut sheets for the tank(s).

19. ☐ ☐ Tank Contents are identified. (Gas diesel, kerosene waste, fuel oil, aviation, other)

20. ☐ ☐ CFC 2206 Property use clearly identified. Verify location of tank(s) with respect to property lines, public ways and buildings.

21. ☐ ☐ CFF 3404 Manufacturers' cut sheets for tanks, piping, and equipment. Examples include (but are not limited to): Tanks, piping, dispenser pans, overfill and over spill protection devices, alarm systems, monitoring system, sensors, dispensers, hoses, fittings, penetration boots, man ways, sumps, collars, etc. Additionally provide compatibilities with material to be contained.

22. ☐ ☐ All listings or certifications for proposed equipment (i.e., UL, SEMI-S2, Third Party Evaluations, Process Hazard Analysis, etc.)

23. ☐ ☐ CFC 3404 Tank spacing is appropriate.

24. ☐ ☐ CFC 3404 Materials specifications for any system that will or may come into contact with hazardous materials.

25. ☐ ☐ CFC 2206 Secondary containment volume calculations are included.

26. ☐ ☐ Monitoring method (Electronic, vapor/pressure, stick/visual) includes equipment used for monitoring secondary containment.

27. ☐ ☐ Tank is constructed and designed in accordance with nationally recognized standards.

28. ☐ ☐ CFC 3403 Class I electrical equipment locations are identified and protected.

29. ☐ ☐ CFC 503 Fire apparatus access is provided.

30. ☐ ☐ CFC 3404 Drainage control and diking is detailed.

31. ☐ ☐ CBC 1634 Seismic considerations are noted

	Y	N	
32.	☐	☐	CFC 3402 Tank has vents installed for Class I, II, III product
33.	☐	☐	CFC 2206 Crash protection is noted
34.	☐	☐	CFC 2208 No smoking is noted
35.	☐	☐	CFC 3403 NFPA diamond is noted
36.	☐	☐	CFC 2205 Secondary Containment is identified
37.	☐	☐	CFC 2205 Emergency Shutoff is noted.
38.	☐	☐	CFC 2205 Spill containment is provided
39.	☐	☐	CFC 2206 Overfill prevention is noted (Ball float valves, automatic shutoff devices, overfill alarms)
40.	☐	☐	CFC 2206 Fill port, pipe tank labeling is noted
41.	☐	☐	CFC 2206 Piping support is provided
42.	☐	☐	CFC 2206 Locations of all connections are noted
43.	☐	☐	CFC 3402 Tank venting is identified
44.	☐	☐	CFC 2206 Anti siphon devises are in place
45.	☐	☐	CFC 3403 Fire Protection is in place (extinguishers, chemical system)
46.	☐	☐	CFC 3404 Leak detection is identified
47.	☐	☐	27 CCR SPCC plan is attached
48.	☐	☐	T-19 CCR Hazardous Materials Business Plan is required prior to final signoff and fuel delivery.

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The completed Work will provide the City with a 20,000-gallon abovegrade emergency generator diesel fuel tank and a dual gasoline and diesel vehicle fueling station and includes removal of an existing 15,000-gallon buried diesel fuel tank.

B. The Work is divided into the following phases:

1. New construction and equipment installation:
   a. Emergency generator fuel storage tank.
   b. Vehicle fueling station.
2. Demolition:
   a. Remove existing diesel vehicle fueling station.
   b. Remove existing emergency generator fuel storage tank.

C. Payment will be made at the contract lump sum price, which shall include full compensation for furnishing all labor, materials, tools and equipment, utilities required for construction, temporary provisions such as sheeting and shoring, and all other items and services required for proper execution of the Work.

1.02 DESCRIPTION OF BID ITEMS

A. Bid Items are presented to indicate major categories of the Work for purposes of comparative bid analyses and payment breakdown for monthly progress payments. Bid items are not intended to be exclusive descriptions of Work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item (work phase) as shown and specified.

B. Bid Item Description and Payment:

1. **Bid Item 1 - Utility Clearance:** See Section 15 Existing Utilities.

2. **Bid Item 2 - Hot Asphalt Mix:** See Section 39 Hot Mix Asphalt.

3. **Bid Item 3 - Demolition:** This bid item includes all work associated with removal, disposal and demolition of existing items as shown in the Contract Documents including the removal of the existing diesel fuel dispensing unit and appurtenances, diesel fuel pumps and piping as shown on Drawings 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.

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4. **Bid Item 4 - Groundwater Management Allowance:** This bid item includes all labor, materials, and equipment necessary to preparation of the groundwater management associated with the Special Provisions, the City's standards, and specified in Section 31 23 19.01, Dewatering. Payment will be in accordance with Standard Specifications Section 9-1.04 Force Account or based on an agreed price. Standard Specifications Section 9-1.06B and 9-1.06C shall not be considered as part of this bid item.

5. **Bid Item 5 - Underground Storage Tank Removal:** This bid item includes all work associated with removal, disposal and demolition of the existing underground diesel storage tank, including removal and testing of soil and debris from excavation and soil backfilling. Payment will be made at the **lump sum** price given in the Bid Schedule and based on percent completion of groundwater management work required.

6. **Bid Item 6 - Contaminated Groundwater and Soil Management Allowance:** This bid item shall be paid for on a **lump sum** basis to provide management efforts as it relates to contaminated groundwater and/or soil encountered during the Project as specified in Section 02 65 00, Underground Storage Tank Removal. This bid item shall provide compensation for all labor, materials, and equipment necessary to perform, including but not limited to providing secondary containment lining, spill control measures, active groundwater treatment system, 40-hour OSHA-HAZWOPER certified workers, contaminated soil stockpiling management, and contaminated soil disposal, and other work incidental thereto, complete in accordance with the provisions specified herein and at the direction of the City. The estimated cost designated by the City is noted in Bid Schedule. Payment will be in accordance with Standard Specifications Section 9-1.04 Force Account or based on an agreed price. Standard Specifications Section 9-1.06B and 9-1.06C shall not be considered as part of this bid item.

7. **Bid Item 7 - Fuel Storage Tanks and Dispensing Equipment:** This bid item includes all work associated with furnishing all labor, materials, tools and equipment involved in installation of the new emergency generator fuel storage tank and vehicle fuel storage tank including startup, testing and commissioning work as shown in the Contract Documents. 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 - Electrical and Instrumentation 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 and instrumentation connection of the new gasoline and diesel fuel tanks, fuel management system, conduit, conductors, wiring, startup, testing and miscellaneous electrical and instrumentation work as shown on Drawings, 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.

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9. **Bid Item 9 - Pipeline and Gear Pump Installation:** This bid item includes all work associated with the installation of the new diesel fuel piping and replacement gear pumps as described on Drawings and Specifications. Payment will be made at the **lump sum** price given in the Bid Schedule and based on percent completion of hot asphalt work required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 01 31 13
PROJECT COORDINATION

PART 1 GENERAL

1.01 UTILITY NOTIFICATION AND COORDINATION

A. Coordinate the Work with various utilities within Project limits. Notify applicable utilities prior to commencing Work, if damage occurs, or if conflicts or emergencies arise during the Work.

1.02 WORK SEQUENCING/CONSTRAINTS

A. Include the following work sequences in the Progress Schedule: Completed commissioning of the emergency generator fuel storage tank.

B. The Laguna Treatment Plant will have ongoing construction projects in progress concurrent with this Project. The Contractor shall coordinate his activities with the requirements of the concurrent activities.

1.03 FACILITY OPERATIONS

A. Continuous operation of City's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.

B. Perform Work continuously during critical connections and changeovers, and as required to prevent interruption of City's operations.

C. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to maintain continuous operations of City's facility.

D. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by the City. Such authorization will be considered within 48 hours after receipt of Contractor's written request.

E. Construct Work in the following stages to allow for the Laguna Treatment Plant's uninterrupted operation during construction.

1. Installation of new emergency generator fuel storage tank system, including but not limited to, storage tank, fuel piping, valves, instruments and control systems, and fuel transfer pumps.
2. Demolition of existing emergency generator fuel storage tank.

F. The emergency generators must be kept operational at all times. The fuel transfer pumps must be replaced one at a time to retain operation of at least one pump at all times. Ensure that the generator fuel day tank is full before removing any existing fuel transfer pump.

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G. A short shutdown of the fuel transfer pipeline will be required to install a new connection and isolation valve for the fuel pipe from the new emergency generator fuel storage tank. Contractor to ensure that the generator fuel day tank is full before the pipeline shutdown. Coordinate shutdown with the City at least 7 days before work begins and submit a System Outage Request. Three (3) days prior to each shutdown, Contractor to submit to City a NOAA forecast that demonstrates zero precipitation for 3 days prior to and during the shutdown. City to provide approval within 1 working day of receiving NOAA forecast to verify flows are conducive to a shutdown. In the event that the City cannot provide approval within 1 working day, additional days will be added to the Contract. Contractor to reschedule shutdown if NOAA forecast predicts rain. Maximum duration of shutdown must not exceed 4 hours. Do not proceed with Work affecting the plant's operation without obtaining City's advanced approval of the shutdown.

H. Relocation of Existing Facilities:

1. During construction, minor relocations of Work may be necessary.
2. Provide complete relocation of existing structures and Underground Facilities, including piping, utilities, equipment, structures, electrical conduit wiring, electrical duct bank, and other necessary items.
3. Use only new materials for relocated facility. Match materials of existing facility, unless otherwise shown or specified.
4. Perform relocations to minimize downtime of existing facilities.
5. Install new portions of existing facilities in their relocated position prior to removal of existing facilities, unless otherwise accepted by the City.

I. All stockpiles of contaminated/suspect soil shall be stored on bermed plastic and covered at the composted facility shown in Exhibit A below. Contractor to coordinate with the City. The Santa Rosa Fire Department and the Bay Area Air Quality Management District (415-771-6000) will need to be contacted regarding treatment and disposal of contaminated soil.

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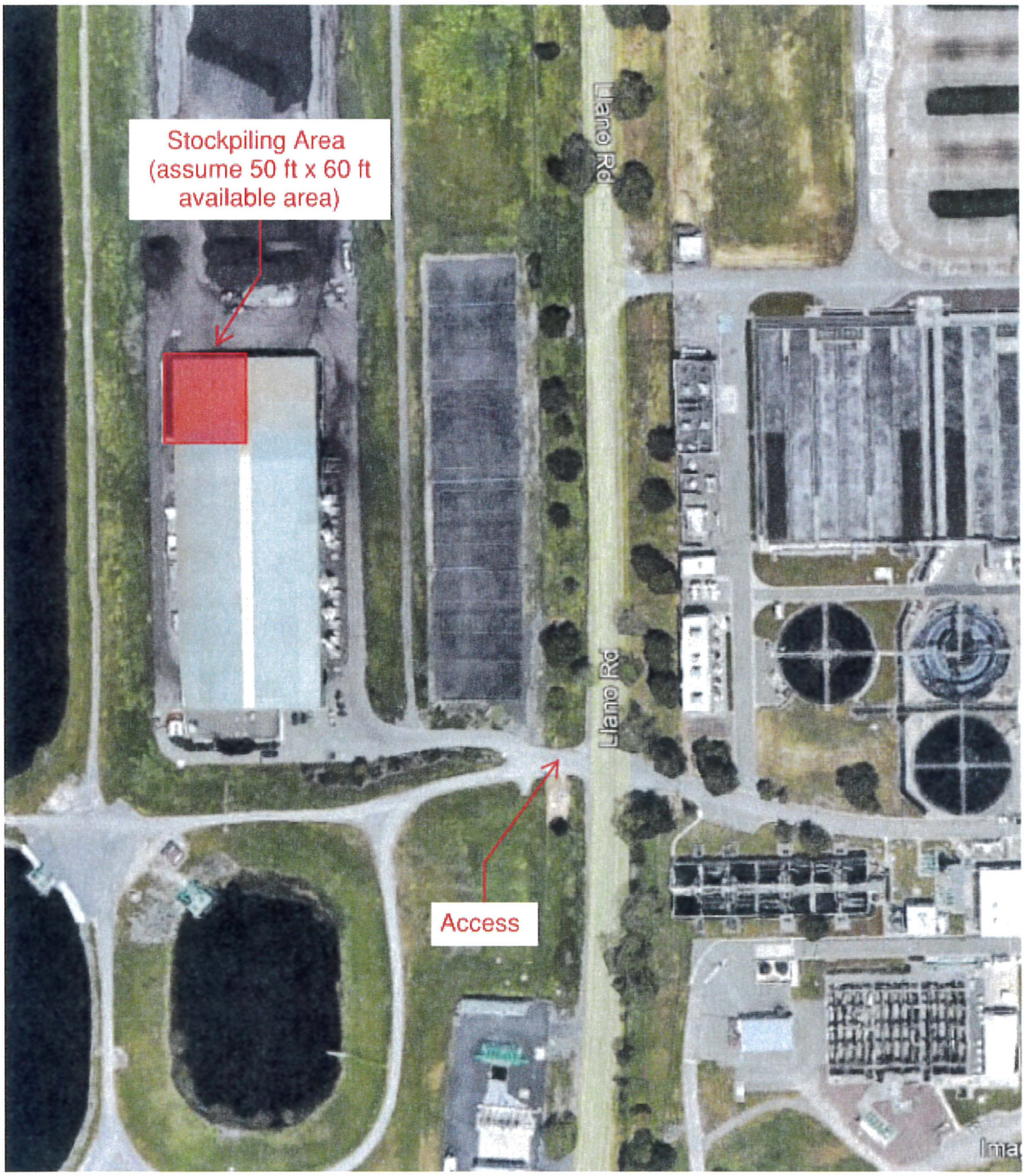

Exhibit A - Stockpiling Area at Composting Facility

1.04 CITY FURNISHED MATERIAL

A. The City will provide fuel for each of the fuel storage tanks. Contractor shall provide a minimum of 14 days' notice to the City prior to requiring fuel to be delivered for testing and commissioning of each fuel system. Reuse of the existing diesel fuel may be allowed if approved by the City and filtered prior to use in the new fuel tanks.

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1.05 REFERENCE POINTS AND SURVEYS

A. City's Responsibilities:

1. Establish benchmarks convenient to Work and at least every 500 feet on roads.
2. Establish horizontal reference points or coordinate system with benchmarks and reference points for Contractor's use as necessary to lay out Work.

B. Location and elevation of benchmarks are shown on Drawings.

C. Contractor's Responsibilities:

1. Provide additional survey and layout required to layout the Work.
2. Notify City at least 3 working days in advance of time when grade and line to be provided by City will be needed.
3. In event of discrepancy in data or staking provided by City, request clarification before proceeding with Work.
4. Retain professional land surveyor or civil engineer registered in the State of California who shall perform or supervise engineering surveying necessary for additional construction staking and layout.
5. Maintain complete accurate log of survey work as it progresses as a Record Document.
6. On request of City, submit documentation.
7. Provide competent employee(s), tools, stakes, and other equipment and materials as City may require checking layout, survey, and measurement work performed by others.

1.06 SYSTEM OUTAGE REQUEST (SOR)

A. SOR Instructions: See Appendix A, attached at the end of this Section.

B. Prepare SOR for the following conditions:

1. Shutdowns, diversions, and tie-ins to the existing facility.
2. Process start-up activities.
3. Power interruption and tie-ins.
4. Switch over between temporary and permanent facilities, equipment, piping, and electrical and instrumentation systems.
5. Process constraints requiring interruption of operating processes or utilities.
6. Road closures.

C. Other Work not specifically listed may require SORs as determined necessary by the Contractor, or City.

D. Where required to minimize treatment process interruptions while complying with specified sequencing constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices throughout the project duration regardless of whether there are active construction activities or not.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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Laguna Treatment Plant:
City Project No.:

CITY OF SANTA ROSA
SYSTEM OUTAGE REQUEST

SOR No.:

Date:

To: Requested By:

---

1. A shutdown is requested on the following (attach an 8-1/2" x 11" highlighted / color -coded plan(s) and or section(s) as appropriate): System / Equipment / Roadway

2. Proposed date of shutdown:

3. Estimated duration: Hrs. Beginning at _____

4. Reason for shutdown:

5. Operations staff assistance required:

   Maintenance staff assistance required:
   Describe:

6. Method of Approach / Sequence of Events:

7. Equipment to be used during shutdown:

8. Contingency Plan:

Laguna Treatment Plant:
City Project No.:

CITY OF SANTA ROSA

SYSTEM OUTAGE REQUEST - RESPONSE

SOR No. _____

Item: _____

Construction Manager Comments:

Construction Manager Signature: _____ Date: _____

Date Transmitted to Plant Operations / Maintenance: _____

Plant Operations / Maintenance Comments:

Plant Operations:_____ Date:_____

Plant Maintenance: _____ Date: _____

Date Transmitted to Construction Manager: _____

SOR Acceptable with Comments Noted: _____

SOR Not Acceptable/Resubmit: _____

Date Construction Manager Transmits to Contractor: _____

SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.01 GENERAL

A. City will schedule physical arrangements for meetings throughout progress of the Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes within 5 days after each meeting to participants and parties affected by meeting decisions.

1.02 PRECONSTRUCTION CONFERENCE

A. Contractor shall be prepared to discuss the following subjects, as a minimum:

1. Required schedules.
2. Status of Bonds and insurance.
3. Sequencing of critical path work items.
4. Progress payment procedures.
5. Project changes and clarification procedures.
6. Use of Site, access, office and storage areas, security and temporary facilities.
7. Major product delivery and priorities.
8. Contractor's safety plan and representative.

B. Attendees will include:

1. City.
2. City's representatives.
3. Contractor's office representative.
4. Contractor's resident superintendent.
5. Subcontractors' representatives whom Contractor may desire or City may request to attend.
6. Engineer's representatives.
7. Others as appropriate.

1.03 PRELIMINARY SCHEDULES REVIEW MEETING

A. As set forth in General Specifications.

1.04 PROGRESS MEETINGS

A. City will schedule regular progress meetings at Site, conducted at least monthly or more frequently as needed to review the Work progress, Progress Schedule, Application for Payment, Contract modifications, and other matters needing discussion and resolution.

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B. Attendees will include:

1. City's representative(s), as appropriate, including the Engineer.
2. Contractor, Subcontractors, and Suppliers, as appropriate.
3. Others as appropriate.

1.05 OTHER MEETINGS

A. In accordance with Contract Documents and as may be required by City.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Progress Schedule:
   a. Submit initial Progress Schedule within 20 days after Effective Date of the Agreement.
   b. Submit an Updated Progress Schedule at each update, in accordance with Article Detailed Progress Schedule.
2. Submit with Each Progress Schedule Submission: Contractor's certification that Progress Schedule submission is actual schedule being used for execution of the Work.
3. Prior to final payment, submit a final Updated Progress Schedule.

1.02 PROGRESS SCHEDULE

A. Show a detailed schedule, beginning with Notice to Proceed, for minimum duration of 90 days, and a summary of balance of Project through Final Completion.

B. Show activities including, but not limited to the following:

1. Notice to Proceed.
2. Permits.
3. Submittals, with review time. Contractor may use Schedule of Submittals specified in Section 01 33 00, Submittal Procedures.
4. Early procurement activities for long lead equipment and materials.
5. Initial Site work.
6. Earthwork.
7. Specified Work sequences and construction constraints.
8. Contract Milestone and Completion Dates.
9. Major structural, mechanical, equipment, electrical, architectural, and instrumentation and control Work.
10. System startup summary.
11. Project close-out summary.
12. Demobilization summary.

C. Update Progress Schedule monthly as part of progress payment process. Failure to do so may result in the City withholding all or part of the monthly progress payment until the Preliminary Progress Schedule is updated in a manner acceptable to City.

D. Format: In accordance with Article Progress Schedule Bar Chart.

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1.03 PROGRESS SCHEDULE—BAR CHART

A. General: Comprehensive bar chart schedule, generally as outlined in Associated General Contractors of America (AGC) 580, "Construction Project Planning and Scheduling Guidelines." If a conflict occurs between the AGC publication and this Specification, this Specification shall govern.

B. Format:

1. Unless otherwise approved, white paper, 11-inch by 17-inch sheet size.
2. Title Block: Show name of Project and Engineer, date submitted, revision or update number, and name of scheduler.
3. Identify horizontally, across the top of the schedule, the time frame by year, month, and day.
4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
5. Legend: Describe standard and special symbols used.

C. Contents: Identify, in chronological order, those activities reasonably required to complete the Work, including as applicable, but not limited to:

1. Obtaining permits, submittals for early product procurement, and long lead time items.
2. Mobilization and other preliminary activities.
3. Initial Site work.
4. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s).
5. Subcontract Work.
6. Major equipment design, fabrication, factory testing, and delivery dates.
7. Sitework.
8. Concrete Work.
9. Structural steel Work.
10. Equipment Work.
11. Mechanical Work.
12. Electrical Work.
13. Instrumentation and control Work.
14. Equipment and system startup and test activities.
15. Project closeout and cleanup.
16. Demobilization.

1.04 PROGRESS OF THE WORK

A. Updated Progress Schedule shall reflect:

1. Progress of Work to within 5 working days prior to submission.
2. Approved changes in Work scope and activities modified since submission.
3. Delays in Submittals or resubmittals, deliveries, or Work.
4. Adjusted or modified sequences of Work.
5. Other identifiable changes.
6. Revised projections of progress and completion.
7. Report of changed logic.

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B. Produce detailed subschedules during Project, upon request of City, to further define critical portions of the Work such as facility shutdowns.

C. If an activity is not completed by its latest scheduled completion date and this failure is anticipated to extend Contract Times (or Milestones), submit, within 7 days of such failure, a written statement as to how nonperformance will be corrected to return Project to acceptable current Progress Schedule. Actions by Contractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

D. City may order Contractor to increase plant, equipment, labor force, or working hours if Contractor fails to:

1. Complete a Milestone activity by its completion date.
2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to City.

1.05 NARRATIVE PROGRESS REPORT

A. Format:

1. Organize same as Progress Schedule.
2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.

B. Contents:

1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
3. Contractor's plan for management of Site (for example, lay down and staging areas, construction traffic), use of construction equipment, buildup of trade labor, and identification of potential Contract changes.
4. Identification of new activities and sequences as a result of executed Contract changes.
5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
7. Changes to activity logic.
8. Changes to the critical path.
9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
10. Steps taken to recover the schedule from Contractor-caused delays.

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1.06 SCHEDULE ACCEPTANCE

A. City's acceptance will demonstrate agreement that:

1. Proposed schedule is accepted with respect to:
   a. Contract Times, including Final Completion and all intermediate Milestones, are within the specified times.
   b. Specified Work sequences and constraints are shown as specified.
   c. Specified City-furnished Equipment or Material arrival dates, or range of dates, are included.
   d. Access restrictions are accurately reflected.
   e. Startup and testing times are as specified.
   f. Submittal review times are as specified.
   g. Startup testing duration is as specified and timing is acceptable.
2. In all other respects, City's acceptance of Contractor's schedule indicates that, in City's judgment, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. City's review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless Contractor has explicitly called the nonconformance to City's attention in submittal. Schedule remains Contractor's responsibility and Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.

B. Unacceptable Progress Schedule:

1. Make requested corrections; resubmit within 10 days.
2. Until acceptable to City as Baseline Progress Schedule, continue review and revision process, including updating schedule on a monthly basis to reflect actual progress and occurrences to date.

C. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to City's acceptance of Baseline Progress Schedule, shall be delineated in Narrative Report current with proposed Updated Progress Schedule.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

A. Action Submittal: Written and graphic information submitted by Contractor that requires City's approval.

B. Informational Submittal: Information submitted by Contractor that requires City's review and determination that submitted information is in accordance with the Conditions of the Contract.

1.02 PROCEDURES

A. Direct submittals to City Representative, unless specified otherwise.

B. Electronic Submittals: Submittals shall, unless specifically accepted, be made in electronic format.

1. Each submittal shall be an electronic file in Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.
2. Electronic files that contain more than ten pages in PDF format shall contain internal bookmarking from an index page to major sections of the document.
3. PDF files shall be set to open "Bookmarks and Page" view.
4. Add general information to each PDF file, including title, subject, author, and keywords.
5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.
6. Submit new electronic files for each resubmittal.
7. City will reject submittal that is not electronically submitted, unless agreed upon prior to submittal.
8. Provide City with authorization to reproduce and distribute each file as many times as necessary for Project documentation.
9. Detailed procedures for handling electronic submittals will be discussed at the preconstruction conference.

C. Transmittal of Submittal:

1. Contractor shall:
   a. Review each submittal and check for compliance with Contract Documents.
   b. Stamp each submittal with uniform approval stamp before submitting to City.
      1) Stamp to include Project name, submittal number, Specification number, Contractor's reviewer name, date of Contractor's approval, and statement certifying submittal has been

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reviewed, checked, and approved for compliance with Contract Documents.

2) City will not review submittals that do not bear Contractor's approval stamp and will return them without action.

2. Complete, sign, and transmit with each submittal package, one Transmittal of Contractor's Submittal form in format approved by City.
3. Identify each submittal with the following:
   a. Numbering and Tracking System:
      1) Sequentially number each submittal.
      2) Resubmission of submittal shall have original number with sequential alphabetic suffix.
   b. Specification section and paragraph to which submittal applies.
   c. Project title and City's project number.
   d. Date of transmittal.
   e. Names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.
4. Identify and describe each deviation or variation from Contract Documents.

D. Format:

1. Do not base Shop Drawings on reproductions of Contract Documents.
2. Package submittal information by individual Specification section. Do not combine different Specification sections together in submittal package, unless otherwise directed in Specification.
3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract Documents.
4. Index with labeled tab dividers in orderly manner.

E. Timeliness: Schedule and submit in accordance Schedule of Submittals and requirements of individual Specification sections.

F. Processing Time:

1. Time for review shall commence on City's receipt of submittal.
2. City will act upon Contractor's submittal and transmit response to Contractor not later than 21 days after receipt, unless otherwise specified.
3. Resubmittals will be subject to same review time.
4. No adjustment of Contract Times or Price will be allowed as a result of delays in progress of Work caused by rejection and subsequent resubmittals.

G. Resubmittals: Clearly identify each correction or change made.

H. Incomplete Submittals:

1. City will return entire submittal for Contractor's revision if preliminary review deems it incomplete.
2. When any of the following are missing, submittal will be deemed incomplete:
   a. Contractor's review stamp; completed and signed.

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b. Transmittal of Contractor's Submittal; completed and signed.
c. Insufficient number of copies.

I. Submittals not required by Contract Documents:

1. Will not be reviewed and will be returned stamped "Not Subject to Review."
2. City will keep one copy and return submittal to Contractor.

1.03 ACTION SUBMITTALS

A. Prepare and submit Action Submittals required by individual Specification sections.

B. Shop Drawings:

1. Identify and Indicate:
   a. Applicable Contract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.
   b. Equipment and Component Title: Identical to title shown on Drawings.
   c. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
   d. Project-specific information drawn accurately to scale.
2. Manufacturer's standard schematic drawings and diagrams as follows:
   a. Modify to delete information that is not applicable to the Work.
   b. Supplement standard information to provide information specifically applicable to the Work.
3. Product Data: Provide as specified in individual Specifications.
4. Deferred Submittal: See Drawings for list of deferred submittals.
   a. Contractor-design drawings and product data related to permanent construction.
      1) Written and graphic information.
      2) Drawings.
      3) Cut sheets.
      4) Data sheets.
      5) Action item submittals requested in individual Specification section.
   b. Prior to installation of indicated structural or nonstructural element, equipment, distribution system, or component or its anchorage, submit required supporting data and drawings for review and acceptance by City. Documentation of review and approval provided on City's comment form, along with completed submittal, shall be filed with permitting agency by Contractor and approved by permitting agency prior to installation.

C. Action Submittal Dispositions: City will review, comment, stamp, and distribute as noted:

1. Approved:
   a. Contractor may incorporate product(s) or implement Work covered by submittal.

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b. Distribution: Electronic.

2. Approved as Noted:
   a. Contractor may incorporate product(s) or implement Work covered by submittal, in accordance with City's notations.
   b. Distribution: Electronic.
3. Partial Approval, Resubmit as Noted:
   a. Make corrections or obtain missing portions, and resubmit.
   b. Except for portions indicated, Contractor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with City's notations.
   c. Distribution: Electronic.
4. Revise and Resubmit:
   a. Contractor may not incorporate product(s) or implement Work covered by submittal.
   b. Distribution: Electronic.

1.04 INFORMATIONAL SUBMITTALS

A. General:

1. Refer to individual Specification sections for specific submittal requirements.
2. City will review each submittal. If submittal meets conditions of the Contract, City will forward copy to appropriate parties. If City determines submittal does not meet conditions of the Contract and is therefore considered unacceptable, City will retain one copy and return remaining copy with review comments to Contractor, and require that submittal be corrected and resubmitted.

B. Certificates:

1. General:
   a. Provide notarized statement that includes signature of entity responsible for preparing certification.
   b. Signed by officer or other individual authorized to sign documents on behalf of that entity.
2. Welding: In accordance with individual Specification sections.
3. Installer: Prepare written statements on manufacturer's letterhead certifying installer complies with requirements as specified in individual Specification section.
4. Material Test: Prepared by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
5. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual Specification sections.
6. Manufacturer's Certificate of Proper Installation: In accordance with Section 01 43 33, Manufacturers' Field Services.

C. Construction Photographs In accordance with Section 01 31 13, Project Coordination, and as may otherwise be required in Contract Documents.

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D. Closeout Submittals: In accordance with Section 01 77 00, Closeout Procedures.

E. Deferred Submittals: See Drawings for list of deferred submittals.

1. Contractor-design data related to permanent construction:
   a. List of assumptions.
   b. List of performance and design criteria.
   c. Summary of loads or load diagram, if applicable.
   d. Calculations.
   e. List of applicable codes and regulations.
   f. Name and version of design software.
   g. Factory test results.
   h. Informational submittals requested in individual Specification section.
2. Prior to installation of indicated structural or nonstructural element, equipment, distribution system, or component or its anchorage, submit calculations and test results of Contractor-designed components for review by City. Documentation of review and indication of compliance with general design intent and project criteria provided on City's comment form as meets conditions of the Contract, along with completed submittal, shall be filed with permitting agency by Contractor and approved by permitting agency prior to installation.

F. Manufacturer's Instructions: Written or published information that documents manufacturer's recommendations, guidelines, and procedures in accordance with individual Specification section.

G. Operation and Maintenance Data: As required in Section 01 78 23, Operation and Maintenance Data.

H. Special Guarantee: Supplier's written guarantee as required in individual Specification sections.

I. Statement of Qualification: Evidence of qualification, certification, or registration as required in Contract Documents to verify qualifications of professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, Specialist, consultant, installer, and other professionals.

J. Submittals Required by Laws, Regulations, and Governing Agencies:

1. Promptly submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
2. Transmit to City for Engineer's records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.

K. Test, Evaluation, and Inspection Reports:

1. General: Shall contain signature of person responsible for test or report.

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2. Factory:
    a. Identification of product and Specification section, type of inspection or test with referenced standard or code.
    b. Date of test, Project title and number, and name and signature of authorized person.
    c. Test results.
    d. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
    e. Provide interpretation of test results, when requested by City.
    f. Other items as identified in individual Specification sections.
3. Field:
    a. As a minimum, include the following:
        1) Project title and number.
        2) Date and time.
        3) Record of temperature and weather conditions.
        4) Identification of product and Specification section.
        5) Type and location of test, Sample, or inspection, including referenced standard or code.
        6) Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
        7) If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
        8) Provide interpretation of test results, when requested by City.
        9) Other items as identified in individual Specification sections.

L. Training Data: In accordance with Section 01 43 33, Manufacturers' Field Services.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 01 43 33
MANUFACTURERS' FIELD SERVICES

PART 1 GENERAL

1.01 DEFINITIONS

A. Person-Day: One person for 8 hours within regular Contractor working hours.

1.02 SUBMITTALS

A. Informational Submittals:

1. Training Schedule: Submit, in accordance with requirements of this Specification, not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.
2. Lesson Plan: Submit, in accordance with requirements of this Specification, proposed lesson plan not less than 21 days prior to scheduled training and revise as necessary for acceptance.

1.03 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual Specification section.

B. Representative subject to acceptance by City. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Furnish manufacturers' services, when required by an individual Specification section, to meet the requirements of this section.

B. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.

C. Schedule manufacturer's services to avoid conflict with other onsite testing or other manufacturers' onsite services.

D. Determine, before scheduling services, that conditions necessary to allow successful testing have been met.

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E. Only those days of service approved by City will be credited to fulfill specified minimum services.

F. When specified in individual Specification sections, manufacturer's onsite services shall include:

1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation or application procedures.
2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
3. Providing, on a daily basis, copies of manufacturers' representatives field notes and data to City.
4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to City.
5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and systems.
6. Assistance during functional and performance testing, and facility startup and evaluation.
7. Training of City's personnel in the operation and maintenance of respective product as required.

3.02 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

A. When so specified, a Manufacturer's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by equipment manufacturer's representative.

B. Such form shall certify signing party is a duly authorized representative of manufacturer, is empowered by manufacturer to inspect, approve, and operate their equipment and is authorized to make recommendations required to ensure equipment is complete and operational.

3.03 TRAINING

A. General:

1. Furnish manufacturers' representatives for detailed classroom and hands-on training to City's personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.
2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with City operations staff, and familiar with operation and maintenance manual information specified in Section 01 78 23, Operation and Maintenance Data.
3. Manufacturer's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.

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B. Training Schedule:

1. List specified equipment and systems that require training services and show:
   a. Respective manufacturer.
   b. Estimated dates for installation completion.
   c. Estimated training dates.
2. Allow for multiple sessions when several shifts are involved.
3. Adjust schedule to ensure training of appropriate personnel as deemed necessary by City, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.
4. Coordinate with Section 01 32 00, Construction Progress Documentation, and requirements listed in individual equipment specifications.

C. Lesson Plan: When manufacturer or vendor training of City personnel is specified, prepare a lesson plan for each required course containing the following minimum information:

1. Title and objectives.
2. Recommended attendees (such as, managers, engineers, operators, maintenance).
3. Course description, outline of course content, and estimated class duration.
4. Format (such as, lecture, self-study, demonstration, hands-on).
5. Instruction materials and equipment requirements.
6. Resumes of instructors providing training.

D. Prestartup Training:

1. Coordinate training sessions with City's operating personnel and manufacturers' representatives and with submission of operation and maintenance manuals in accordance with Section 01 78 23, Operation and Maintenance Data.
2. Complete at least 7 days prior to beginning of facility startup.

3.04 SUPPLEMENTS

A. The supplement listed below, following "End of Section," is part of this Specification.

1. Manufacturer's Certificate of Proper Installation.

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MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

ENGINEER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

☐ Installed in accordance with Manufacturer's recommendations.

☐ Inspected, checked, and adjusted.

☐ Serviced with proper initial lubricants.

☐ Electrical and mechanical connections meet quality and safety standards.

☐ All applicable safety equipment has been properly installed.

☐ Functional tests.

☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer:_____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Submit prior to application for final payment.
   a. Record Documents: As required in General Specifications.
   b. Special bonds, Special Guarantees, and Service Agreements.
   c. Consent of Surety to Final Payment: As required in General Specifications.
   d. Releases or Waivers of Liens and Claims: As required in General Specifications.
   e. Releases from Agreements.
   f. Final Application for Payment: Submit in accordance with procedures and requirements stated in the General Specifications.
   g. Extra Materials: As required by individual Specification sections.

1.02 RECORD DOCUMENTS

A. Quality Assurance:

1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain Record Documents.
2. Accuracy of Records:
   a. Coordinate changes within Record Documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
   b. Purpose of Project Record Documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.
4. Prior to submitting each request for progress payment, request City's review and approval of current status of Record Documents. Failure to properly maintain, update, and submit Record Documents may result in a deferral by City to recommend whole or any part of Contractor's Application for Payment, either partial or final.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

A. General:

1. Promptly following commencement of Contract Times, secure from City at no cost to Contractor, one complete set of Contract Documents.
2. Label or stamp each Record Document with title, "RECORD DOCUMENTS," in neat large printed letters.
3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
2. Make documents and Samples available at all times for observation by City.

C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
   a. Color Coding:
      1) Green when showing information deleted from Drawings.
      2) Red when showing information added to Drawings.
      3) Blue and circled in blue to show notes.
2. Date entries.
3. Call attention to entry by "cloud" drawn around area or areas affected.
4. Legibly mark to record actual changes made during construction, including, but not limited to:
   a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
   b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
   c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
   d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.

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e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and City's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.

5. Dimensions on Schematic Layouts: Show on Record Drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
   a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
   b. Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," and the like).
   c. Make identification so descriptive that it may be related reliably to Specifications.

3.02 FINAL CLEANING

A. At completion of the Work or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire Site or parts thereof, as applicable.

1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to City.
2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
3. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
4. Broom clean exterior paved driveways and parking areas.
5. Rake clean all other surfaces.
6. Leave water courses, gutters, and ditches open and clean.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Detailed information for the preparation, submission, and City's review of Operations and Maintenance (O&M) Data, as required by individual Specification sections.

1.02 DEFINITIONS

A. Preliminary Data: Initial and subsequent submissions for City's review.

B. Final Data: City-accepted data, submitted as specified herein.

C. Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

1.03 SEQUENCING AND SCHEDULING

A. Equipment and System Data:

1. Preliminary Data:
   a. Do not submit until Shop Drawing for equipment or system has been reviewed and approved by City.
2. Final Data: Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project.

1.04 DATA FORMAT

A. Prepare preliminary and final data in the form of an instructional manual. Prepare final data on electronic media.

B. Instructional Manual Format:

1. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
2. Size: 8-1/2 inches by 11 inches, minimum.
3. Cover: Identify manual with typed or printed title "OPERATION AND MAINTENANCE DATA" and list:
   a. Project title.
   b. Designate applicable equipment.
4. Spine:
   a. Project title.
   b. Identify volume number if more than one volume.

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5. Title Page:
    a. Contractor name, address, and telephone number.
    b. Subcontractor, Supplier, installer, or maintenance contractor's name, address, and telephone number, as appropriate.
        1) Identify area of responsibility of each.
        2) Provide name and telephone number of local source of supply for parts and replacement.
6. Table of Contents:
    a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
    b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
7. Paper: 20-pound minimum, white for typed pages.
8. Text: Manufacturer's printed data, or neatly typewritten.
9. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

C. Electronic Media Format:

1. Portable Document Format (PDF):
    a. After all preliminary data has been found to be acceptable to City, submit Operation and Maintenance data in PDF format on CD.
    b. Files to be exact duplicates of City-accepted preliminary data. Arrange by Specification number and name.
    c. Files to be fully functional and viewable in most recent version of Adobe Acrobat.

1.05 SUBMITTALS

A. Informational:

1. Preliminary Data:
    a. Submit two copies for City's review.
    b. If data meets conditions of the Contract:
        1) One copy will be returned to Contractor.
        2) One copy will be forwarded to City.
    c. If data does not meet conditions of the Contract:
        1) All copies will be returned to Contractor with City's comments (on separate document) for revision.
        2) City's comments will be retained in City's file.
        3) Resubmit copies revised in accordance with City's comments.
2. Final Data: Submit one copy in format specified herein.

1.06 DATA FOR EQUIPMENT AND SYSTEMS

A. Content For Each Unit (or Common Units) and System:

1. Product Data:
    a. Include only those sheets that are pertinent to specific product.

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b. Clearly annotate each sheet to:
    1) Identify specific product or part installed.
    2) Identify data applicable to installation.
    3) Delete references to inapplicable information.
c. Function, normal operating characteristics, and limiting conditions.
d. Performance curves, engineering data, nameplate data, and tests.
e. Complete nomenclature and commercial number of replaceable parts.
f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
g. Spare parts ordering instructions.
h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).

2. As-installed, color-coded piping diagrams.
3. Charts of valve tag numbers, with the location and function of each valve.
4. Drawings: Supplement product data with Drawings as necessary to clearly illustrate:
    a. Format:
        1) Provide reinforced, punched, binder tab; bind in with text.
        2) Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
        3) Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
        4) Identify Specification section and product on Drawings and envelopes.
    b. Relations of component parts of equipment and systems.
    c. Control and flow diagrams.
    d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
5. Instructions and Procedures: Within text, as required to supplement product data.
    a. Format:
        1) Organize in consistent format under separate heading for each different procedure.
        2) Provide logical sequence of instructions for each procedure.
        3) Provide information sheet for City's personnel, including:
            a) Proper procedures in event of failure.
            b) Instances that might affect validity of guarantee or Bond.
    b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
    c. Operating Procedures:
        1) Startup, break-in, routine, and normal operating instructions.
        2) Test procedures and results of factory tests where required.
        3) Regulation, control, stopping, and emergency instructions.
        4) Description of operation sequence by control manufacturer.
        5) Shutdown instructions for both short and extended duration.
        6) Summer and winter operating instructions, as applicable.
        7) Safety precautions.
        8) Special operating instructions.

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d. Maintenance and Overhaul Procedures:
    1) Routine maintenance.
    2) Guide to troubleshooting.
    3) Disassembly, removal, repair, reinstallation, and re-assembly.

6. Guarantee, Bond, and Service Agreement: In accordance with Section 01 77 00, Closeout Procedures.

B. Content for Each Electric or Electronic Item or System:

1. Description of Unit and Component Parts:
    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data, nameplate data, and tests.
    c. Complete nomenclature and commercial number of replaceable parts.
    d. Interconnection wiring diagrams, including control and lighting systems.
2. Circuit Directories of Panelboards:
    a. Electrical service.
    b. Control requirements and interfaces.
    c. Communication requirements and interfaces.
    d. List of electrical relay settings, and control and alarm contact settings.
    e. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
    f. As-installed control diagrams by control manufacturer.
3. Operating Procedures:
    a. Routine and normal operating instructions.
    b. Startup and shutdown sequences, normal and emergency.
    c. Safety precautions.
    d. Special operating instructions.
4. Maintenance Procedures:
    a. Routine maintenance.
    b. Guide to troubleshooting.
    c. Adjustment and checking.
    d. List of relay settings, control and alarm contact settings.
5. Manufacturer's printed operating and maintenance instructions.
6. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 01 88 15
ANCHORAGE AND BRACING

PART 1 GENERAL

1.01 SUMMARY

A. This section covers requirements for anchorage and bracing of equipment, distribution systems, and other nonstructural components required in accordance with the ICC 2019 California Building Code (CBC), for seismic, wind, gravity, soil, and operational loads.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Institute of Steel Construction (AISC) 360, Specification for Structural Steel Buildings.
2. American Society of Civil Engineers (ASCE): ASCE 7, Minimum Design Loads for Buildings and Other Structures.
3. International Code Council (ICC): California Building Code (CBC).

1.03 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be City when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.

B. Designated Seismic System: Architectural, electrical, and mechanical system or their components for which component importance factor is greater than 1.0.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

A. General:

1. Anchorage and bracing systems shall be designed by a qualified professional engineer registered in the State of California.
2. Design anchorage into concrete including embedment in accordance with ACI 318-14; Chapter 17 (or other industry standard approved by City), and Project Specifications.
   a. Unless otherwise noted, design for cracked concrete condition.
3. Design anchorage and bracing of architectural, mechanical, and electrical components and systems in accordance with this section, unless a design is specifically provided within Contract Documents or where exempted hereinafter.

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4. Design attachments, braces, and anchors for equipment, components, and distribution systems to structure for gravity, seismic, wind, and operational loading.
5. Anchor and brace piping and ductwork, whether exempt or not exempt for this section, so that lateral or vertical displacement does not result in damage or failure to essential architectural, mechanical, or electrical equipment.
6. Provide supplementary framing where required to transfer anchorage and bracing loads to structure.
7. Adjust equipment pad sizes or provide additional anchorage confinement reinforcing to provide required anchorage capacities.
8. Design anchorage and bracing for:
    a. Equipment and components that weigh more than 400 pounds and have center of mass located 4 feet or less above adjacent finished floor.
    b. Equipment weighing more than 20 pounds that has center of mass located more than 4 feet above adjacent finished floor.
    c. Mechanical and electrical components that are not provided with flexible connections between components and associated ductwork, piping, or conduit.
    d. Distribution systems that weigh more than 5 pounds per foot that have center of mass located more than 4 feet above adjacent finished floor.
9. Design seismic anchorage and bracing for Designated Seismic Systems regardless of weight or mounting height.
    a. Component Important Factor:
        1) Ip = 1.0, unless noted otherwise.
        2) Ip shall be taken as 1.5 if any of the following conditions apply:
            a) Component is required to function for life-safety purposes after an earthquake, including fire protection sprinkler systems and egress stairways.
            b) Component contains hazardous materials.
            c) Component is in or attached to Risk Category IV structure and is needed for continued operation of facility or its failure could impair continued operation of facility.
10. For components exempted from design requirements of this section, provide bolted, welded, or otherwise positively fastened attachments to supporting structure.

B. Design Loads:

1. Gravity: Design anchorage and bracing for self-weight and superimposed loads on components and equipment.
2. Wind: Design anchorage and bracing for wind criteria provided on General Structural Notes on Drawings for exposed architectural components and exterior and wind-exposed mechanical and electrical equipment. Alternately, manufacturer certification may be provided for components such as roofing and flashing to verify attachments meet Project-specific design criteria.

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3. Operational:
    a. For loading supplied by equipment manufacturer for CBC required load cases.
    b. Loads may include equipment vibration, torque, thermal effects, effects of internal contents (weight and sloshing), water hammer, and other load-inducing conditions.
    c. Locate braces to minimize vibration to or movement of structure.
    d. For vibrating loads, use anchors meeting requirements of Section 05 05 19, Post-Installed Anchors, for anchors with designated capacities for vibratory loading per manufacturer's ICC-ES report.
4. Seismic:
    a. In accordance with 2019 CBC, Section 1613, and Chapter 13 of ASCE 7.
    b. Design anchorage and bracing for design criteria listed on General Structural Notes on Drawings.
    c. Design forces for anchors in concrete shall be in accordance with ASCE 7, Section 13.4.2, or CBC Section 1905.1.9 as applicable for Project Seismic Design Category.

C. Seismic Design Requirements:

1. Nonstructural Components: Design as nonbuilding structures for components with weights greater than or equal to 25 percent of effective seismic weight of overall structure.
2. Analyze local region of body of nonstructural component for load transfer of anchorage attachment if component Ip = 1.5.
3. Provide support drawings and calculations for electrical distribution components if any of the following conditions apply:
    a. Conduit diameter is greater than 2.5-inch trade size.
    b. Total weight of bus duct, cable tray, or conduit supported by trapeze assemblies exceeds 10 pounds per foot.
4. Other seismic design and detailing information identified in ASCE 7, Chapter 13, is required to be provided for new mechanical and electrical components, systems, or equipment.

1.05 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
    a. List of architectural, mechanical, and electrical equipment requiring Contractor-designed anchorage and bracing, unless specifically exempted.
    b. Manufacturers' engineered seismic and non-seismic hardware product data.
    c. Attachment assemblies' drawings including seismic attachments; include connection hardware, braces, and anchors or anchor bolts for nonexempt components, equipment, and systems.

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d. Submittal will be rejected if proposed anchorage method would create excessive stress to supporting member. Revise anchorages and strengthen structural support to eliminate overstressed condition.

B. Informational Submittals:

1. Anchorage and Bracing Calculations: For attachments, braces, and anchorages, include CBC and Project-specific criteria as noted on General Structural Notes on Drawings, in addition to manufacturer's specific criteria used for design; sealed by a civil or structural engineer registered in the State of California.
2. Manufacturer's hardware installation requirements.

C. Deferred Submittals:

1. Submit deferred Action Submittals such as Shop Drawings with supporting deferred informational submittals such as calculations no less than 4 weeks in advance of installation of component, equipment or distribution system to be anchored to structure.

1.06 SOURCE QUALITY CONTROL

A. Contractor and supplier responsibilities to accommodate City-furnished shop fabrication related special inspections and testing are provided in Project's Statement of Special Inspections on Drawings.

B. Provide all other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections.

PART 2 PRODUCTS

2.01 GENERAL

A. Design and construct attachments and supports transferring seismic and non-seismic loads to structure of materials and products suitable for application and in accordance with design criteria shown on Drawings and nationally recognized standards.

B. Provide cast-in-place or post-installed concrete and masonry anchors for anchorage of equipment to concrete or masonry in accordance with Section 05 05 19, Post-Installed Anchors. Provide post-installed anchors of the size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by City.

C. Do not use powder-actuated fasteners or sleeve anchors for seismic attachments and anchorage where resistance to tension loads is required. Do not use expansion anchors, other than undercut anchors, for nonvibration isolated mechanical equipment rated over 10 hp.

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PART 3 EXECUTION

3.01 GENERAL

A. Make attachments, bracing, and anchorage in such a manner that component lateral force is transferred to lateral force resisting system of structure through a complete load path.

B. Design, provide, and install overall seismic anchorage system to provide restraint in all directions, including vertical, for each component or system so anchored.

C. Provide snubbers in each horizontal direction and vertical restraints for components mounted on vibration isolation systems where required to resist overturning.

D. Provide piping anchorage that maintains design flexibility and expansion capabilities at flexible connections and expansion joints.

1. Piping and ductwork suspended more than 12 inches below supporting structure shall be braced for seismic effects to avoid significant bending of hangers and their attachments, unless high- or limited- deformability piping is used per ASCE 7, Section 13.6.8 or HVAC ducts have a cross-sectional area of less than 6 square feet or weigh 17 pounds per foot or less.

E. Anchor tall and narrow equipment such as motor control centers and telemetry equipment at base and within 12 inches from top of equipment, unless approved otherwise by City.

F. Do not attach architectural, mechanical, or electrical components to more than one element of a building structure at a single restraint location where such elements may respond differently during a seismic event. Do not make such attachments across building expansion and contraction joints.

3.02 INSTALLATION

A. Do not install components or their anchorages or restraints prior to review and acceptance by City and AHJ.

B. Notify City upon completion of installation of seismic restraints.

3.03 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. In accordance with Section 05 05 19, Cast-in-Place and Post-Installed Anchors.

B. City-Furnished Quality Assurance, in accordance with CBC Chapter 17 requirements, is provided in Statement of Special Inspections Plan on Drawings.

C. Provide any other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections.

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SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American National Standards Institute (ANSI): A10.6, Safety Requirements for Demolition Operations.
2. Occupational Safety and Health Administration (OSHA), U.S. Code of Federal Regulations (CFR) Title 29 Part 1926—Occupational Safety and Health Regulations for Construction.
3. Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR), Title 40:
   a. Part 61—National Emission Standards for Hazardous Air Pollutants.
   b. Part 82—Protection of Stratospheric Ozone.
   c. Part 273—Standards for Universal Waste Management.

1.02 DEFINITIONS

A. Demolition: Dismantling, razing, destroying, or wrecking of any fixed building or structure or any part thereof. Demolition also includes removal of pipes, manholes tanks, conduit, and other underground facilities, whether as a separate activity or in conjunction with construction of new facilities.

B. Modify: Provide all necessary material and labor to modify an existing item to the condition indicated or specified.

C. Relocate: Remove, protect, clean and reinstall equipment, including electrical, instrumentation, and all ancillary components required to make the equipment fully functional, to the new location identified on the Drawings.

D. Renovation: Altering a facility or one or more facility components in any way.

E. Salvage/Salvageable: Remove and deliver, to the specified location(s), the equipment, building materials, or other items so identified to be saved from destruction, damage, or waste; such property to remain that of the City. Unless otherwise specified, title to items identified for demolition shall revert to Contractor.

1.03 REGULATORY AND SAFETY REQUIREMENTS

A. When applicable, demolition Work shall be accomplished in strict accordance with 29 CFR 1926-Subpart T.

B. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the General Specifications, Contractor's safety requirements shall conform to ANSI A10.6.

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1.04 SEQUENCING AND SCHEDULING

A. Include the Work of this Specification in the progress schedule, as specified in Section 01 32 00, Construction Progress Documentation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXISTING FACILITIES TO BE DEMOLISHED OR RENOVATED

A. Facilities: See Drawings for demolition limits of the existing diesel fuel vehicle fuel station and fuel shut-off switch area.

B. Tanks and Vessels: Remove in accordance with Section 02 65 00, Underground Storage Tank Removal.

C. Paving and Slabs:

1. Remove concrete and asphaltic concrete paving and slabs as indicated to a depth of 6 inches below existing adjacent grade.
2. Provide neat sawcuts at limits of pavement removal as indicated.

D. Electrical:

1. Cut off concealed or embedded conduit, boxes, or other materials a minimum of 3/4 inch below final finished surface.
2. When removing designated equipment, conduit and wiring may require rework to maintain service to other equipment.
3. Rework existing circuits, or provide temporary circuits as necessary during renovation to maintain service to existing lighting and equipment not scheduled to be renovated. Existing equipment and circuiting shown are based upon limited field surveys. Verify existing conditions, make all necessary adjustments, and record the Work on the Record Drawings. This shall include, but is not limited to, swapping and other adjustments to branch circuits and relocation of branch circuit breakers within panelboards as required to accomplish the finished work.
4. Raceways and cabling not scheduled for reuse.
5. Inaccessibly Concealed: Cut off and abandon in place.
6. Exposed or Concealed Above Accessible Ceilings: Remove.
7. Raceways and Cabling Scheduled for Future Use: Cap/seal and tag.
8. Relocating Equipment: Extend existing wiring or run new wiring from the source.
9. Where the existing raceway is concealed, the outlet box shall be cleaned, and a blank cover plate installed.
10. Where the concealed raceway is uncovered remove raceway (or extended to new location if appropriate).
11. Provide new typewritten panelboard circuit directory cards.

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3.02 PROTECTION

A. Dust and Debris Control:

1. Prevent the spread of dust and debris to avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, flooding or pollution.
2. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to vehicular traffic.

B. Traffic Control Signs: Where pedestrian and driver safety is endangered in the area of removal Work, use traffic barricades.

C. Existing Work:

1. Survey the site and examine the Drawings and Specifications to determine the extent of the Work before beginning any demolition or renovation.
2. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain the property of the City; any Contractor-damaged items shall be repaired or replaced as directed by the City.
3. Do not overload pavements to remain.

D. Protection of Personnel:

1. During demolition, continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.
2. Provide temporary barricades and other forms of protection to protect City's personnel and the general public from injury due to demolition Work.
3. Provide protective measures as required to provide free and safe passage of City's personnel and the general public to occupied portions of the structure.

3.03 BACKFILL

A. Do not use demolition debris as backfill material.

B. Fill excavations and other hazardous openings to existing ground level or foundation level of new construction.

3.04 DISPOSITION OF MATERIAL

A. Do not remove equipment and materials without approval of Contractor's Demolition/Renovation Plan by the City.

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3.05 CLEANUP

A. Debris and rubbish shall be removed from excavations. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

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SECTION 02 65 00
UNDERGROUND STORAGE TANK REMOVAL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American Petroleum Institute (API):
   a. RP 1604, Closure of Underground Petroleum Storage Tanks.
   b. RP 2003, Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents.
   c. RP 2219, Safe Operation of Vacuum Trucks in Petroleum Service.
   d. STD 2217A, Guidelines for Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries.
   e. STD 2015, Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks.
   f. PUBL 1628, A Guide to the Assessment and Remediation of Underground Petroleum Releases.
2. California Code of Regulations (CCR): Title 23, Division 3, Chapter 16 and 17.
3. Environmental Protection Agency (EPA):
   a. SW-846, Test Methods for Evaluating Solid Waste.
   b. Functional Guidelines for Evaluating Data Quality.
4. City of Santa Rosa Fire Department, Underground Storage Tank (UST) Removal Procedures

1.02 SUBMITTALS

A. Informational Submittals:

1. Contractor certifications or licenses required by state or local authorities.
2. Work Plan:
   a. Submit within 30 days prior to start of Work.
   b. Include the following information:
      1) Site layout plan that includes the following:
         a) Exclusion zone.
         b) Work areas.
         c) Support zone.
         d) Material staging area.
         e) Fencing and other security devices.
         f) Location of existing structures, facilities, utilities, and other applicable features.

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2) Description of proposed equipment, procedures, and materials for excavation, removal, cleaning, purging, cutting, plugging, capping and disposing of tank, piping, and appurtenant features.
3) Proposed sequence and schedule for tank removal, disposal, and restoration operations.
4) Written procedures for examining, sampling, and removing contaminated soil and debris from excavation.
5) Written requirements and controls for protecting personnel and property.
6) Written procedures for controlling, handling, and disposing of contaminated soil, debris, water, and fluids, including containment and spill prevention requirements.
7) Proposed Contaminated Materials Staging Area:
   a) Layout.
   b) Drainage controls.
   c) Containers.
   d) Spill containment measures.
   e) Linings, covers, and other measures to prevent release of contaminants.
8) Proposed Laboratories: Name and qualifications of analytical laboratories proposed for chemical analyses.
9) Proposed Transportation and Disposal Subcontractors:
   a) Name and letter of acceptance from disposal facilities proposed for disposal of tank, appurtenances, liquid, contaminated soil, and debris.
   b) Name, qualifications, and licensing information for transportation Subcontractor proposed for removing tank, appurtenances, liquid, contaminated soil, and debris.
10) Discharge permit requirements for releasing treated or uncontaminated water.

c. Site work shall not begin until work plan has been reviewed by City.

3. Personnel Qualifications:
   a. Prior to start of Work, submit names, qualifications, and experience of key supervisory, health and safety, and quality control personnel proposed for Project.
   b. Where Work requires health and safety trained and medically screened personnel, provide documentation of training and medical qualifications for personnel working inside exclusion zone.
4. Tank Closure Report:
   a. Submit within 60 days of completion of tank removal.
   b. Include the following information:
      1) Cover letter signed by Registered Professional Engineer in State of California certifying services involved have been performed in accordance with Contract Documents.
      2) Narrative describing:
         a) General Site conditions, including groundwater conditions.
         b) Summary of removal operations.

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c) Visible evidence of leaks or stained soil.
d) Results of vapor monitoring.
e) Actions taken, including quantities removed.
f) Summary of sampling and analyses, including locations of Samples.
g) Disposal information.
h) Backfilling information.

3) Copies of analytical test results.
4) Copies of waste analysis and waste profile sheets.
5) Copies of final disposal certifications from disposal facilities.
6) Copies of regulatory approvals, Fire Marshall inspection reports, and other applicable documentation.

1.03 REGULATORY REQUIREMENTS

A. Work under this section, including transportation and disposal of tank, contents, piping, debris, and contaminated soil shall be done in conformance with applicable local, state, and federal requirements.

B. Conform to federal, state, and local sheeting shoring, bracing, and sloping requirements for excavation.

C. Prior to commencing removal operations, obtain local, state, and federal permits and licenses that directly impact Contractor's ability to perform Work. See Section A, Fees and Permits, for additional permitting details.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Follow the guidelines and procedures in Appendix A of this Section herein, for the City of Santa Rosa Fire Department, Underground Storage Tank (UST) Removal Procedures.

B. Conduct tank removal operations in accordance with approved work plan and applicable guidelines API RP 1604, API RP 2003, API RP 2219, API STD 2217A, API STD 2015, API PUBL1628, and CCR Title 23 Chapter 16 as applicable.

C. Conduct the Work with appropriate means, methods, equipment, and materials as to minimize potential for fires, explosions, accidents, and release of contaminants into environment.

D. Take precautions to avoid damage to existing structures, their appurtenances, monitoring wells, utilities, or other facilities affected by Work activities.

3.02 REMOVAL OF TANK CONTENTS AND PURGING

A. Inspect tank for presence of liquid and sludge prior to start of the Work.

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B. Coordinate with City for sampling residual liquid and sludge within the tank.

C. Remove liquid from tank. Drain and purge appurtenant piping into tank as liquid is removed from tank.

D. Remove solids and residual liquid.

E. Analyze vapors within tank for explosive potential with combustible gas indicator. Purge and vent tank and piping in accordance with API RP 1604 and CCR Health and Safety Code, Division 20, Chapter 6.5 if combustible gas concentration is equal to or greater than 10 percent of lower explosive limit.

F. Contain and store tank product, pumpable liquid, and sludge in approved containers until testing is completed, applicable manifests are provided, and transportation and disposal have been arranged. Reuse of diesel fuel may be allowed if approved by City.

1. Provide temporary storage area with appropriate dikes, secondary containment lining, and spill control measures.
2. Minimum volume of containment area shall be at least the volume of the largest tank plus a minimum of 1 foot of freeboard.

G. Inspect containment area at least daily and after each rainfall event, and remove accumulated liquids.

3.03 EXCAVATION

A. Conduct exploratory trenches as necessary to determine tank location, limits, and location of piping and ancillary equipment.

B. Excavate for removal of tank, appurtenant piping, and contaminated soil within limits shown on Drawings and as specified in Section 19, Earthwork.

C. Excavate around perimeter of tank in manner that limits amount of potentially contaminated soil that could be mixed with uncontaminated soil. Where possible, carefully excavate visually contaminated soil and segregate from uncontaminated soil.

D. Excavation support shall be in accordance with Section 31 41 00, Shoring, and federal, state, and local requirements.

E. Excavated soil and groundwater associated with this Section has the potential of having contaminants. Contractor shall maintain awareness of potential signs of contamination and notify the City immediately upon discovery, in accordance with Section 7-1.02K(6)(b) Excavation Safety.

1. Upon the identification of contaminated groundwater or soil, the Contractor shall provide 40-hour OSHA-HAZWOPER certified workers and provide a field Site Safety Officer that is also an 8-hour OSHA-HAZWOPER Supervisor trained to directly oversee the work associated with

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contaminated materials removal and handling operation. All workers in this circumstance must have their initial and annual renewal refresher training, medical clearance and personal protection equipment in accordance with 8CCR Section 5192.

2. Limits of excavation shall be extended as necessary, at the direction of the City, to remove visually contaminated soil. Contractor shall maintain and secure the excavation.
3. Payment for HAZWOPER compliance shall be considered as included in the prices paid for under Contaminated Groundwater and Soil Management Allowance, and no additional compensation will be allowed therefore.

3.04 CONTROL OF WATER

A. Divert surface water around excavation to minimize amount of surface water entering excavation.

B. Where groundwater is encountered in excavation, dewater to allow adequate access to tank and piping, to ensure safe excavation, and to ensure compaction and moisture requirements can be met during backfilling.

C. Control of water shall be in accordance with Section 31 23 19.01 Dewatering.

D. Inspect containment area at least daily, and after each rainfall event, and remove accumulated liquids.

3.05 EXCAVATED SOIL STOCKPILES

A. All stockpiles of contaminated/suspect soil shall be stored on bermed plastic and covered at the composted facility shown in Exhibit A in Section 01 31 13, Project Coordination. Contractor to coordinate with the City. The Santa Rosa Fire Department and the Bay Area Air Quality Management District (415-771-6000) will need to be contacted regarding treatment and disposal of contaminated soil.

B. Excavated Soil:

1. Stockpile as follows:
   a. Place within diked area and a safe distance from excavation, and provide with appropriate drainage controls.
   b. Lined with impermeable geomembrane with minimum thickness of 10 mils.
   c. Covered with removable geomembrane cover with minimum thickness of 10 mils and secured in place during nonworking periods by sand bags or other security devices.
2. Contractor to assume third party entity provided by the City will be responsible for testing soil. Contractor to coordinate with third party entity and provide required soil samples. Third party will be testing for potential volatile or semi-volatile organic compounds as it relates to appropriate disposal. Contractor responsible for stockpiling excavated until further direction provided by the City.

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3. Full compensation for stockpiling and maintaining excavated soils shall be considered as included in the prices paid for Underground Storage Tank Removal, and no additional compensation will be allowed therefor.

C. Contaminated Soil:

1. Contaminated soil shall be disposed of under the direction of the Engineer at the appropriate location.
2. Full compensation for disposal of contaminated soils shall be considered as included in the prices paid for under Contaminated Groundwater Contaminated Soil Management Allowance, and no additional compensation will be allowed therefor.

D. Noncontaminated Excavated Soil:

1. Noncontaminated soil shall be property of the Contractor. None of the excavated soil shall be disposed of on the Work Site. Prior to disposal of any excess material from the Work Site, the Contract shall submit to the Engineer written authorization for such disposal and entry permission signed by the approved disposal site. Contractor shall comply with all disposal regulations such as city, county, and/or state permits and licenses, as may be required.
2. Full compensation for disposal of noncontaminated soils shall be considered as included in the prices paid for under Underground Storage Tank Removal, and no additional compensation will be allowed therefor.

3.06 REMOVAL/DEMOLITION OF APPURTENANT PIPING

A. Disconnect piping and ancillary equipment from tank. Remove piping as shown on Drawings.

B. Securely plug pipe ends and tank openings as piping connections are exposed by excavation, except for those connections necessary to inert tank in excavation zone.

C. Expose and remove piping as shown on Drawings. Permanently cap ends of piping that are to be abandoned in place.

3.07 TANK REMOVAL

A. Once tank has been freed of vapors and before it is removed, plug or cap accessible holes, except one plug should have a 1/8-inch hole to prevent excessive differential pressures caused by temperature changes. Locate this vent plug so it will be on top of tank during subsequent storage and transport.

B. Remove tank from excavation, clean exterior to remove soil, and inspect for signs of corrosion, structural damage, or leakage. Materials, equipment, and tools, including shovels and slings that come in contact with tank containing flammable vapors or in vicinity of excavation for such tanks, shall be nonsparking type.

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C. Remove tank to level surface at location approved by Resident Project Representative and secure it with wooden blocks to prevent movement. Remove UL label from tank if label exists.

D. On tanks that will not be cut up or crushed onsite, install label or mark with letters denoting removal date, former contents, current vapor state, and appropriate warning against certain re-use.

3.08 TANK CLEANING

A. Exterior Cleaning:

1. Remove soil from exterior of tank, piping, and associated equipment to eliminate soil deposition on roadways, to ensure marking will adhere, and to simplify cutting. Remove using nonsparking tools.
2. Collect soil and debris removed from tank for appropriate disposal.

B. Interior Cleaning:

1. Tank interior shall be cleaned in accordance with CCR Title 23, Division 3, Chapter 16, Article 7.
2. Clean interior surfaces of piping using same method used for cleaning tank.
3. Contaminated water generated from interior cleaning operations shall not exceed following quantities for each tank cleaned:

Tank Volume (Gallons)	Percent of Tank Volume
Less than 1,000	5%
1,000 to 9,999	5%, or 100 gallons, whichever is less
10,000 to 20,000	1%, or 150 gallons, whichever is less
Greater than 20,000	1%, or 250 gallons, whichever is less

4. Coordinate with City for sampling contaminated water resulting from cleaning operations. Temporary storage shall be located in area provided with secondary containment and spill control measures.

3.09 CUTTING TANK APART

A. Immediately prior to cutting tank, confirm explosive gases have been adequately purged. If combustible gas concentration is still equal to or greater than 10 percent of lower explosive limit, purge tank again or clean interior.

B. If regulatory and local agencies allow tank to be cut onsite, cut tank into pieces smaller than 1/8 total outside surface area of tank. Before moving tank offsite, decontaminate tank pieces onsite if tank has not been cleaned previously.

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C. If tank cannot be cut apart onsite, label, crush, or perforate with numerous holes in all sections to prevent tank from being reused.

D. Perform cutting, crushing, and perforating with appropriate explosion-proof and nonsparking tools.

3.10 ANCHORAGE REMOVAL

A. Remove strapping bands and concrete used to anchor tank in ground. Place recovered materials with corresponding soil, debris, or metal for proper disposal.

3.11 DISPOSAL

A. Dispose of tank, appurtenances, and other debris materials at disposal facilities licensed to accept such waste.

B. Contractor shall be responsible for separating asphalt, concrete, base rock, asbestos cement pipe, and other non-contaminated debris from the soil prior to loading the soil for transport to disposal sites. Dispose of asphalt, concrete, and base rock at a recycler of these materials as specified in Section 124, Material Recycling, of these Special Provisions.

3.12 SUPPLEMENTS

A. Supplements listed below, following "End of Section," is a part of this Specification:

1. Appendix A – UST Removal Procedures.

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Section 02 65 00 - Appendix A
UNDERGROUND STORAGE TANK REMOVAL PROCEDURE

PURPOSE:

This policy describes procedures to follow for closure of underground storage tanks and sumps containing fuels or hazardous substances by the Santa Rosa Fire Department (SRFD).

REFERENCE

California Code of Regulations (CCR) Title 23, Division 3, Chapter 16, Article 7, (Underground Storage Tank Closure Requirements) Sections 2670-2672 (General Applicability, Temporary Closure Requirements, Permanent Closure Requirements); California Health and Safety Code, Chapter 6.7, Sections 25293 (Monitoring of Tank Systems by Operator; Records), 25296.10 (Corrective Action Requirements in Response to Unauthorized Releases), 25296.15 (Soil and Groundwater Testing for MTBE; Prerequisite to Closure Letters), 25296.20 (Corrective Actions or Site Closure Proposals; Notification to All Current Record Owners of Fee Title), 25298 (Abandonment, Closing, or Temporary Ceasing of Operation of Underground Storage Tank) Santa Rosa Municipal Code – 17-34.040 Certified Unified Program Agency Permit required and 17-34.150 Closure work plan and closure report.

POLICY

It is the policy of the SRFD to receive, review and issue permits for underground tank closures, be present at the closure to witness and document closure activities and review the closure report. If groundwater contamination exists after closure, the site will be referred to the Regional Water Quality Control Board for follow-up. If satisfactory closure has been achieved and no further action is warranted, a No Further Action letter will be issued for the site.

AUTHORITY:

Authority rests with the CUPA Program Manager to ensure this policy is followed.

PROCEDURE:

A. General Information

These guidelines are applicable to hazardous material underground storage tank systems (tanks and piping) and sumps regulated by the California Underground Storage Tank Regulations.

1. A permit for closure of underground tank systems (USTs) or sumps will be issued upon the satisfactory review and approval of a complete Fire Department permit application for closure of an underground storage tank and payment of permit fees. Closure includes removal of the UST or closure in place. All hazardous waste, residuals, and rinsate must be properly disposed pursuant to Title 22, California Code of Regulations.

   The permit application must be submitted at least thirty (30) days prior to the anticipated closure along with two sets of plans and must include the following:

   a. Current certifications of all contractors who will be performing the excavation and closure of the underground storage tank.

b. Plans for inerting the tank.
c. Proposed sampling (number and location) and analytical methods to be used.
d. Plans for disposal of tank, equipment, residual contents of tank and cleaning fluids.
e. Plans for labeling the tank "WARNING this tank has contained hazardous materials. Not suitable for drinking water".
f. Site Health and Safety Plan.
g. Plans to complete the Hazardous Waste Tank Certification of Closure Certification Form and upload it into CERS and revise the UST Tank Information/Monitoring Plan in CERS to indicate the date the UST was permanently closed.
h. Requirement to submit a UST Closure Report to the Fire Department within 60 days of closure. The Closure Report must contain all information in Section E.
i. A permit for backfill and compaction is required from the City Building Department.
j. Fire extinguisher on site (3A40BC).

2. Upon satisfactory review and approval of permit application and submittals and payment of permit fees, the owner of the hazardous materials storage tank or sump shall carry out the proposed actions. Tank and sump closure and sampling activities must be witnessed by a representative from the SRFD. Closure inspections must be scheduled at least 48 hours in advance.

4. Contractors shall submit or have on file with the SRFD information verifying that they possess a current State Contractor's License (General Engineering A, B, Plumbing Contractor C-36, or Limited Specialty C-61/D-40), State Hazardous Substance Removal Certificate "HAZ" and Workers' Compensation Insurance, and business license. Contractor information may be obtained by calling the Contractors State License Board at (800) 321-2752.

5. The Bay Area Air Quality Management District (BAAQMD) requires written notification prior to removal of any tank containing organic material (it must be postmarked at least five days before start of excavation). For further information regarding this requirement, call (415) 771-6000.

6. Underground Service Alert should be contacted at (800) 642-2444 prior to the start of excavation.

7. The contractor shall be responsible for ensuring that conditions at the site provide for workplace safety, protection of the environment, and maintenance of integrity of nearby structures.

8. Cal/OSHA requires that a Site-Specific Health and Safety Plan be maintained on site during closure activities.

9. Soil/groundwater samples shall be analyzed by a laboratory state-certified for the required analyses and handled under a chain-of-custody form. Sample results without a chain-of-custody form shall be considered invalid and re-sampling will be required.

10. When groundwater is encountered, groundwater samples shall be required as described in local Regional Water Quality Control Board Guidelines.

11. If contamination of any detectable concentration is found, further soil and groundwater investigation may be required.

12. Check with the Building and/or Public Works Departments regarding requirements for additional permits (e.g. electrical, plumbing, excavation, compaction and grading, etc.) and any work impacting public streets, walkways, and rights-of-way.

13. Owners of hazardous materials storage tanks shall enter into CERS the date of the tank closure and include the hazardous waste tank closure certification form.

B. Tank Removal

1. All residual liquid, solids or sludges shall be removed and handled as hazardous waste or recyclable materials in accordance with Chapter 6.5 of the Health and Safety Code. Materials generated as the result of the rinsing or decontamination of tanks shall also be manifested as hazardous wastes.

2. BAAQMD requires emissions controls for vapor freeing or ventilation when tanks are greater than 250 gallons. A notification form is required to be sent to BAAQMD for all UST removals containing volatile hydrocarbons at least 5 days prior to the project start. If aeration of soil greater than 50 ppmv is anticipated, a permit application and Risk Screening Analysis is required.

3. Tanks may be disposed as non-hazardous according to the City of Santa Rosa guidance. Tanks must be certified clean with an LEL of 0%. If any readings are above this level, they must be transported and disposed as hazardous waste. All tanks and piping shall be manifested and hauled by a licensed hazardous waste transporter to a permitted hazardous waste facility.

4. Tanks shall be removed from the excavation within 24 hours of removal of backfill.

5. Tank removal or relocation may commence only after the SRFD Inspector has given approval.

6. All tanks shall be transported from the site on the same calendar day as they are removed from the ground or they may be required to be placed back into the excavation.

7. All electrical service to tank(s)/pumps shall be terminated prior to start of excavation.

8. The pump and all associated piping shall be removed or capped if it is unable to be removed. (Note: Plumbing permits may be required.)

9. For tanks previously containing flammable/combustible materials, the licensed tank closure contractor shall provide, on-site and readily accessible, at least one 3A 40BC rated portable fire extinguisher and a calibrated meter capable of measuring LEL (Lower Explosive Limit) and oxygen levels.

10. Per CCR Title 23, Section 2672(b) tanks must be inerted for potential flammable vapors at standard temperature and pressure. Tanks previously containing flammable/combustible materials shall be made safe for removal from the excavation by the addition of dry ice (carbon dioxide) or other methods approved by the local agency sufficient to achieve an atmosphere

of either less than 5 % oxygen or less than 10% LEL. The amount of dry ice needed is 15-30 pounds per 1,000-gallon tank capacity.

11. All openings other than a pressure relief hole at the top of each tank to allow for venting shall be capped or plugged immediately after removal.

12. The tank closure contractor shall provide tank removal/lifting equipment of a size adequate to safely remove tanks.

13. If an excavation is to remain open after the contractor leaves the site, the excavation perimeter shall be fenced 6' high or provided with a 24-hour guard.

14. All stockpiles of contaminated/suspect soil shall be stored on bermed plastic and covered at the compost facility adjacent to the LTP, refer to Section 01 31 13, Project Coordination. The Santa Rosa Fire Department and the Bay Area Air Quality Management District (415-771-6000) will need to be contacted regarding treatment and disposal of contaminated soil.

15. Soil backfilling and compaction must be completed according to the approved Building Department permit.

C. <u>Soil and Groundwater Sampling (to be completed by Others)</u>

Not less than two soil samples, one at each end of the tank is required for all tank closures, regardless of size. Additional samples may be required depending visual observations at the time of closure All piping must be exposed and prepared for removal unless otherwise approved by the SRFD Inspector prior to the tank closure inspection appointment. All dispensers shall be removed prior to the tank removal inspection.

Tank Size	Minimum Number of Soil Samples	Location of Soil Samples
Any tank size	Two (2) per tank	Each end of the tank
Piping	One (1) per 20 linear feet	3 feet below the piping
Dispenser	One (1) per dispenser	5 feet below the dispenser

1. Soil samples shall be required under dispensers and every 20 linear feet along piping runs at joints and as directed by the inspector overseeing closure. Where pipeline samples cannot be taken (e.g. under structures), pipeline pressure-testing shall be required to determine if leakage has occurred. Additional samples may be required.

2. Soil samples shall be obtained by a professional engineer, geologist, or authorized representative of a State-approved laboratory. The number of samples must be approved by the SRFD inspector.

3. Backhoe samples must be collected as per 2672(d): immediately beneath removed portions of the tank, a minimum of two feet in native material at each end of the tank. The first soil from the backhoe may be discard in order to ensure the tested sample is a minimum of two feet into native soil. All soil samples shall be taken from the backhoe bucket, unless the excavation has been safely graded or shored.

4. Soil samples shall be collected using an Encore© type sampler or other approved method if EPA method 5035 for volatile organic compounds will be used.

5. One water sample must be taken from the tank pit bottom if water is observed.

6. All samples shall be immediately transported in a chest on ice to the laboratory for analysis.

7. An approved chain-of-custody records shall be kept to track the possession of a sample from the time it is taken in the field until the time it is analyzed.

8. Samples may not be composited by the laboratory and analyzed together.

9. Soil stockpiled from the excavation shall be sampled and analyzed for the constituents of concern (see chart below). The number of samples and specific analysis will be dictated by the disposition of the soil. The inspector may also require additional samples and analyses. Typically, 3 discrete or appropriately composited samples will be required per each 50yd^3 stockpiled.

10. Excavated soil must not be used as backfill unless it can be demonstrated that soil is not contaminated. Typically, Total Petroleum Hydrocarbons (TPH) must not exceed 100 mg/kg with no volatile organic compounds or MTBE detected.

11. All samples must be analyzed by a laboratory certified by the California Department of Public Health for the analysis method requested as per the California State Water Resources Control Board Leaking Underground Fuel Tank Guidance Manual (Sept. 2012):

SUBSTANCE	COMPONENT	ANALYTICAL METHOD
Gasoline	TPH as Gasoline	TPH-G, EPA 8015 or 8260B/C
	BTEX, Fuel Oxygenates, naphthalene, Chlorinated Hydrocarbons (deepest soil sample or water sample only), and Ethanol Add Lead and Lead Scavengers for tanks older than 1992	EPA 8260B/C
Diesel, Jet fuels, and Fuel Oils #1 and #2	TPH as Diesel (see silica gel note above for diesel)	TPH-D, EPA 8015
	BTEX, Naphthalene and Chlorinated Hydrocarbons (deepest soil sample or water sample only)	EPA 8260
Waste Oil or Unknown Fuel, and Hydraulic Lifts	TPH as motor oil, hydraulic oil	EPA 8015 (quantified to standard that best matches)
	BTEX, Fuel Oxygenates, naphthalene, Chlorinated Hydrocarbons, and Ethanol; (deepest soil sample or water sample only) Add Lead and Lead Scavengers for tanks and lifts older than 1992	EPA 8260B/C
	SVOCs for PCBs and PAHs	EPA 8270
	Metals: Cd, Cr, Pb, Zn, Ni (soil only)	WET, EPA 6010 or 6020 (ICAP) or EPA 7000 series (AA)
Dry Cleaning Substance	TPH as Stoddard Solvent	EPA 8015
	Chlorinated Hydrocarbons	EPA 8260B/C

BTEX = Benzene, Toluene, Ethylbenzene, and total Xylenes
Fuel Oxygenates = Methyl tert-Butyl Ether (MTBE), tert-Butyl Alcohol (TBA), di-Isopropyl Ether (DIPE), tert-Amyl Methyl Ether (TAME)
Lead Scavengers = Ethyl tert-Butyl Ether (ETBE), 1,2-Dibromoethane (EDB), 1,2-Dichloroethane (EDC) Chlorinated Hydrocarbons: Tetrachloroethane (PCE), Trichloroethene (TCE), cis-1,2-Dichloroethene, trans-1,2- Dichloroethene, and Vinyl Chloride.
PCBs = Polychlorinated Biphenyls
PAHs = Polyaromatic Hydrocarbons, 16 priority pollutant PAHs as defined in LUFT Manual
WET=Waste Extraction Test method as described in the CCR, Title 22, Division 4.5, Chapter 11

E. Sump Closure

All relevant requirements for underground storage tank closure shall apply to sump closure activities. The following are requirements specific to sump closure:

1. All piping and sewer connections shall be removed where applicable. (Note: plumbing permits may be required.)
2. Sumps shall be sampled to determine proper disposal method, or disposed of as hazardous waste based on generator knowledge of hazardous nature. Specific sample analyses required is dependent upon materials which were or might have been introduced into the sump structure.
3. Concrete shall be cored or jackhammered to permit collection of native soil samples from beneath the structure. Soil samples may be required from beneath any piping run.
4. Sumps may be either removed from the ground and disposed of in an approved manner or broken up and left in place depending on site conditions.
5. If any well closures are conducted during this closure process, permits must be obtained from the North Coast Regional Water Control Board.

F. Summary of Requirements to Obtain Final Tank System Closure Document

1. The following information shall be submitted within 60 days of tank closure:
    a. Analytical results from samples collected. The laboratory shall note status of evidence tape and condition of samples at time of sample
    b. Chain(s)-of-Custody forms
    c. Site drawings showing tank location(s), pipeline runs, sampling locations, and sampling depths
    d. Other information (e.g. backfill compaction report, observation of contamination etc.)
    e. Photos
    f. Completed Hazardous Waste Tank Closure Certification Form
    g. Receipt of CERS submittal of tank closure (Certification of installation/modification)
    h. If a release was discovered during the closure, provide a copy of the Unauthorized Release Form.
    i. Soil disposition
    j. One photocopy of the TSDF-signed copy of each hazardous waste manifest used to transport the following items:
        i. Tanks/piping/other equipment
        ii. Rinsate
        iii. Contaminated soils

G. Fire Prevention Bureau Process for Documenting Underground Storage Tank Closures

1. The fire department permit application and supporting documentation for an underground storage tank goes to the Fire CD Technician for processing.
2. The plans and documents are reviewed by a Fire Prevention Dept. staff, comments are submitted back to the owner/contractor.
3. Once all comments are addressed, and permit fees are paid, the permit can be issued.

4. Proper personal protective equipment (PPE) for this activity for the SRFD inspector includes hard hat, steel toed shoes, and gloves.

5. On the date of removal, an inspector will be present at the site to observe the site safety plan, tank cleaning, inerting the tank, % oxygen and % LEL readings, removal of tank, piping, dispenser, pumps, sumps and other appurtenant structures. Photos should be taken of the tank removal process. The inspector will observe and direct soil sampling activities. Observations need to be detailed on the inspection report.

6. If the tanks(s) are closed in place, an inspector will be present on site to observe soil borings and sampling which will be completed prior to tank closure. Once this sampling has been completed and accepted by the SRFD as to no unauthorized release has occurred, another inspection will be scheduled and an inspector will be present on site to observe tank cleaning, inerting the tank, % LEL readings, and filling of tank with inert materials. Dispensers and all accessible piping must be removed. Photos should be taken of the tank closure process. The inspector will observe and direct soil sampling activities. Observations need to be detailed on the inspection report.

7. Observe manifest(s) for tank and final disposition for tank, piping, pumps and other equipment holding hazardous waste liquids.

8. If an unauthorized release is observed, complete an Unauthorized Release Form and Prop. 65 form and submit to the North Coast Water Quality Control District and also the County Health Department.

9. Notify owner/contractor to submit final closure report within 60 days complying with Section E.

10. Review final closure report within 30 days of receipt.

11. Review CERS to ensure the tank removal and Hazardous Waste Tank Certification Form have been entered properly.

12. Based on the results of the analytical results and visual observations during the removal process, either issue a No Further Action (NFA) letter or a referral to the North Coast Regional Water Quality Control Board. Depending on the limitations of further excavation, it is possible to issue a NFA as well as recommendation to the Water Board for follow-up. The following language must be included in the NFA letter:

    "The owner/operator has demonstrated to the Santa Rosa CUPA the underground tank removal has been satisfactorily closed" and either one of the following statements:

    [ ] Based on the analytical results of the soil sampling or visual observations during closure activities, it appears that no unauthorized release has occurred. The tank closure is complete. No further action is required.

    or

    [ ] Based on the analytical results of the soil sampling or visual observations during closure activities, a release has occurred. Due to limitations for further excavation, and extent

feasible, further exaction at this time is not required. No further action is required however soil remediation may be required for future property and/or site development/redevelopment. [This letter is cc'd to the North Coast Regional Water Quality Control Board.]

or

[ ] Based on the analytical results of the soil sampling or visual observations during closure activities, a release has occurred. An unauthorized release form has been submitted to the North Coast Regional Water Quality Control Board. Contact the NCRWQCB for further investigation, corrective or remedial actions and site closure.

13. Keep all documents related to the closure in a separate red folder in the address file and label it as UST Closure. Keep this file indefinitely.

SECTION 05 05 19
CAST-IN-PLACE AND POST-INSTALLED ANCHORS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):
   a. 318, Building Code Requirements for Structural Concrete.
   b. 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
   c. 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
2. American Iron and Steel Institute (AISI): Stainless Steel Type 316.
3. American National Standards Institute (ANSI).
4. ASTM International (ASTM):
   a. A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   b. A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
   c. A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   d. A193/A193M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
   e. A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
   f. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   g. A380, Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
   h. A385, Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
   i. A563, Specification for Carbon and Alloy Steel Nuts.
   j. A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   k. A967, Specification for Chemical Passivation Treatments for Stainless Steel Parts.
   l. E488, Standard Test Methods for Strength of Anchors in Concrete Elements.
   m. F436, Specification for Hardened Steel Washers.
   n. F468, Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
   o. F568M, Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners.
   p. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   q. F594, Specification for Stainless Steel Nuts.
   r. F1554, Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

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5. International Association of Plumbing and Mechanical Officials Uniform ES (IAPMO-UES): Evaluation Reports for Concrete and Masonry Anchors.
6. International Code Council Evaluation Service (ICC-ES):
    a. Evaluation Reports for Concrete and Masonry Anchors.
    b. AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
    c. AC70, Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements.
    d. AC106, Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.
    e. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
    f. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements. Evaluation Reports for Concrete and Masonry Anchors.
7. Specialty Steel Industry of North America (SSINA):
    a. Specifications for Stainless Steel.
    b. Design Guidelines for the Selection and Use of Stainless Steel.
    c. Stainless Steel Fabrication.
    d. Stainless Steel Fasteners.

1.02 DEFINITIONS

A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.

B. Exterior Area: Location not protected from weather by a building or other enclosed structure to include buried roof structures.

C. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or wash down, and where wall or roof slab is not common to a water-holding or earth-retaining structure.

D. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or wash down, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.

E. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling, or floor surface inside a covered water-holding structure, or exterior belowgrade wall or roof surface of water-holding structure, open or covered.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Specific instructions for concrete anchor installation, including drilled hole size and depth, preparation, placement, procedures, and instructions for safe handling of anchoring systems.

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B. Informational Submittals:

1. Concrete Anchors:
   a. Manufacturer's product description and installation instructions.
   b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
   c. Adhesive Anchor Installer Certification.
2. Passivation method for stainless steel members.
3. Hot-Dip Galvanizing: Certificate of Compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.
2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package stainless steel items in a manner to provide protection from carbon impregnation.

B. Protect hot-dip galvanized finishes from damage as a result of metal banding and rough handling.

PART 2 PRODUCTS

2.01 GENERAL

A. Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Stainless Steel:	
Threaded Rods	F593, AISI Type 316, Condition CW
Nuts*	F594, AISI Type 316, Condition CW
Bolts	F593, AISI Type 316, Group 2, Condition SH

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Item	ASTM Reference
Carbon Steel:	
Threaded Rods and Anchor Bolts	F1554, Grade 36 or F568M Class 5.8, with weldability supplement S1.
Flat and Beveled Washers (Hardened)	F436
Nuts*	A194/A194M, Grade 2H
Galvanized Steel:	
All	A153/A153M
*Nuts of other grades and styles having specified proof load stresses greater than specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than minimum tensile strength of specified threaded rod.	

B. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, and zinc-plated steel material types as indicated in Fastener Schedule at end of this section.

2.02 ANCHOR BOLTS AND ANCHOR BOLT SLEEVES

A. Cast-In-Place Anchor Bolts:

1. Headed type, unless otherwise shown on Drawings.
2. Material type and protective coating as shown in Fastener Schedule at end of this section.

B. Anchor Bolt Sleeves:

1. Plastic:
   a. Single unit construction with corrugated sleeve.
   b. Top of sleeve shall be self-threading to provide adjustment of threaded anchor bolt projection.
   c. Material: High-density polyethylene.
2. Fabricated Steel: ASTM A36/A36M.

2.03 POST-INSTALLED CONCRETE ANCHORS

A. General:

1. AISI Type 316 stainless, hot-dip galvanized or zinc-plated steel, as shown in Fastener Schedule at end of this section.
2. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or equivalent for use in cracked concrete and for short-term and long-term loads including wind and earthquake.

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3. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.
4. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.

B. Torque-Controlled Expansion Anchors (Wedge Anchors):

1. Manufacturers and Products:
   a. Hilti, Inc., Tulsa, OK; Kwik-Bolt –TZ (KB-TZ) Anchors (ESR-1917).
   b. DeWalt/Powers Fasteners, Brewster, NY; Power-Stud +SD1, +SD2, +SD4, or +SD6 Anchors (ESR-2502 and ESR-2818).
   c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Strong-Bolt 2 Anchors (ESR-1771 and ESR-3037).
   d. Or Approved Equal.

C. Undercut Anchors:

1. Manufacturers and Products:
   a. USP Structural Connectors, Burnsville, MN; DUC Undercut Anchor (ESR-1970).
   b. Hilti, Inc., Tulsa, OK; HDA Undercut Anchor (ESR-1546).
   c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; TORQ-CUT Self-Undercutting Anchor (ESR-2705).
   d. DeWalt/Powers Fasteners, Brewster, NY; Atomic+ Undercut Anchor (ESR-3067).
   e. Or Approved Equal.

D. Adhesive Anchors:

1. Threaded Rod:
   a. Diameter as shown on Drawings.
   b. Length as required to provide minimum depth of embedment indicated and thread projection required.
   c. Clean and free of grease, oil, or other deleterious material.
2. Adhesive:
   a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
   b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
3. Packaging and Storage:
   a. Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
   b. Store adhesive on pallets or shelving in a covered storage area.
   c. Package Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

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d. Dispose of When:
    1) Shelf life has expired.
    2) Stored other than in accordance with manufacturer's instructions.

4. Manufacturers and Products:
    a. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT RE 500 V3 (ESR-3814), or HIT-HY 200 (ESR-3187).
    b. Simpson Strong-Tie Co., Inc., Pleasanton, CA; SET-XP Epoxy Adhesive Anchors (ESR-2508), or AT-XP Adhesive Anchors (IAPMO UES-263).
    c. DeWalt/Powers Fasteners, Brewster NY; Pure 110+ Epoxy adhesive anchor system (ESR-3298).
    d. Or Approved Equal.

E. Adhesive Threaded Inserts:

1. Type 316 stainless steel, internally threaded inserts.
2. Manufacturer and Product: Hilti, Inc., Tulsa, OK; HIS-RN Insert with HIT-RE 500-V3 or HIT-HY 200 adhesive, or Approved Equal.

PART 3 EXECUTION

3.01 CAST-IN-PLACE ANCHOR BOLTS

A. Locate and hold anchor bolts in place with templates at time concrete is placed.

B. Use anchor bolt sleeves for location adjustment and provide two nuts and one washer per bolt of same material as bolt.

C. Minimum Bolt Size: 1/2-inch diameter by 12 inches long, unless otherwise shown.

3.02 POST-INSTALLED CONCRETE ANCHORS

A. Begin installation only after concrete to receive anchors has attained design strength.

B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by City prior to drilling. Coordinate with City to adjust anchor locations where installation would result in hitting reinforcing.

C. Install in accordance with written manufacturer's instructions.

D. Provide minimum embedment, edge distance, and spacing as indicated on Drawings.

E. Use only drill type and bit type and diameter recommended by anchor manufacturer.

F. Clean hole of debris and dust per manufacturer's requirements.

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G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify City for direction on how to proceed.

H. Adhesive Anchors:

1. Unless otherwise approved by City and adhesive manufacturer:
   a. Do not install adhesive anchors when temperature of concrete is below 40 degrees F or above 100 degrees F.
   b. Do not install prior to concrete attaining an age of 21 days.
   c. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry.
   d. Do not disturb anchor during recommended curing time.
   e. Do not exceed maximum torque as specified in manufacturer's instructions.

3.03 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. City-Furnished Quality Assurance, in accordance with CBC Chapter 17 requirements and as required by anchorage designer

3.04 MANUFACTURER'S SERVICES

A. Adhesive Anchors: Conduct Site training of installation personnel for proper installation, handling, and storage of adhesive anchor system. Notify City of time and place for sessions.

3.05 FASTENER SCHEDULE

A. Unless indicated otherwise on Drawings, provide fasteners as follows:

Service Use and Location	**Product**	**Remarks**
1. Cast-in-Place or Post-Installed Anchors for Metal Components to Cast-in-Place Concrete (such as, Ladders, Handrail Posts, Electrical Panels, Platforms, and Equipment)		
Interior Dry Areas	Anchor material type to match material being anchored (for example, stainless steel anchors to anchor stainless steel equipment, zinc-plated anchors to anchor painted equipment, galvanized anchors to anchor galvanized equipment).	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application

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Service Use and Location	Product	Remarks
Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel anchor bolts or adhesive anchors	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application
2. All Others		
All service uses and locations	Stainless steel fasteners	

B. Antiseizing Lubricant: Use on all stainless steel threads.

C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

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SECTION 23 13 00
FUEL STORAGE TANKS AND DISPENSING EQUIPMENT

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Petroleum Institute (API): 607, Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats.
2. American Welding Society (AWS).
3. Bay Area Air Quality Management District (BAAQMD).
4. California Environmental Quality Act (CEQA).
5. California Fire Code (CFC).
6. FM Global (FM).
7. National Electrical Manufacturers Association (NEMA).
8. National Fire Protection Association (NFPA):
   a. NFPA 30, Flammable and Combustible Liquids Code.
   b. NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response.
9. The Society for Protective Coatings (SSPC): SP-10, Near-White Blast Cleaning.
10. Steel Tank Institute/Steel Plate Fabricators Association (STI/SPFA):
    a. Quality Assurance Program.
    b. 130-50-1000, Fireguard: Specification for Fireguard Protected Aboveground Storage Tank.
11. UL:
    a. 142, Standard for Safety for Steel Aboveground Tanks for Flammable and Combustible Liquids.
    b. 2085, Standard for Safety for Protected Aboveground Tanks for Flammable and Combustible Liquids.
12. City of Santa Rosa Fire Department, Aboveground Storage Tank Installation Checklist.

1.02 DEFINITIONS

A. Aboveground Storage Tank (AST): Tank that is installed above grade, at grade, or below grade without backfill.

B. Atmospheric Tank: Horizontal storage tank designed to operate at pressures from atmospheric through 1.0 psig measured at top of tank under normal venting conditions and up to 2.5 psig under emergency venting conditions.

C. Authority Having Jurisdiction (AHJ): Organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

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D. Combustible Liquid: Liquid with a closed-cup flash point at or above 100 degrees F as determined by procedures set forth in NFPA 30; includes Class II, Class IIIA, and Class IIIB combustible liquids as defined in NFPA 30.

E. Flammable Liquid: Liquid with a closed-cup flash point below 100 degrees F, as determined by procedures set forth in NFPA 30; includes Class I, Class IA, Class IB, and Class IC flammable liquids as defined in NFPA 30.

F. Protected Tank: Tank listed in accordance with UL 2085 that consists of a primary tank provided with protection from physical damage and fire-resistive protection to a high intensity liquid pool fire.

G. Secondary Containment Tank: Tank with an inner and outer wall with interstitial space (annulus) between walls and has means for monitoring interstitial space for a leak.

H. Functional Test: Test or tests in presence of the City to demonstrate that installed equipment meets manufacturer's installation, calibration, and adjustment requirements and other requirements as specified.

I. Performance Test: Test or tests performed after any required functional test in presence of the City to demonstrate and confirm individual equipment meets performance requirements specified in individual sections.

J. Facility Performance Demonstration:

1. A demonstration, conducted by Contractor, with assistance of Owner, to demonstrate and document the performance of the entire operating facility, both manually and automatically (if required), based on criteria developed in conjunction with Owner and as accepted by Engineer.
2. Such demonstration is for the purposes of (i) verifying to City entire facility performs as a whole, and (ii) documenting performance characteristics of completed facility for City's records. Neither the demonstration nor the evaluation is intended in any way to make performance of a unit process or entire facility the responsibility of Contractor, unless such performance is otherwise specified.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Design data, including:
      1) Tank size, overall dimensions and inside dimensions of inner tank for secondary containment tank.
      2) Tank steel and insulation thickness.
      3) Locations, sizes, and details of nozzles and tank openings.
      4) Construction details plainly identifying materials of construction.
      5) Dimensions and details of supports of legs.
      6) Data sheets on tank coatings.

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7) Verification tank is in accordance with specified standards.
8) Required emergency venting capacity.

b. Cut sheets for tank accessories showing materials of construction, dimensions, details of construction, and connection details.
c. Descriptive literature for tank instrumentation describing in detail the function, setpoints, available input and output signals, wiring diagrams, and field connection points.
d. Detailed programming and set up procedures for control panels and monitoring instruments.
e. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Description of quality assurance program to be utilized, including verification of manufacturer's licensing agreement or certification program, if required, to manufacture tanks to a given standard or to carry a given trademark.
2. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
3. Installation details in accordance with manufacturer's recommendations and instructions.
4. Tank field repair procedures.
5. Manufacturer's list of proposed spares and expendables.
6. Operation and Maintenance Data as specified in Section 01 78 23, Operation and Maintenance Data.
7. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.
8. City of Santa Rosa Fire Department, AST Installation Checklist in accordance with Section A, Fees and Permits.
9. Equipment Testing and Facility Startup:
   a. Facility Startup and Performance Demonstration Plan.
   b. Functional and performance test results.
   c. Completed Unit Process Startup Form for each unit process.
   d. Completed Facility Performance Demonstration/Certification Form.

1.04 REGULATORY REQUIREMENTS

A. AHJ: Governing code for tank installation. This will be legally adopted code generally BAAQMD.

B. Governing Codes and Standards: CEQA, California Fire Code (CFA), NFPA 30, UL.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Provide galvanized steel caps or plugs on threaded ports and 12-gauge minimum steel or 1/2-inch minimum plywood blind flanges on flanged ports.

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1.06 FACILITY STARTUP AND PERFORMANCE DEMONSTRATION PLAN

A. Develop a written plan, in conjunction with City's operations personnel; to include the following:

1. Step-by-step instructions for startup of each unit process and the complete facility.
2. Complete the City's AST Installation Checklist, refer to Section A, Fees and Permits.
3. Unit Process Startup Form (sample attached), to minimally include the following:
   a. Description of the unit process, including equipment numbers/nomenclature of each item of equipment and all included devices.
   b. Detailed procedure for startup of the unit process, including valves to be opened/closed, order of equipment startup, etc.
   c. Startup requirements for each unit process, including water, power, chemicals, etc.
   d. Space for evaluation comments.
4. Facility Performance Demonstration/Certification Form (sample attached), to minimally include the following:
   a. Description of unit processes included in the facility startup.
   b. Sequence of unit process startup to achieve facility startup.
   c. Description of computerized operations, if any, included in the facility.
   d. Contractor certification facility is capable of performing its intended function(s), including fully automatic operation.
   e. Signature spaces for Contractor and City.

PART 2 PRODUCTS

2.01 GENERAL

A. Two separate AST fuel storage systems shall be provided as specified:

1. Emergency Generator Fuel Storage Tank: Shall provide fuel storage for existing emergency generators.
2. Split Compartment Vehicle Fuel Storage Tank: Shall be capable of dispensing diesel or gasoline to City's motor vehicles.

B. Tanks Requirements:

1. Emergency Generator Fuel Storage Tank:
   a. Equipment Tag: ST117191.
   b. Fuel Stored: No. 2 diesel fuel (Red Dye).
   c. NFPA Fuel Classification: Combustible, Class II.
   d. Type: Horizontal, cylindrical, tank mounted on saddles, conforming to UL 2085.
   e. Storage Capacity: 20,000 gallons.

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f. Manufacturers:
1) Containment Solutions.
2) Envirosafe Fuel Storage Tanks.
3) Modern Welding Company Inc.
4) Or Approved Equal.

2. Split Compartment Vehicle Fuel Storage Tank:
a. Equipment Tag: ST100101.
b. Fuel Stored: No. 2 diesel fuel and gasoline.
c. NFPA Fuel Classification: Combustible, Class II, and Flammable, Class IB.
d. Type: Horizontal, rectangular or cylindrical, dual compartment tank conforming to UL 2085.
e. Storage Capacity: 1,500 Gallons (500 diesel, 1,000 Gasoline).
f. Manufacturers and Products:
1) Containment Solutions; Hoover Vault model.
2) Or Approved Equal.

2.02 PROTECTED TANK—STEEL CONTAINMENT TANK

A. Tank Manufacturer: Licensed member company of the STI which is subject to the STI/SPFA's Quality Assurance Program.

B. Tank Construction:

1. Horizontal, atmospheric storage tank in accordance with UL 2085, with steel inner tank, fully enclosed steel outer tank, and thermal insulation between inner and outer tanks.
2. Tank Label: Provide UL 2085 label and/or STI/SPFA 130-50-1000 Fireguard label and meet requirements for a fire-protected tank as defined by NFPA 30.
3. Inner and Outer Tanks:
a. Continuous welds on all sides, conforming to AWS Standards for continuous welds.
b. Steel Thickness: In accordance with UL 2085.
c. Inner Tank Capacity: In accordance with Tanks requirements specified above.
4. Fire Resistance:
a. Tank System: Designed and tested to provide 2-hour fire protection.
b. Tested in accordance with procedures established in UL 2085.
5. Thermal Protection:
a. Tank Construction: Include lightweight thermal insulation, installed in factory, to protect inner tank against excessive heat in the event of fire outside tank, in accordance with UL 2085.
b. Concrete thermal insulation will not be accepted.
c. Provide insulation which allows liquid to migrate through annular space to monitoring point, and is protected from weathering and outside moisture by outer tank.

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6. Tank Openings:
    a. Provide minimum number of tank openings as listed herein under Article Tank Openings and Attachments; arranged as shown on Drawings.
    b. Make piping connections to tank above normal maximum liquid level.
7. Corrosion Protection:
    a. Outer Tank Exterior Coating: As specified herein under Article Corrosion Protection.
    b. Inner Tank Interior Coating: As specified herein under Article Corrosion Protection over entire interior of tank.
8. Venting:
    a. Conform to NFPA fire codes and UL Standards.
    b. Provide emergency vent for inner tank and outer tank, and operating vent for inner tank.
9. Leak Detection Access:
    a. Provide steel outer tank for secondary containment and to allow monitoring of leaks from primary tank.
    b. Locate leak detection access tube in space between inner tank and outer tank.
    c. Design positive space to permit leaked fluid to flow to monitoring point.
    d. Secondary Containment Annular Space: Pressure testable.
10. Support Legs: Fabricated steel saddle supports with flat bottoms, not less than 4 inches or more than 12 inches tall at bottom centerline of tank located by Tank Manufacturer.

2.03 EMERGENCY GENERATOR FUEL STORAGE TANK - OPENINGS AND ATTACHMENTS

A. General: For secondary containment tank or protected tank with outer steel tank, seal weld tank openings to both inner and outer tank walls.

B. Manway: 30-inch flanged steel with lifting handles and fuel resistant gasket.

C. Normal Vent: 3-inch female NPT port. Also provide atmospheric updraft vent stack as shown on Drawings.

D. Emergency Vent:

1. Fuel Holding Tank (Primary): Raised face slip on flange nozzle (RFSO) sized to match required emergency vent valve.
2. Steel Outer Tank (Secondary): Raised face slip on flange nozzle (RFSO) sized to match required emergency vent valve.

E. Fill Port:

1. 4-inch female NPT threaded port with double-tapped bushing on top of tank for installation of fill limiter valve with connection to remote fill pipe, as specified under Article Valves.

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2. Fill port shall have a 4-inch drop pipe that extends to within 4 inches of the bottom of the tank. Provide foot valve at bottom of drop pipe, as specified under Article Valves, located with end 4 inches above bottom of tank.
3. Level Sensor Port: 3/4-inch female NPT port with drop tube terminating within 6 inches of bottom of tank compatible with sensor probe specified under Article Accessories.

F. Clock Gauge Port: 2-inch female NPT port compatible with sensor probe specified under Article Accessories.

G. Stick Port: 2-inch male NPT port with cap as specified under Article Accessories. Located reinforcing plate on tank bottom below stick port.

H. Leak Monitoring Port: 2-inch female NPT port communicating with tank annulus with drop tube extending through or alongside fuel holding tank.

I. Spare Ports: Provide the following spare ports with galvanized steel caps or plugs.

1. Two of 2-inch female NPT ports.

J. Lifting Eyes: Provide tank with minimum of four lifting eyes. Lifting eyes shall consist of plate steel welded to steel tank with hole for attaching shackle.

2.04 EMERGENCY GENERATOR FUEL STORAGE TANK - ACCESSORIES

A. Remote Fill Spill Container Box:

1. 15 gallons minimum capacity, CARB compliant, UL listed, powder-coated steel overfill/spill containment sump.
2. Surround fill pipe.
3. Provide with the following features:
   a. Hinged, padlockable lid or lockable door.
   b. Hydraulic stanchion or stay-open lockout.
   c. Tank side wall mounted, SST pedestal, or four SST legs.
   d. 4-inch female NPT connection for top entry fill pipe.
   e. Box bottom sloped to sump with 1/2-inch FPT drain and plug.
   f. Vent holes.
4. Additional Components: External 3/4-inch ball valve for drain connection as specified in Article Accessories.
5. Manufacturers and Products:
   a. Baker Industries Northwest; Series 700.
   b. OPW; Series 211-RMOT.
   c. Morrison Brothers; Series 515.
   d. Or Approved Equal.

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B. Fuel Delivery Couplers and Accessories:

1. Provide all equipment required for a functioning fuel transfer from transport truck to AST through fill pipe. Normal disconnection operation should be dry with no excess fuel leakage.
2. Provide with following components:
   a. 4-inch dust cap.
   b. 4-inch poppeted camlock adapter for remote fill application.
3. Seals and materials shall be compatible with service liquid.
4. Manufacturers and Products:
   a. OPW.
   b. Morrison Brothers.
   c. Or Approved Equal.

C. Drop Tube and Diffuser:

1. Provide aluminum drop tubes with threaded aluminum diffuser on end.
2. Manufacturers and Products:
   a. Morrison Brothers; Fig. 419 and Fig. 539.
   b. Or Approved Equal.

D. Normal Vent Cap for Class II and Class III Liquids:

1. Metal body, 3-inch female NPT connection, upward opening vent with screened opening.
2. Manufacturers and Products:
   a. Universal Valve; Model 45.
   b. Morrison Brothers; Series 354.
   c. Or Approved Equal.

E. Combination Vent and Overfill Alarm:

1. Metal body, 2-inch female NPT connection, with pressure and vacuum poppets to allow tank to breathe during filling or withdrawal operations. Poppets to close when tank pressure is equalized.
2. Provide screen over vent opening.
3. Vent cap to have brass seat, 8-ounce pressure setting, and 1-ounce vacuum setting.
4. Vent to include float and cable assembly that operates a whistle in vent body and creates audible alarm when level in tank reaches predetermined level.
5. Manufacturers and Products:
   a. Morrison Brothers; Figure 922
   b. Or Approved Equal.

F. Tank Monitoring System:

1. Alarm Console TMS 117191:
   a. UL Listed.
   b. NEMA 4X enclosure.

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c. Intrinsically safe output circuits to sensors.
d. Operate on 120V ac power supply.
e. SPST normally open dry contact output rated 1.25 amperes minimum at 120V ac and 12V dc low voltage output for each alarm.
f. Face:
1) Provide the following:
a) Green “system operating” light.
b) Amber ”alarm condition” light for each high level or liquid leak sensor; which will remain lit until alarm condition is corrected.
c) Audible alarm horn with silence button.
d) Test switch which tests entire system electronics.
e) One output dry contact to plant SCADA system.
g. Manufacturers and Products:
1) Franklin Fueling Systems; TS-550 evo FMS.
2) Omntec Manufacturing; LU2.
3) Or Approved Equal.

2. Remote Annunciator Console RA-117191 and RA-117200:
a. UL Listed.
b. NEMA 4X enclosure.
c. Face: Provide the following:
1) Amber alarm light for each alarm signal.
2) Audible alarm and a silence button.
3) Tank level display for RA-117191
d. Operate on 12V dc alarm output from main alarm console.
e. Manufacturers and Products:
1) Omntec Manufacturing; RA-2.
2) Or Approved Equal.

3. Liquid Level Sensor:
a. Wire float level sensor compatible with alarm console.
b. Level Sensor Length: Selected to provide level reading over total tank depth.
c. Mount on 4-inch flanged tank port.
d. Housing with space for wiring terminations and threaded conduit connection.
e. Manufacturers and Products:
1) Preferred Utilities; TG-EL-WF
2) Or Approved Equal.

4. Annular Space Leak Monitor:
a. Fit through 2-inch female NPT tank port.
b. Mounted with 3/4-inch RGS conduit and 2-inch by 3/4-inch double-tapped bushing.
c. Manufacturers and Products:
1) Omntec Manufacturing; LS-ASC.
2) Or Approved Equal.

G. Mechanical Level Gauge:

1. Clock Gauge:
a. Float-operated, liquid level gauge, for tanks up to 12 feet tall.

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b. Aluminum body with 2-inch male NPT connection.
c. Stainless steel float and cable.
d. Standard faceplate.
e. Manufacturers and Products:
1) Morrison Brothers; Figure 818, fully mechanical.
2) Or Approved Equal.

H. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, and as specified in Section 05 05 19, Cast-in-Place and Post-Installed Anchors.

I. Seismic Restraints:

1. Seismic Restraints:
a. Fabricate cradles in which tank legs sit of welded 1/4-inch steelplate and hot-dip galvanized after fabrication.
b. Provide minimum of four restraints per tank.
c. Provide four holes for anchor bolts for attaching restraint to concrete pad.

J. Ground Rods and Ground Conductor: Provide in accordance with Section 26 05 26, Grounding and Bonding for Electrical Systems.

K. Equipment Identification:

1. Identify tank with manufacturer's name, manufacturer's location, and capacity in gallons, manufacturer's model number, and date of manufacture.
2. UL Mark: Include file number, product classification, and product serial number.
3. Mark tanks on all sides with warning signs reading "FLAMMABLE" or "COMBUSTIBLE," "NO SMOKING," product identification, and other signs as required by applicable codes. Product identification in accordance with NFPA 704.
4. Provide 16-gauge Type 316 stainless steel identification plate securely mounted on each separate equipment component in a readily visible location. Engrave plate 1/4-inch-high block type black enamel filled equipment identification number and letters indicated in this Specification and as shown on Drawings.

2.05 SPLIT COMPARTMENT VEHICLE FUEL STORAGE TANK - OPENINGS AND ATTACHMENTS

A. General:

1. Provide a single secondary containment tank with inner dual compartment primary tank as specified. In addition to regulations already listed, this tank and its components shall conform to CARB Phase I EVR System requirements where applicable.
2. For secondary containment tank or protected tank with outer steel tank, seal weld tank openings to both inner and outer tank walls.

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3. Provide two of each opening or attachment listed in this section for each of the primary tanks except as noted otherwise below.

B. Manway: 18-inch flanged steel with lifting handles and fuel resistant gasket.

C. Normal Vent: 2-inch female NPT port. Also provide atmospheric updraft vent stack as shown on Drawings.

D. Emergency Vent:

1. Fuel Holding Tank: Female NPT port sized to match required emergency vent valve.
2. Steel Outer Tank: Female NPT port sized to match required emergency vent valve. Provide a single secondary tank emergency vent only.

E. Fill Port:

1. 2-inch male NPT threaded port on top of tank for installation of fill limiter valve with connection to remote fill pipe, as specified under Article Valves.
2. Fill port shall have a drop pipe that extends to within 4-inches of the bottom of the tank.

F. Level Sensor Port: 4-inch female NPT port with drop tube terminating within 6 inches of bottom of tank.

G. Clock Level Gauge Port: 2-inch female NPT port compatible with sensor probe specified under Article Accessories.

H. Stick Port: 2-inch male NPT port with cap as specified under Article Accessories. Located reinforcing plate on tank bottom below stick port.

I. Leak Monitoring Port: 2-inch female NPT port communicating with tank annulus with drop tube extending through or alongside fuel holding tank. Provide single port for secondary containment tank only.

J. Fuel Supply Port: 2-inch female NPT port with double-tapped bushing for 2-inch fuel supply drop pipe with foot valve, as specified under Article Valves, located with inlet 4 inches above bottom of tank.

K. Phase I Vapor Recovery Port: 4-inch female NPT port with double-tapped bushing for 3-inch fuel return drop pipe with bottom of pipe located 6 inches above bottom of tank. Provide port only for gasoline primary tank.

L. Spare Ports: Provide the following spare ports with galvanized steel caps or plugs.

1. 2-inch female NPT port on gasoline side.
2. 2-inch female NPT port on diesel side.

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M. Lifting Eyes: Provide tank with minimum of four lifting eyes. Lifting eyes shall consist of plate steel welded to steel tank with hole for attaching shackle.

N. Grounding Lugs: Provide minimum of two welded to inner steel tank for protected concrete encased tank. Lugs shall be 1/2-inch steel rod to accommodate attachment of compression style ground wire connector.

2.06 SPLIT VAULT VEHICLE FUEL STORAGE TANK - ACCESSORIES

A. General: In addition to regulations already listed, gasoline fuel dispensing components shall conform to CARB Phase II EVR System requirements where applicable.

B. Tank Mounted Fill Container Box:

1. 15 gallons minimum capacity, UL listed, powder-coated steel overfill/spill containment sump.
2. Surround fill pipe.
3. Provide with the following features:
   a. Hinged, padlockable lid or lockable door.
   b. Hydraulic stanchion or stay open lockout.
   c. Tank side wall mounted, SST pedestal, or adjustable four-leg stand with 1/2-inch holes for anchors.
   d. Two of 2-inch female NPT connection for top entry fill pipes.
   e. One of 2-inch female NPT connection for top entry vapor recovery pipe.
   f. Box bottom sloped to sump with 3/4-inch FPT drain and plug.
   g. Vent holes.
4. Additional Components: External 3/4-inch ball valve for drain connection as specified herein under Valves paragraph.
5. Manufacturers and Products:
   a. Baker Industries Northwest; Series 700.
   b. OPW; Series 211-RMOT.
   c. Morrison Brothers; Series 515.
   d. Or Approved Equal.

C. Fuel Delivery Couplers and Accessories:

1. Provide all equipment required for a functioning fuel transfer from transport truck to AST through fill pipe. Normal disconnection operation should be dry with no excess fuel leakage.
2. Provide with following components:
   a. 2-inch dust cap.
   b. 2-inch poppeted camlock adapter for remote fill application.
   c. 2-inch vapor recovery adaptor.
   d. 2-inch vapor recovery cap (externally mounted).
3. Seals and materials shall be compatible with service liquid.

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4. Manufacturers and Products:
    a. OPW.
    b. Morrison Brothers.
    c. Or Approved Equal.

D. Drop Tube and Diffuser:

1. Provide aluminum drop tubes with threaded aluminum diffuser on end.
2. Manufacturers and Products:
    a. Morrison Brothers; Fig. 419 & Fig. 539.
    b. Or Approved Equal.

E. Stick Port Cap:

1. Lockable, gasketed, tight seal, 2-inch brass cap.
2. Provide single unit for gasoline primary tank side.
3. Manufacturers and Products:
    a. Morrison Brothers; Figure 178.
    b. Or Approved Equal.

F. Normal Vent Cap and Flame Arrestor for Class IB Liquids:

1. Metal body, 2-inch female NPT connection, with flame arrestor and screened vent cap.
2. Manufacturers and Products:
    a. Morrison Brothers; Figure 351S.
    b. Or Approved Equal.

G. Normal Vent Cap for Class II Liquids:

1. Metal body, 2-inch female NPT connection, upward opening vent with screened opening.
2. Manufacturers and Products:
    a. Universal Valve; Model 45.
    b. Or Approved Equal.

H. Combination Vent and Overfill Alarm:

1. Metal body, 2-inch female NPT connection, with pressure and vacuum poppets to allow tank to breathe during filling or withdrawal operations. Poppets to close when tank pressure is equalized.
2. Provide screen over vent opening.
3. Vent cap to have brass seat, 8-ounce pressure setting, and 1-ounce vacuum setting.
4. Vent to include float and cable assembly that operates a whistle in vent body and creates audible alarm when level in tank reaches predetermined level.
5. Manufacturers and Products
    a. Morrison Brothers; Figure 922.
    b. Or Approved Equal.

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I. Mechanical Level Gauge:

1. Clock Gauge For Each Tank:
   a. Float-operated, liquid level gauge, for tanks up to 12 feet tall.
   b. Aluminum body with 2-inch male NPT connection.
   c. Stainless steel float and cable.
   d. Standard faceplate.
   e. Manufacturers and Products:
      1) Morrison Brothers; Figure 818, fully mechanical.
      2) Or Approved Equal.

J. Anchor Bolts: Sized by equipment manufacturer, and as specified in Section 05 05 19, Cast-in-Place and Post-Installed Anchors.

K. Ground Rods and Ground Conductor: Provide in accordance with Section 26 05 26, Grounding and Bonding for Electrical Systems.

L. Equipment Identification:

1. Identify tank with manufacturer's name, manufacturer's location, and capacity in gallons, manufacturer's model number, and date of manufacture.
2. UL Mark: Include file number, product classification, and product serial number.
3. Mark tanks on all sides with warning signs reading "FLAMMABLE" or "COMBUSTIBLE," "NO SMOKING," product identification, and other signs as required by applicable codes. Product identification in accordance with NFPA 704.
4. Provide 16-gauge Type 316 stainless steel identification plate securely mounted on each separate equipment component in a readily visible location. Engrave plate 1/4-inch high block type black enamel filled equipment identification number and letters indicated in this Specification and as shown on Drawings.

2.07 VALVES

A. Fill Limiter Valve:

1. Float-operated to close fill pipe when liquid level in fuel tank reaches 95 percent capacity. Adjust nipple length and tank riser pipe height to achieve required valve setting corresponding to this level.
2. Provide 2-inch fill pipe and 4-inch female threaded tank connection.
3. Terminate at top in male or female NPT pipe connection.
4. Allows attachment of drop pipe to bottom to extend fill pipe to within 6 inches of tank bottom. If drop pipe is manufactured accessory to fill limiter valve, rather than a length of threaded steel pipe, then furnish drop pipe with fill limiter valve.

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5. Manufacturers and Products:
    a. Morrison Brothers; Figure 9095A.
    b. Universal Valve; Model 49.
    c. Or Approved Equal.

B. Emergency Vent Valve:

1. Painted cast-iron body and lid with male NPT or flanged connection and O-ring seat.
2. Sized by tank manufacturer to provide required venting capacity.
3. Pressure Setting: 1 psi.
4. Manufacturers and Products:
    a. Morrison Brothers; Figure 244.
    b. Universal Valve; Model 48.
    c. Or Approved Equal.

C. Solenoid Valve:

1. Normally-closed solenoid valve with threaded stainless steel body and stainless steel trim, Viton seat and Viton or Buna seals.
2. Class H, 120V ac, 60-Hz solenoid coil with NEMA 4, NEMA 7, and NEMA 9 Group C and Group D watertight enclosure, threaded conduit connection and 12-inch minimum leads.
3. Rated for a maximum differential of 100 psi and require no differential pressure to open.
4. Manufacturers and Products:
    a. Morrison Brothers; Figure 710
    b. Magnatrol; Type K (stainless steel).
    c. Or Approved Equal.

D. Foot Valve:

1. Double poppet, metal-seated bronze, brass or plated cast-iron foot valve with inlet screen and threaded pipe connection.
2. Manufacturers and Products:
    a. OPW; Model 86 or Model 92.
    b. EBW; Model 50-201.
    c. Or Approved Equal.

E. Expansion Relief Valve:

1. Spring-loaded, angle-pattern with ductile-iron threaded body with 1/2-inch port.
    a. Manufacturers and Products:
        1) Morrison Brothers; Figure 78 DI
        2) Or Approved Equal.

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F. Fire Valve with Fusible Link:

1. External emergency valve capable of flow shut-off in event of a fire. Fusible link holds open spring actuated poppet in the open position.
2. Fuse link shall be UL listed.
    a. Manufacturer and Product:
        1) Morrison Brothers; Fig. 346.
        2) Or Approved Equal.

G. Shear Valve:

1. Emergency shut-off/ shear valves for use in fuel dispensers. Shall be UL listed. Includes fusible link with melting point at 165 degrees F.
2. Female threaded outlet.
    a. Manufacturers and Products:
        1) OPW; Series 10 Plus.
        2) Morrison Brothers; Fig. 636.
        3) Or Approved Equal.

H. Ball Valve:

1. Three-piece threaded, carbon steel body with type 316 stainless steel ball, reinforced Teflon seats, latch lock lever handle, and conforming to API 607.
    a. Manufacturers and Products:
        1) Nibco; TM-590-CS-R-66-FS-LL.
        2) Jomar; T-CS-2001N-SS-4B.
        3) Or Approved Equal.

I. Check Valve:

1. Y-pattern swing check with threaded stainless steel body and metal seat.
2. Manufacturers and Products:
    a. Nibco; T-413.
    b. Watts; CVY.
    c. Or Approved Equal.

J. Priming Tee:

1. 1-inch NPT, stainless steel, horizontal priming tee with plug. Normally closed.
2. Manufacturers and Products:
    a. Morrison Brothers; Series 912-AT.
    b. Or Approved Equal.

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2.08 FUEL STORAGE TANKS STATUS AND ANNUNCIATOR

A. Status and Annunciator panel Tank Monitoring System TMS-117191 shall include the following:

1. Level element input from Diesel Fuel Storage Tank displaying:
   a. High Level - for Diesel Fuel Storage Tank.
   b. Low Level - for Diesel Fuel Storage Tank.
   c. Daily consumption from Diesel Fuel Storage Tank.
2. Leak - High Level Switch Diesel Fuel Storage Tank interstitial space.
3. Outputs from TMS to RA-117191 tank level display and tank full alarm to remote fill station.
4. Leak - High Level Switch Split Chamber Fuel Storage Tank interstitial space.
5. Level element input from Split Chamber Diesel Tank displaying:
   a. High Level - for Diesel Tank.
   b. Low Level - for Diesel Tank.
   c. Daily consumption from Diesel Tank.
6. Leak - High Level Switch at Diesel Fuel Dispenser sump.
7. Level element input from Split Chamber Gasoline Tank displaying:
   a. High Level - for Gasoline Tank.
   b. Low Level - for Gasoline Tank.
   c. Daily consumption from Gasoline Tank.
8. Leak - High Level Switch at Gasoline Fuel Dispenser sump.
9. Outputs from TMS to RA-117200 tank level display for gasoline and diesel tank, and full alarms to remote fill station.

2.09 SPLIT CHAMBER FUEL STORAGE TANK – FUEL DISPENSER CONTROL PANEL PNL-117200

A. PNL-117200 shall house the following:

1. Dispenser hook modules.
2. Transfer pump controllers.
3. Marshalling for all intrinsic safe barriers for remote sensors in classified areas.

2.10 FUEL MANAGEMENT UNIT FMU-117200

A. Fuel Management Unit will interface with the Diesel Dispenser and the Gasoline Dispenser, will automate control of fuel dispensing via user PROKEEs.

B. Fuel Management Unit will connect to the City's Thin Client as shown on Contract Drawings.

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C. Contractor shall obtain necessary equipment as needed to provide a complete functioning FuelMaster-2500 Pls, automatic fuel dispensing system, with PROKEEs.

1. Manufacturer and Product: Syn-Tech; Fuel Master 2500 Plus.
   a. No equal.

2.11 PIPE AND PIPE FITTINGS

A. Fuel Oil Pipe and Fittings: Refer to Section 40 27 00, Process Piping–General.

2.12 RACEWAYS AND CONDUCTORS

A. Refer to Section 26 05 05, Conductors, and Section 26 05 33, Raceway and Boxes.

2.13 CORROSION PROTECTION

A. Steel Tank Exterior Coating:

1. Surface Preparation: Blast clean in accordance with SSPC SP-10.
2. Prime Coat: Anticorrosive, converted epoxy primer containing rust-inhibitive pigments, 2.5-mil dry film thickness.
3. Finish Coat: Two-component, aliphatic- or acrylic-based polyurethane enamel; high-gloss finish, 3-mil dry film thickness.

B. Steel Tank Interior Coating:

1. Surface Preparation: Blast clean in accordance with SSPC SP-10.
2. Prime coat: Anticorrosive, converted epoxy primer containing rust-inhibitive pigments, 2.5-mil dry film thickness.
3. Finish Coat: Polyamidoamine epoxy, minimum 69 percent volume solids, capability of 4 to 8 MDFT per coat, 4-mil dry film thickness.

C. Exterior Coating for Inner Steel Tanks of Double-Wall and Tanks:

1. Surface Preparation: Blast clean in accordance with SSPC SP-10.
2. Prime Coat: Anticorrosive, converted epoxy primer containing rust-inhibitive pigments, 2.5-mil dry film thickness.

2.14 FUEL DISPENSING SYSTEM

A. In general, provide an appropriate number of accessories required for a fully functioning system.

B. Fuel Dispenser:

1. Provide two pedestal mounted, one for diesel, one for gasoline, compact single, remote dispenser, lane oriented unit.

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2. Features include enhanced capacity, internal filter, pulse output interface board, single sided designator, iMeter2, solenoid valve, hose mast.
3. Shall comply with ADA requirements for Gas Pumps including unobstructed side and high reach.
4. Manufacturers and Products:
    a. Wayne Fueling Systems; Select S1.
    b. Or Approved Equal.

C. General Dispenser Accessories:

1. Post-type Counterweight Hose Retractors:
    a. Provide entire assembly for conventional hose configuration. Including but not limited to top and pulley assembly, cable housing, hose clamp, 2 inch by 2 inch post, sliding bracket dispenser mount, and freestanding retractor base.
    b. Shall be CARB Stage II certified.
    c. Height of 79-inches minimum.
    d. Provide coating suitable for outdoor use.
    e. Manufacturers and Products:
        1) OPW POMECO 100; Model 6100-6000 series.
        2) Or Approved Equal.
2. Quickclamp Male Flex Connectors:
    a. Length of 18-inches.
    b. Connector type: HEXxFLEX.
    c. Manufacturers and Products:
        1) Hose Master; FireShield HEXxFLEX connector
        2) Or Approved Equal.

D. Gasoline Hanging Hardware:

1. 3/4-inch ECO dripless, CARB listed, black nozzle for gasoline, with dual point vapor recovery.
    a. Manufacturers and Products:
        1) OPW Retail Fueling.
        2) Or Approved Equal.
2. 3/4-inch Reconnectable Breakaway:
    a. Manufacturers and Products:
        1) OPW Retail Fueling.
        2) Or Approved Equal.
3. 3/4-inch hose swivel, 2-plane, MNPTxFNPT:
    a. Manufacturers and Products:
        1) OPW Retail Fueling.
        2) Or Approved Equal.
4. 3/4-inch by 4 foot Enviro-Loc hose MSxMS:
    a. Manufacturers and Products:
        1) Vapor Systems Technologies.
        2) Or Approved Equal.

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5. 3/4-inch by 8 foot Enviro-Loc hose MSxMS:
    a. Manufacturers and Products:
        1) Vapor Systems Technologies.
        2) Or Approved Equal.

E. Diesel Hanging Hardware:

1. 3/4-inch leaded, green, diesel, 2PcHi, 2PsPk, standard nozzle:
    a. Manufacturers and Products:
        1) OPW Retail Fueling.
        2) Or Approved Equal.
2. 3/4-inch reconnectable breakaway:
    a. Manufacturers and Products:
        1) OPW Retail Fueling.
        2) Or Approved Equal.
3. 3/4-inch hose swivel, 2-plane, MNPTxFNPT:
    a. Manufacturers and Products:
        1) OPW Retail Fueling.
        2) Or Approved Equal.
4. 3/4-inch by 4 foot Flexsteel, green, hardwall hose MxMS:
    a. Manufacturers and Products:
        1) ContiTech USA.
        2) Or Approved Equal.
5. 3/4-inch by 8 foot Flexsteel, green, hardwall hose MxMS:
    a. Manufacturers and Products:
        1) ContiTech USA.
        2) Or Approved Equal.

2.15 FUEL TRANSFER PUMP (SPLIT-VAULT AST MOUNTED)

A. Pump, Submersible Turbine.

1. Gasoline Equipment Package:
    a. Top mounted, submersible turbine pump with 1/3 hp fixed speed.
    b. Power: Single-phase, 208-230V ac, 60 Hz.
    c. Fixed length coordinated by manufacturer.
    d. Additional Features: Check valve, pressure relief valve, syphon, active air elimination, electrical disconnect.
    e. Riser length: See Drawings.
    f. Manufacturers and Products:
        1) Franklin Fueling Systems; FE Petro STP 33.
        2) Or Approved Equal.
2. Diesel Equipment Package:
    a. Top mounted, submersible turbine pump with 3/4 hp fixed speed.
    b. Power: Single-phase, 208-230V ac, 60 Hz.
    c. Fixed length coordinated by manufacturer.
    d. Additional Features: Check valve, pressure relief valve, syphon, active air elimination, electrical disconnect.

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e. Riser Length: See Drawings.
f. Manufacturers and Products:
1) Franklin Fueling Systems; FE Petro STP 75.
2) Or Approved Equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to installation, visually inspect tank for impact damage that may have occurred during storage. Repair damage as approved by City.

3.02 INSTALLATION

A. In accordance with manufacturer's written instructions and the AST Installation Checklist in Section A, Fees and Permits.

B. Lift tanks using manufacturer provided lifting points or with nylon slings as recommended by manufacturer.

C. Install tanks on a reinforced concrete slab as specified on Drawings.

D. Attach tanks with steel legs to concrete pad with anchor bolts sized to match holes provided in tank legs.

E. Install tank package system valves as specified herein and in accordance with manufacturer's instructions.

3.03 FIELD TESTING

A. General:

1. City shall supply fuel for testing. Contractor shall coordinate with City's Representative in advance of scheduling any testing.
2. Prior to startup, inspect equipment for proper installation and connection by means of a functional test. Demonstrate proper operation of normal vent valves, remote fill boxes, antisiphon valves, and solenoid valves.
3. Perform testing as specified below and in accordance with manufacturer's written procedures. If manufacturer's written procedures conflict with instructions below, notify City and Engineer of discrepancy.

B. Primary Tank:

1. Test for leaks by pressurizing with air or inert gas at a minimum pressure of 3 psig and a maximum pressure of 5 psig for a minimum of 2 hours.
2. If drop in pressure or leak is detected, repair leaks in accordance with manufacturer's written recommendations.
3. While under pressure, apply soap solution to piping connections to aid in detection of leaks.
4. Repair and retest until no leaks are detected.

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5. Shade tank and allow temperature of test medium to equalize prior to start of test, as required to mitigate effects of tank heat loss or heat gain on test results.
6. For secondary contained tanks, vent secondary containment to atmospheric pressure during testing of primary tank.

C. Secondary Tank:

1. After primary tank has been successfully tested, test for leaks by pressurizing at a minimum pressure of 3 psig and a maximum pressure of 5 psig. Vacuum test in accordance with manufacturer's written procedures may be performed in lieu of pressure testing.
2. During testing of secondary tank, maintain a minimum pressure of 3 psig on primary tank.
3. While under pressure, apply soap solution to piping connections to aid in leak detection.
4. If pressure drop or leak is detected, repair leaks in accordance with manufacturer's written recommendations.
5. Repair and retest until no leaks are detected.

D. Level and Leak Instrumentation:

1. Demonstrate tank high level and low level instrumentation indication and alarm functions.
2. Fill tank with fuel to demonstrate alarm and level indications that occur on rising fuel level.
3. Set tank high level alarm to activate at 90 percent of tank capacity, unless otherwise noted.
4. Pump fuel from tank using a temporary pump and portable tank to demonstrate tank low level alarm.
5. Demonstrate secondary tank leak detector function by removing leak sensor from tank annulus and placing it in both fuel and water to simulate a leak.
6. Demonstrate alarm to plant control system or remote locations.

E. Overfill Limiter Valve:

1. Fill tank with fuel to demonstrate functioning of overfill limiter valve.
2. Set overfill limiter valve to shut off fuel flow to tank at 95 percent of tank capacity, unless otherwise noted.

F. Grounding: Measure and record resistance from tank to ground in accordance with Section 26 05 26, Grounding and Bonding for Electrical Systems. Resistance shall be 20 ohms or less.

G. Fuel Pipe Valves: Pressure test at time of pipe testing in accordance with Section 40 27 00, Process Piping–General.

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3.04 EQUIPMENT TESTING

A. Preparation:

1. Complete installation before testing.
2. Furnish qualified manufacturers' representatives, when required by individual Specification sections.
3. Obtain and submit from equipment manufacturer's representative Manufacturer's Certificate of Proper Installation Form, in accordance with Section 01 43 33, Manufacturers' Field Services, when required by individual Specification sections.
4. Equipment Test Report Form: Provide written test report for each item of equipment to be tested, to include the minimum information:
   a. City/Project Name.
   b. Equipment or item tested.
   c. Date and time of test.
   d. Type of test performed (Functional or Performance).
   e. Test method.
   f. Test conditions.
   g. Test results.
   h. Signature spaces for Contractor, City and Engineer as witness.
5. Cleaning and Checking: Prior to beginning functional testing:
   a. Calibrate testing equipment in accordance with manufacturer's instructions.
   b. Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
   c. Lubricate equipment in accordance with manufacturer's instructions.
   d. Turn rotating equipment by hand when possible to confirm that equipment is not bound.
   e. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
   f. Check power supply to electric-powered equipment for correct voltage.
   g. Adjust clearances and torque.
   h. Test piping for leaks.
6. Ready-to-test determination will be by City based at least on the following:
   a. Acceptable Operation and Maintenance Data.
   b. AST Installation Checklist
   c. Notification by Contractor of equipment readiness for testing.
   d. Receipt of Manufacturer's Certificate of Proper Installation, if so specified.
   e. Adequate completion of work adjacent to, or interfacing with, equipment to be tested.
   f. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
   g. Satisfactory fulfillment of other specified manufacturer's responsibilities.
   h. Equipment and electrical tagging complete.
   i. Delivery of all spare parts and special tools.

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B. Functional Testing:

1. Conduct as specified in individual Specification sections.
2. Notify the City and Engineer in writing at least 10 days prior to scheduled date of testing.
3. Prepare Equipment Test Report summarizing test method and results.
4. When, in Engineer's opinion, equipment meets functional requirements specified, such equipment will be accepted for purposes of advancing to performance testing phase, if so required by individual Specification sections. Such acceptance will be evidenced by Engineer/City's signature as witness on Equipment Test Report.

C. Performance Testing:

1. Conduct as specified in individual Specification sections.
2. Notify the Engineer and City in writing at least 10 days prior to scheduled date of test.
3. Performance testing shall not commence until equipment has been accepted by the City as having satisfied functional test requirements specified.
4. Type of fluid, gas, or solid for testing shall be as specified.
5. Unless otherwise indicated, furnish labor, materials, and supplies for conducting the test and taking samples and performance measurements.
6. Prepare Equipment Test Report summarizing test method and results.
7. When, in Engineer's opinion, equipment meets performance requirements specified, such equipment will be accepted as to conforming to Contract requirements. Such acceptance will be evidenced by Engineer's signature on Equipment Test Report.

3.05 STARTUP OF UNIT PROCESSES

A. Prior to unit process startup, equipment within unit process shall be accepted by Engineer as having met functional and performance testing requirements specified.

B. Startup sequencing of unit processes shall be as chosen by Contractor to meet schedule requirements.

C. Make adjustments, repairs, and corrections necessary to complete unit process startup.

D. Startup shall be considered complete when, in opinion of Engineer, unit process has operated in manner intended for 5 continuous days without significant interruption. This period is in addition to functional or performance test periods specified elsewhere.

E. Significant Interruption: May include any of the following events:

1. Failure of Contractor to provide and maintain qualified onsite startup personnel as scheduled.

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2. Failure to meet specified functional operation for more than 2 consecutive hours.
3. Failure of any critical equipment or unit process that is not satisfactorily corrected within 5 hours after failure.
4. Failure of any noncritical equipment or unit process that is not satisfactorily corrected within 8 hours after failure.
5. As determined by Engineer.

F. A significant interruption will require startup then in progress to be stopped. After corrections are made, startup test period to start from beginning again.

3.06 FACILITY PERFORMANCE DEMONSTRATION

A. When, in the opinion of Engineer, startup of all unit processes has been achieved, sequence each unit process to the point that facility is operational.

B. Demonstrate proper operation of required interfaces within and between individual unit processes.

C. After facility is operating, complete performance testing of equipment and systems not previously tested.

D. Document, as defined in Facility Startup and Performance Demonstration Plan, the performance of the facility until all unit processes are operable and under control of computer system.

E. Certify, on the Facility Performance Demonstration/Certification Form, that facility is capable of performing its intended function(s), including fully automatic and computerized operation.

3.07 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:

1. Present at Site or classroom designated by City, for minimum person-days listed below, travel time excluded:
   a. 2 person-days for installation assistance and inspection.
   b. 1 person-day for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
   c. 1/2 person-day for prestartup classroom or Site training.
   d. 1 person-day for facility startup.
   e. 1/2 person-day for post-startup training of City's personnel. Training shall not commence until accepted detailed lesson plan for each training activity has been reviewed by City.

B. See Section 01 43 33, Manufacturers' Field Services.

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3.08 SUPPLEMENTS

A. Supplements listed below, following “End of Section,” are a part of this Specification:

1. Unit Process Startup Form.
2. Facility Performance Demonstration/Certification Form.

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UNIT PROCESS STARTUP FORM

CITY:_____ **PROJECT:**_____

Unit Process Description: (Include description and equipment number of all equipment and devices):

_____

_____

_____

_____

Startup Procedure (Describe procedure for sequential startup and evaluation, including valves be opened/closed, order of equipment startup, etc.):

_____

_____

_____

_____

_____

Startup Requirements (Water, power, chemicals, etc.):_____

_____

_____

Evaluation Comments:_____

_____

_____

_____

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FACILITY PERFORMANCE DEMONSTRATION/CERTIFICATION FORM

CITY:_____ **PROJECT:**_____

Unit Processes Description (List unit processes involved in facility startup):

_____

_____

_____

_____

Unit Processes Startup Sequence (Describe sequence for startup, including computerized operations, if any):

_____

_____

_____

_____

_____

Contractor Certification that Facility is capable of performing its intended function(s), including fully automatic operation:

Contractor: _____ **Date:** _____, **20**____

City/Engineer: _____ **Date:** _____, **20**____
(Authorized Signature)

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SECTION 26 05 02
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Requirements specified within this section apply to Division 26, Electrical. Work specified herein shall be performed as if specified in the individual sections.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. National Electrical Contractors Association (NECA): National Electrical Installation Standards.
2. National Electrical Manufacturers Association (NEMA):
   a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   b. Z535.4, Product Safety Signs and Labels.
3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

1.03 DESIGN REQUIREMENTS

A. Provide anchorage and bracing design drawings, calculations, and related information where required under Section 01 88 15, Anchorage and Bracing.

1.04 SUBMITTALS

A. Action Submittals:

1. Provide manufacturers' data for the following:
   a. Nameplates, signs, and labels.
2. Anchorage and bracing drawings and catalog information, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals: Anchorage and bracing calculations, as required by Section 01 88 15, Anchorage and Bracing.

1.05 QUALITY ASSURANCE

A. Provide the Work in accordance with NFPA 70. Where required by Authority Having Jurisdiction (AHJ), material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ, in order to provide a basis for approval under the NEC.

B. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark or label.

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C. Provide materials and equipment acceptable to AHJ for Class, Division, and Group of hazardous area indicated.

1.06 ENVIRONMENTAL CONDITIONS

A. The following areas are classified hazardous Class IB, and Class II because of the potential for occurrence of hazardous concentrations of combustible gases. Use materials and methods required for such areas.

1. Any and all areas near fuel storage tanks per NFPA 30 and NFPA 70.

PART 2 PRODUCTS

2.01 GENERAL

A. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.

B. Material and equipment installed in heated and ventilated areas shall be capable of continuous operation at their specified ratings within an ambient temperature range of 40 degrees F to 104 degrees F.

C. Materials and equipment installed outdoors shall be capable of continuous operation at their specified rating within the ambient temperature range of 25 degrees F to 120 degrees F.

D. Equip panels installed outdoors in direct sun with sun shields.

2.02 EQUIPMENT FINISH

A. Manufacturer's standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in accordance with light gray color finish as approved by the City.

2.03 NAMEPLATES

A. Material: Laminated plastic.

B. Attachment Screws: Stainless steel.

C. Color: Black, engraved to a white core.

D. Letter Height:

1. Pushbuttons/Selector Switches: 1/8 inch.
2. Other Electrical Equipment: 1/4 inch.

2.04 SIGNS AND LABELS

A. Sign size, lettering, and color shall be in accordance with NEMA Z535.4.

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PART 3 EXECUTION

3.01 GENERAL

A. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned. Contractor shall be responsible for actual location of equipment and devices and for proper routing and support of raceways, subject to approval of the City.

B. Check approximate locations of light fixtures, switches, electrical outlets, equipment, and other electrical system components shown on Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify the City in writing.

C. Install work in accordance with NECA Standard of Installation, unless otherwise specified.

D. Keep openings in boxes and equipment closed during construction.

E. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of the Engineer. Carefully perform 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 to original condition.

3.02 COMBINING CIRCUITS INTO COMMON RACEWAY

A. Drawings show each homerun circuit to be provided. Do not combine power or control circuits into common raceways without authorization of the City.

B. Homerun circuits shown on Drawings indicate functional wiring requirements for power and control circuits. Circuits may be combined into common raceways in accordance with the following requirements:

1. Power circuits from loads in same general area to same source location: panelboard, low voltage motor control center).
    a. Lighting Circuits: Combine no more than three circuits to a single raceway. Contractor shall be responsible for increasing conduit and conductor size if derating is required by NEC.
    b. All Other Power Circuits: Do not combine power circuits without authorization of the City.

3.03 NAMEPLATES, SIGNS, AND LABELS

A. Multiple Power Supply Sign: Install permanent plaque or directory at each service disconnect location denoting other services, feeders, and branch circuits supplying the building, and the area served by each.

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B. Equipment Nameplates:

1. Provide a nameplate to label electrical equipment including switchgear, switchboards, motor control centers, panelboards, motor starters, transformers, terminal junction boxes, disconnect switches, switches and control stations.
2. Switchgear, motor control center, transformer, and terminal junction box nameplates shall include equipment designation.
3. Disconnect switch, starter, and control station nameplates shall include name and number of equipment powered or controlled by that device.
4. Switchboard and panelboard nameplates shall include equipment designation, service voltage, and phases.

3.04 LOAD BALANCE

A. Drawings and Specifications indicate circuiting to electrical loads and distribution equipment.

B. Balance electrical load between phases as nearly as possible on switchboards, panelboards, motor control centers, and other equipment where balancing is required.

C. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

3.05 CLEANING AND TOUCHUP PAINTING

A. Cleaning: Throughout the Work, clean interior and exterior of devices and equipment by removing debris and vacuuming.

B. Touchup Paint:

1. Touchup scratches, scrapes and chips on exterior and interior surfaces of devices and equipment with finish matching type, color, and consistency and type of surface of original finish.
2. If extensive damage is done to equipment paint surfaces, refinish entire equipment in a manner that provides a finish equal to or better than factory finish, that meets requirements of Specification, and is acceptable to the Engineer.

3.06 PROTECTION FOLLOWING INSTALLATION

A. Protect materials and equipment from corrosion, physical damage, and effects of moisture on insulation and contact surfaces.

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B. When equipment intended for indoor installation is installed at Contractor's convenience in areas where subject to dampness, moisture, dirt or other adverse atmosphere until completion of construction, ensure adequate protection from these atmospheres is provided and acceptable to the City.

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SECTION 26 05 04
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
   a. A1011/A1011M, Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy and High-Strength Low Alloy Formability.
   b. E814, Method of Fire Tests of Through-Penetration Fire Stops.
2. Canadian Standards Association (CSA).
3. Institute of Electrical and Electronics Engineers, Inc. (IEEE): 18, Standard for Shunt Power Capacitors.
4. International Society of Automation (ISA): RP12.06.01, Wiring Practices for Hazardous (Classified) Locations Instrumentation–Part 1: Intrinsic Safety.
5. National Electrical Manufacturers Association (NEMA):
   a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
   b. C12.1, Code for Electricity Metering.
   c. C12.6, Phase-Shifting Devices Used in Metering, Marking and Arrangement of Terminals.
   d. ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
   e. ICS 5, Industrial Control and Systems: Control Circuit and Pilot Devices.
   f. KS 1, Enclosed and Miscellaneous Distribution Switches (600 Volts Maximum).
6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
7. UL:
   a. 98, Standard for Enclosed and Dead-Front Switches.
   b. 248, Standard for Low Voltage Fuses.
   c. 486E, Standard for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors.
   d. 489, Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
   e. 508, Standard for Industrial Control Equipment.
   f. 810, Standard for Capacitors.
   g. 943, Standard for Ground-Fault Circuit-Interrupters.
   h. 1059, Standard for Terminal Blocks.
   i. 1479, Fire Tests of Through-Penetration Fire Stops.

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1.02 SUBMITTALS

A. Action Submittals:

1. Provide manufacturers' data for the following:
   a. Control devices.
   b. Control relays.
   c. Circuit breakers.
   d. Fused switches.
   e. Nonfused switches.
   f. Timers.
   g. Fuses.
   h. Magnetic contactors.
   i. Intrinsic safety barriers.
   j. Firestopping.
   k. Enclosures: Include enclosure data for products having enclosures.
2. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals: Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.

1.03 EXTRA MATERIALS

A. Furnish, tag, and box for shipment and storage the following spare parts and special tools:

1. Fuses, 0 Volt to 600 Volts: Six of each type and each current rating installed.

PART 2 PRODUCTS

2.01 MOLDED CASE CIRCUIT BREAKER THERMAL MAGNETIC, LOW VOLTAGE

A. General:

1. Type: Molded case.
2. Trip Ratings: 15 amps to 800 amps.
3. Voltage Ratings: 120, 240, 277, 480, and 600V ac.
4. Suitable for mounting and operating in any position.
5. UL 489.

B. Operating Mechanism:

1. Overcenter, trip-free, toggle type handle.
2. Quick-make, quick-break action.
3. Locking provisions for padlocking breaker in OPEN position.
4. ON/OFF and TRIPPED indicating positions of operating handle.
5. Operating handle to assume a CENTER position when tripped.

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C. Trip Mechanism:

1. Individual permanent thermal and magnetic trip elements in each pole.
2. Variable magnetic trip elements with a single continuous adjustment 3X to 10X for frames greater than 100 amps.
3. Two and three pole, common trip.
4. Automatically opens all poles when overcurrent occurs on one pole.
5. Test button on cover.
6. Calibrated for 40 degrees C ambient, unless shown otherwise.
7. Do not provide single-pole circuit breakers with handle ties where multi-pole circuit breakers are shown.

D. Short Circuit Interrupting Ratings:

1. Equal to rating of existing equipment.
2. Not less than the following rms symmetrical currents for the indicated trip ratings:
   a. Up to 100A, 250V ac to 600V ac: 45,000 amps.

E. Connections:

1. Supply (line side) at either end.
2. Mechanical wire lugs, except crimp compression lugs where shown.
3. Lugs removable/replaceable for breaker frames greater than 100 amperes.
4. Suitable for 75 degrees C rated conductors without derating breaker or conductor ampacity.

F. Enclosures for Independent Mounting:

1. See Article Enclosures.
2. Service Entrance Use: Breakers in required enclosure and required accessories shall be UL 489 listed.
3. Interlock: Enclosure and switch shall interlock to prevent opening cover with switch in the ON position. Provide bypass feature for use by qualified personnel.

2.02 COMBINATION MOTOR STARTERS

A. General: Combination motor starters shall consist of an integrally mounted magnetic starter and a breaker type disconnect switch in a heavy-duty type, dead front, sheet steel NEMA 1 enclosure, surface-mounted. Size and number of poles shall be as shown and required by equipment served. Combination motor starters shall be as specified for individual motor starters, except as modified herein.

B. Individual Motor Starters: shall consist of an integrally mounted, magnetic, full voltage, non-reversing (FVNR), 1-speed, 1-winding starter in a heavy-duty type, dead front, sheet steel enclosure and shall be surface mounted. Size and number of poles shall be as shown and required by equipment served. All starters shall be constructed and tested in accordance with the latest NEMA standards and shall be NEMA standard sizes. IEC sizes are not acceptable. All starters shall contain 480V – 120V control transformer.

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C. Contacts: Magnetic starter contacts shall be solid silver cadmium oxide alloy and shall not require any filing, dressing or cleaning throughout the life of the starter.

D. Operating Coils: Operating coils shall be 120-volts and shall be pressure molded and designed so that accidental exposure to excessive voltage up to 480-volts will not damage the coil. The starter design shall also be such that when a coil fails due to an overvoltage condition, the starter shall definitely open and shall not freeze in the closed position.

E. Overload Relays: All starters shall have class 10 solid state overload relays. Overload relays shall have visual trip indication, be ambient insensitive within an operating temperature range to minus 20 and to plus 70 degrees Celsius. They shall provide built in thermal memory to prevent hot motor restarts. Relays shall provide protection against phase current loss, and phase current unbalance, adjustable from 20 to 50 percent for all three phases. Relay shall have adjustable full load current dial. They shall have a reset mechanism that resets on the upstroke only.

F. Pilot Lights: Pilot lights shall be mounted in the starter enclosure cover. Pilot lights shall be operated from an interlock on the motor starter and shall not be wired across the operating coil. Pilot lights shall be LED type. Furnish pilot lights for motor starters:

1. Provide red RUNNING pilot lights for all motor starters.
2. Provide green STOPPED pilot lights for all motor starters.
3. Provide white POWER pilot lights for all motor starters.
4. Provide amber FAIL pilot lights for all motor starters.

G. Controls: Provide starters with ON-OFF-AUTO switches as shown or required. Motor starter controls shall be mounted in the starter enclosure cover.

H. Control Power: A single-phase control power transformer shall be included integrally with each starter for 120-volt control power. The primary shall be connected to the line side of the motor starter and shall have both legs fused; the secondary shall have one leg fused and one leg grounded. Arrange transformer terminals so that wiring to terminals will not be located above the transformer.

I. Auxiliary Contacts: Each starter shall have a minimum of one normally open and one normally closed convertible auxiliary contact in addition to the number of contacts required for the “holding interlock”. Provide additional contacts if required for control, interlock, and monitoring. In addition, it shall be possible to field-install one or more additional auxiliary contacts without removing existing wiring or removing the starter from its enclosure.

J. Unit Wiring: Unit shall be completely prewired to terminals to eliminate any interior field wiring except for:

1. Connection of power supply conductors to switch line side terminals.
2. Motor leads to the starter load side terminals.
3. Control conductors to holding coil terminals.

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K. Enclosures: All combination motor starter enclosures shall be NEMA 1, general purpose enclosures, unless shown otherwise.

2.03 PUSHBUTTON, INDICATING LIGHT, AND SELECTOR SWITCH

A. Contact Rating: 7,200VA make, 720VA break, at 600V, NEMA ICS 5 Designation A600.

B. Selector Switch Operating Lever: Bat lever.

C. Indicating Light: LED, full voltage.

D. Pushbutton Color:

1. RESET: Black.

E. Legend Plate:

1. Material: Aluminum.
2. Engraving: Enamel filled in high contrasting color.
3. Text Arrangement: 11-character/spaces on one line, 14-character/spaces on each of two lines, as required, indicating specific function.
4. Letter Height: 7/64 inch.

F. Manufacturers and Products:

1. Heavy-Duty, Oil-Tight Type:
   a. General Electric Co.; Type CR 104P.
   b. Square D Co.; Type T.
   c. Eaton/Cutler-Hammer; Type 10250T.
   d. Or Approved Equal.
2. Heavy-Duty, Watertight, and Corrosion-Resistant Type:
   a. Square D Co.; Type SK.
   b. General Electric Co.; Type CR 104P.
   c. Eaton/Cutler-Hammer; Type E34.
   d. Crouse-Hinds; Type NCS.
   e. Or Approved Equal.

2.04 TERMINAL BLOCK, 600 VOLTS

A. UL 486E and UL 1059.

B. Size components to allow insertion of necessary wire sizes.

C. Capable of termination of control circuits entering or leaving equipment, panels, or boxes.

D. Screw clamp compression, dead front barrier type, with current bar providing direct contact with wire between compression screw and yoke.

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E. Yoke, current bar, and clamping screw of high strength and high conductivity metal.

F. Yoke shall guide all strands of wire into terminal.

G. Current bar shall ensure vibration-proof connection.

H. Terminals:

1. Capable of wire connections without special preparation other than stripping.
2. Capable of jumper installation with no loss of terminal or rail space.
3. Individual, rail mounted.

I. Marking system, allowing use of preprinted or field-marked tags.

J. Manufacturers:

1. Weidmuller, Inc.
2. Ideal.
3. Electrovert USA Corp.
4. Or Approved Equal.

2.05 MAGNETIC CONTROL RELAY

A. Industrial control with field convertible contacts rated 10 amps continuous, 7,200VA make, 720VA break.

B. NEMA ICS 2, Designation: A600 (600 volts).

C. Manufacturers and Products:

1. Eaton/Cutler-Hammer; D26 Type M.
2. General Electric Co.; Type CR120A.
3. Square D; Type X.
4. Or Approved Equal.

2.06 ELAPSED TIME METER

A. Drive: Synchronous motor.

B. Range: 0 hour to 99,999.9 hours, nonreset type.

C. Mounting: Semiflush panel.

D. Manufacturers and Products:

1. General Electric Co.; Type 240, 2-1/2-inch Big Look.
2. Eagle Signal Controls; Bulletin 705.
3. Or Approved Equal.

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2.07 MAGNETIC CONTACTOR

A. UL listed.

B. Electrically operated, electrically held.

C. Main Contacts:

1. Power driven in one direction with mechanical spring dropout.
2. Silver alloy with wiping action and arc quenchers.
3. Continuous-duty, rated 30 amperes.
4. Poles: Three.

D. Control: Two-wire.

E. Auxiliary Contacts: One normally open and one normally closed rated 7200VA make, 720VA break, at 600V, A600 per NEMA ICS 5.

F. Enclosures: See Article Enclosures.

G. Manufacturers and Products:

1. Eaton/Cutler-Hammer; Class A201.
2. General Electric Co.; CR 353.
3. Square D Co.; Class 8910.
4. Or Approved Equal.

2.08 SUPPORT AND FRAMING CHANNELS

A. Carbon Steel Framing Channel:

1. Material: Rolled, mild strip steel, 12-gauge minimum, ASTM A1011/ A1011M, Grade 33.
2. Finish: Hot-dip galvanized after fabrication.

B. Paint Coated Framing Channel: Carbon steel framing channel with electro-deposited rust inhibiting acrylic or epoxy paint.

C. Stainless Steel Framing Channel: Rolled, Type 316 stainless steel, 12-gauge minimum.

D. Extruded Aluminum Framing Channel:

1. Material: Extruded from Type 6063-T6 aluminum alloy.
2. Fittings fabricated from Alloy 5052-H32.

E. Nonmetallic Framing Channel:

1. Material: Fire retardant, fiber reinforced vinyl ester resin.
2. Channel fitting of same material as channel.

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3. Nuts and bolts of long glass fiber reinforced polyurethane.

F. Manufacturers:

1. B-Line Systems, Inc.
2. Unistrut Corp.
3. Aickinstrut.
4. Or Approved Equal.

2.09 INTRINSIC SAFETY BARRIER

A. Provides a safe energy level for exposed wiring in a Class I, Division 1 or Division 2 hazardous area when circuit is connected to power source in nonhazardous area.

B. Rating: Power source shall be rated 24 volts dc, nominal, with not more than 250 volts available under fault conditions.

C. Contact Rating: 5 amps, 250 V ac.

D. Mounting: Rail or surface.

E. Manufacturers and Products:

1. MTL, Inc.; Series 2000 or Series 3000.
2. R. Stahl, Inc.
3. Or Approved Equal.

2.10 ENCLOSURES

A. Finish: Sheet metal structural and enclosure parts shall be completely painted using an electrodeposition process so interior and exterior surfaces as well as bolted structural joints have a complete finish coat on and between them.

B. Color: Manufacturer's standard color (gray) baked-on enamel, unless otherwise shown.

C. Barriers: Provide metal barriers within enclosures to separate wiring of different systems and voltage.

D. Enclosure Selections:

1. Except as shown otherwise, provide electrical enclosures according to the following table:

Enclosures			
Location	**Finish**	**Environment**	**NEMA 250 Type**
Indoor	Unfinished	Industrial Use	12
Indoor and Outdoor	Any	Wet	4

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PART 3 EXECUTION

3.01 GENERAL

A. Install equipment in accordance with manufacturer's recommendations.

3.02 INSTALLATION OF MOTOR STARTERS

A. General: Install motor starters where shown, in accordance with the manufacturer's written instructions, the applicable requirements of the NEC and the NECA's "Standard of Installation", and recognized industry practices to ensure that products serve the intended function. Major equipment motor starters located in mechanical rooms that are a part of the main building service shall be mounted where top of panel is 60-inches above finish floor.

B. Supports: Provide all individual and combination motor starters with galvanized angle or other suitable supports where mounting on wall or other rigid surface is impractical. Starters shall not be supported by conduit alone. Where motor starters are mounted on equipment served, the switch shall not inhibit removal of any service panels or interfere with any required access areas. All motor starters shall be installed plumb and aligned in the plane of the wall in/on which they are installed.

C. Testing:

1. Pre-energization Check: Check motor starters for continuity of circuits, short circuits, presents of foreign material, and remedy prior to energizing.
2. Post Hookup Test: Subsequent to wire and cable hook-ups, energize motor starter and demonstrate satisfactory functioning.
3. Motor-starter Coordination Documentation: Provide motor-starter coordination documents including, but not limited to, the following information in the operation and maintenance manuals:
    a. Motor size in horsepower.
    b. Motor full load amps.
    c. Motor efficiency.
    d. Motor service factor.
    e. Size and manufacturer's catalog number of starter and thermal overloads.

D. Motor Rotation: Verify that motor rotation is correct as connected. Where rotation must be changed, reconnect phase conductors to motor leads at motor junction box.

E. Identification:

1. Provide nameplate for all motor starters.
2. Every starter shall have an internal wiring diagram on the inside of the starter cover and shall be labeled inside the cover to indicate the type and ampacity of thermal overloads installed.

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3.03 PUSHBUTTON, INDICATING LIGHT, AND SELECTOR SWITCH

A. Install heavy-duty, oil-tight type in nonhazardous, indoor, dry locations, including motor control centers, control panels, and individual stations, unless otherwise shown.

B. Install heavy-duty, watertight and corrosion-resistant type in nonhazardous, outdoor, or normally wet areas, unless otherwise shown.

3.04 SUPPORT AND FRAMING CHANNEL

A. Install where required for mounting and supporting electrical equipment, raceway, and cable tray systems.

B. Channel Type:

1. Interior, Wet or Dry Locations:
   a. Aluminum Raceway: Extruded aluminum or carbon steel with neoprene material isolators.
   b. PVC-Coated Conduit: PVC coated.
2. Outdoor:
   a. PVC Conduit: Type 316 stainless steel or nonmetallic.
   b. Aluminum Raceway: Aluminum.
   c. Other Systems Not Covered: Type 316 stainless steel.
3. Aluminum Railings: Devices mounted on aluminum railing shall use aluminum framing channel.

C. Paint cut ends prior to installation with the following:

1. Carbon Steel Channel: Zinc-rich primer.
2. Painted Channel: Rust-inhibiting epoxy or acrylic paint.
3. Nonmetallic Channel: Epoxy resin sealer.
4. PVC-Coated Channel: PVC patch.

3.05 INTRINSIC SAFETY BARRIERS

A. Install in compliance with ISA RP12.06.01.

B. Arrange conductors such that wiring from hazardous areas cannot short to wiring from nonhazardous area.

C. Stencil “INTRINSICALLY SAFE CIRCUIT” on all boxes enclosing barriers.

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SECTION 26 05 05
CONDUCTORS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Association of Edison Illuminating Companies (AEIC): CS 8, Specification for Extruded Dielectric Shielded Power Cables Rated 5 kV through 46 kV.
2. ASTM International (ASTM):
   a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   b. B3, Standard Specification for Soft or Annealed Copper Wire.
   c. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
   d. B496, Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors.
3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   a. 48, Standard Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV Through 500 kV.
   b. 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V.
   c. 404, Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500000 V.
4. Insulated Cable Engineer's Association, Inc. (ICEA):
   a. S-58-679, Standard for Control Cable Conductor Identification.
   b. S-73-532, Standard for Control Thermocouple Extensions and Instrumentation Cables.
   c. T-29-520, Conducting Vertical Cable Tray Flame Tests with Theoretical Heat Input of 210,000 Btu/hour.
5. National Electrical Manufacturers' Association (NEMA):
   a. CC 1, Electric Power Connectors for Substations.
   b. WC 57, Standard for Control, Thermocouple Extension, and Instrumentation Cables.
   c. WC 70, Standard for Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
   d. WC 71, Standard for Nonshielded Cables Rated 2001-5000 Volts for Use in the Distribution of Electric Energy.
   e. WC 74, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.
6. National Fire Protection Association (NFPA):
   a. 70, National Electrical Code (NEC).
   b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
7. Telecommunications Industry Association (TIA): TIA-568-C, Commercial Building Telecommunications Cabling Standard.

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8. UL:
    a. 13, Standard for Safety for Power-Limited Circuit Cables.
    b. 44, Standard for Safety for Thermoset-Insulated Wires and Cables.
    c. 62, Standard for Safety for Flexible Cord and Cables.
    d. 486A-486B, Standard for Safety for Wire Connectors.
    e. 486C, Standard for Safety for Splicing Wire Connectors.
    f. 510, Standard for Safety for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
    g. 854, Standard for Safety for Service-Entrance Cables.
    h. 1072, Standard for Safety for Medium-Voltage Power Cables.
    i. 1277, Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
    j. 1569, Standard for Safety for Metal-Clad Cables.
    k. 1581, Standard for Safety for Reference Standard for Electrical Wires, Cables, and Flexible Cords.

1.02 SUBMITTALS

A. Action Submittals:

1. Product Data:
    a. Wire and cable.
    b. Wire and cable accessories.
    c. Cable fault detection system.
2. Manufactured Wire Systems:
    a. Product data.
    b. Rating information.
    c. Dimensional drawings.
    d. Special fittings.
3. Cable Pulling Calculations:
    a. Ensure submitted and reviewed before cable installation.
    b. Provide for the following cable installations:
        1) Power and control conductor, and control and instrumentation cable installations in ductbanks.

B. Informational Submittals: Factory Test Report for conductors 600 volts and below.

1.03 QUALITY ASSURANCE

A. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70. Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
2. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark.

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1.04 INSULATION TESTING

A. Testing Requirements: The following test requirements supplement test and acceptance criteria that may be stated elsewhere.

B. Electrical Tests:

1. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500V dc for 300 volt rated cable, and 1,000V dc for 600 volt rated cable. Test duration shall be 1 minute.
2. Equipment which may be damaged during this test shall be disconnected.
3. The Engineer shall be consulted if minimum insulation values cannot be obtained.
4. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable.

C. Electrical Test Values: Insulation-resistance values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations shall be investigated.

D. Electrical Test Report:

1. The test report shall include the following:
   a. Summary of project.
   b. Description of equipment tested.
   c. Description of test.
   d. Test data.
   e. Analysis and recommendations.
2. Test data records shall include the following minimum requirements:
   a. Identification of the testing organization.
   b. Equipment identification.
   c. Humidity, temperature, and other atmospheric conditions that may affect the results of the tests/calibrations.
   d. Date of electrical test.
   e. Identification of the testing technician.
   f. Indication of "as-found" and "as-left" results.
   g. Sufficient spaces to allow all results and comments to be indicated.
3. The Contractor shall submit the complete report to the Engineer for review.

PART 2 PRODUCTS

2.01 CONDUCTORS 600 VOLTS AND BELOW

A. Conform to applicable requirements of NEMA WC 70.

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B. Conductor Type:

1. 120-Volt and 277-Volt Lighting, 10 AWG and Smaller: Stranded copper.
2. 120-Volt Receptacle Circuits, 10 AWG and Smaller: Stranded copper.
3. All Other Circuits: Stranded copper.

C. Insulation: Type THHN/THWN-2, except for sizes No. 6 and larger, with XHHW-2 insulation.

2.02 600-VOLT RATED CABLE

A. General:

1. Type TC, meeting requirements of UL 1277, including Vertical Tray Flame Test at 70,000 Btu per hour, and NFPA 70, Article 340, or UL 13 meeting requirements of NFPA 70, Article 725.
2. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.
3. Suitable for installation in open air, in cable trays, or conduit.
4. Minimum Temperature Rating: 90 degrees C dry locations, 75 degrees C wet locations.
5. Overall Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.

B. Type 3, 16 AWG, Twisted, Shielded Pair, Instrumentation Cable: Single pair, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 57 requirements.

1. Outer Jacket: 45-mil nominal thickness.
2. Rating: Direct bury.
3. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer overlapped to provide 100 percent coverage.
4. Dimension: 0.31-inch nominal OD.
5. Conductors:
   a. Bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8.
   b. 20 AWG, seven-strand tinned copper drain wire.
   c. Insulation: 15-mil nominal PVC.
   d. Jacket: 4-mil nominal nylon.
   e. Color Code: Pair conductors, black and red.
6. Manufacturers:
   a. Okonite Co.
   b. Alpha Wire Corp.
   c. Belden.
   d. Or Approved Equal.

2.03 300-VOLT RATED CABLE

A. General:

1. Type PLTC, meeting requirements of UL 13 and NFPA 70, Article 725.

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2. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.
3. Suitable for installation in open air, in cable trays, or conduit.
4. Minimum Temperature Rating: 105 degrees C.
5. Passes Vertical Tray Flame Test.
6. Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.

2.04 SPECIAL CABLES

A. Type 29, Direct Bury Rated, Outdoor Shielded Twisted Pair (STP) Telephone and Data Cable, 300V:

1. Category 5e STP, UL listed, and third party verified to comply with TIA/EIA 568 C.2 Category 5e requirements.
2. Provide four each individually twisted pair, 24 AWG conductors, with Polyolefin insulation and black PVC jacket.
3. Outer Shield Material: Combination foil tape and braid shields.
   a. Layer 1: Foil tape aluminum/polyester shield with 100 percent coverage and 26 AWG solder tinned copper drawing wire.
   b. Layer 2: Tinned copper braided shield with a minimum of 70 percent coverage.
4. Cable shall withstand a bend radius of 1 inch minimum at a temperature of minus 20 degrees C maximum without jacket or insulation cracking.
5. Manufacturers and Products: Belden; 7921A, True Cable; CMX, or Approved Equal.

B. Type 30, Unshielded Twisted Pair (UTP) Telephone and Data Cable, 300V:

1. Category 6 UTP, UL listed, and third party verified to comply with TIA/EIA 568-C Category 6 requirements.
2. Suitable for high speed network applications including gigabit ethernet and video. Cable shall be interoperable with other standards compliant products and shall be backward compatible with Category 5 and Category 5e.
3. Provide four each individually twisted pair, 23 AWG conductors, with FEP insulation and blue PVC jacket.
4. NFPA 70 Plenum (CMP) rated; comply with flammability plenum requirements of NFPA 70 and NFPA 262.
5. Cable shall withstand a bend radius of 1-inch minimum at a temperature of minus 20 degrees C maximum without jacket or insulation cracking.
6. Manufacturer and Product: Belden; 7852A.

C. Tracer Wire, Flexible Copper Polyethylene (30), UL -Tracer Wire:

1. Conductor: Annealed bare copper.
2. Conductor Sizes: 6 – 18 AWG as indicated on Drawings.
3. Construction: One solid copper HMW-PE insulated conductor.
4. Insulation Material: HMW-PE (High Molecular Weight Polyethylene).
5. Insulation Thickness: 0.030-inch nominal wall.
6. Temperature Rating: Minus 20 degrees°C to plus 80 degrees°C.
7. Operating Voltage: 30V.

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8. Color: Yellow.
9. Tensile Strength: 35,000 psi.
10. Approvals: UL Listed for direct burial applications.
11. Manufacturers and Products: Agave Wire; APE Solid Copper PE30, or Approved Equal.

2.05 GROUNDING CONDUCTORS

A. Equipment: Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.

B. Direct Buried: Bare stranded copper.

2.06 ACCESSORIES FOR CONDUCTORS 600 VOLTS AND BELOW

A. Tape:

1. General Purpose, Flame Retardant: 7-mil, vinyl plastic, Scotch Brand 33+, rated for 90 degrees C minimum, meeting requirements of UL 510.
2. Flame Retardant, Cold and Weather Resistant: 8.5-mil, vinyl plastic, Scotch Brand 88.
3. Arc and Fireproofing:
   a. 30-mil, elastomer.
   b. Manufacturers and Products:
      1) 3M; Scotch Brand 77, with Scotch Brand 69 glass cloth tapebinder.
      2) Plymouth; 53 Plyarc, with 77 Plyglas glass cloth tapebinder.
      3) Or Approved Equal.

B. Identification Devices:

1. Sleeve:
   a. Permanent, PVC, yellow or white, with legible machine-printed black markings.
   b. Manufacturers and Products:
      1) Raychem; Type D-SCE or ZH-SCE.
      2) Brady, Type 3PS.
      3) Or Approved Equal.
2. Heat Bond Marker:
   a. Transparent thermoplastic heat bonding film with acrylic pressure sensitive adhesive.
   b. Self-laminating protective shield over text.
   c. Machine printed black text.
   d. Manufacturers and Products: 3M Co.; Type SCS-HB, or Approved Equal.
3. Marker Plate: Nylon, with legible designations permanently hot stamped on plate.
4. Tie-On Cable Marker Tags:
   a. Chemical-resistant white tag.
   b. Size: 1/2 inch by 2 inches.

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c. Manufacturers and Products: Raychem; Type CM-SCE, or Approved Equal.

5. Grounding Conductor: Permanent green heat-shrink sleeve, 2-inch minimum.

C. Connectors and Terminations:

1. Nylon, Self-Insulated Crimp Connectors:
   a. Manufacturers and Products:
      1) Thomas & Betts; Sta-Kon.
      2) Burndy; Insulug.
      3) ILSCO.
      4) Or Approved Equal.
2. Nylon, Self-Insulated, Crimp Locking-Fork, Torque-Type Terminator:
   a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
   b. Seamless.
   c. Manufacturers and Products:
      1) Thomas & Betts; Sta-Kon.
      2) Burndy; Insulink.
      3) ILSCO; ILSCONS.
      4) Or Approved Equal.
3. Self-Insulated, Freespring Wire Connector (Wire Nuts):
   a. UL 486C.
   b. Plated steel, square wire springs.
   c. Manufacturers and Products:
      1) Thomas & Betts.
      2) Ideal; Twister.
      3) Or Approved Equal.
4. Self-Insulated, Set Screw Wire Connector:
   a. Two piece compression type with set screw in brass barrel.
   b. Insulated by insulator cap screwed over brass barrel.
   c. Manufacturers:
      1) 3M Co.
      2) Thomas & Betts.
      3) Marrette.
      4) Or Approved Equal.

D. Cable Lugs:

1. In accordance with NEMA CC 1.
2. Rated 600 volts of same material as conductor metal.
3. Uninsulated Crimp Connectors and Terminators:
   a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
   b. Manufacturers and Products:
      1) Thomas & Betts; Color-Keyed.
      2) Burndy; Hydent.
      3) ILSCO.
      4) Or Approved Equal.

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4. Uninsulated, Bolted, Two-Way Connectors and Terminators:
    a. Manufacturers and Products:
        1) Thomas & Betts; Locktite.
        2) Burndy; Quiklug.
        3) ILSCO.
        4) Or Approved Equal.

E. Cable Ties:

1. Nylon, adjustable, self-locking, and reusable.
2. Manufacturers and Products: Thomas & Betts; TY-RAP, or Approved Equal.

F. Heat Shrinkable Insulation:

1. Thermally stabilized cross-linked polyolefin.
2. Single wall for insulation and strain relief.
3. Dual Wall, adhesive sealant lined, for sealing and corrosion resistance.
4. Manufacturers and Products:
    a. Thomas & Betts; SHRINK-KON.
    b. Raychem; RNF-100 and ES-2000.
    c. Or Approved Equal.

2.07 PULLING COMPOUND

A. Nontoxic, noncorrosive, noncombustible, nonflammable, water-based lubricant; UL listed.

B. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable.

C. Approved for intended use by cable manufacturer.

D. Suitable for zinc-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways.

E. Manufacturers:

1. Ideal Co.
2. Polywater, Inc.
3. Cable Grip Co.
4. Or Approved Equal.

2.08 SOURCE QUALITY CONTROL

A. Conductors 600 Volts and Below: Test in accordance with UL 44 and UL 854.

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PART 3 EXECUTION

3.01 GENERAL

A. Conductor installation shall be in accordance with manufacturer's recommendations.

B. Conductor and cable sizing shown is based on copper conductors, unless noted otherwise.

C. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii.

D. Terminate conductors and cables, unless otherwise indicated.

E. Tighten screws and terminal bolts in accordance with UL 486A-486B for copper conductors.

F. Cable Lugs: Provide with correct number of holes, bolt size, and center-to-center spacing as required by equipment terminals.

G. Ream, remove burrs, and clear interior of installed conduit before pulling wires or cables.

H. Concrete-Encased Raceway Installation: Prior to installation of conductors, pull through each raceway a mandrel approximately 1/4-inch smaller than raceway inside diameter.

3.02 POWER CONDUCTOR COLOR CODING

A. Conductors 600 Volts and Below:

1. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, and at accessible locations wrapped at least six full overlapping turns, covering area 1-1/2 inches to 2 inches wide.
2. 8 AWG and Smaller: Provide colored conductors.
3. Colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
240/120 Volts, Single-Phase, Three-Wire	Grounded Neutral One Hot Leg Other Hot Leg	White Black Red
208Y/120 Volts, Three-Phase, Four-Wire	Grounded Neutral Phase A Phase B Phase C	White Black Red Blue

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System	Conductor	Color
240/120 Volts, Three-Phase, Four-Wire, Delta, Center Tap, Ground on Single-Phase	Grounded Neutral Phase A High (wild) Leg Phase C	White Black Orange Blue
480Y/277 Volts, Three-Phase, Four-Wire	Grounded Neutral Phase A Phase B Phase C	White Brown Orange Yellow
Note: Phase A, B, C implies direction of positive phase rotation.		

4. Tracer: Outer covering of white with identifiable colored strip, other than green, in accordance with NFPA 70.

3.03 CIRCUIT IDENTIFICATION

A. Identify power, instrumentation, and control conductor circuits at each termination, and in accessible locations such as manholes, handholes, panels, switchboards, motor control centers, pull boxes, and terminal boxes.

B. Circuits Appearing in Circuit Schedules: Identify using circuit schedule designations.

C. Circuits Not Appearing in Circuit Schedules:

1. Assign circuit name based on device or equipment at load end of circuit.
2. Where this would result in same name being assigned to more than one circuit, add number or letter to each otherwise identical circuit name to make it unique.

D. Method:

1. Conductors 3 AWG and Smaller: Identify with sleeves or heat bond markers.
2. Cables and Conductors 2 AWG and Larger:
   a. Identify with marker plates or tie-on cable marker tags.
   b. Attach with nylon tie cord.
3. Taped-on markers or tags relying on adhesives not permitted.

3.04 CONDUCTORS 600 VOLTS AND BELOW

A. Install 10 AWG or 12 AWG conductors for branch circuit power wiring in lighting and receptacle circuits.

B. Do not splice incoming service conductors and branch power distribution conductors 6 AWG and larger, unless specifically indicated or approved by Engineer.

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C. Connections and Terminations:

1. Install wire nuts only on solid conductors. Wire nuts are not allowed on stranded conductors.
2. Install nylon self-insulated crimp connectors and terminators for instrumentation and control, circuit conductors.
3. Install self-insulated, set screw wire connectors for two-way connection of power circuit conductors 12 AWG and smaller.
4. Install uninsulated crimp connectors and terminators for instrumentation, control, and power circuit conductors 4 AWG through 2/0 AWG.
5. Install uninsulated, bolted, two-way connectors and terminators for power circuit conductors 3/0 AWG and larger.
6. Install uninsulated terminators bolted together on motor circuit conductors 10 AWG and larger.
7. Place no more than one conductor in any single-barrel pressure connection.
8. Install crimp connectors with tools approved by connector manufacturer.
9. Install terminals and connectors acceptable for type of material used.
10. Compression Lugs:
    a. Attach with a tool specifically designed for purpose. Tool shall provide complete, controlled crimp and shall not release until crimp is complete.
    b. Do not use plier type crimpers.

D. Do not use soldered mechanical joints.

E. Splices and Terminations:

1. Insulate uninsulated connections.
2. Indoors: Use general purpose, flame retardant tape or single wall heat shrink.
3. Outdoors, Dry Locations: Use flame retardant, cold- and weather-resistant tape or single wall heat shrink.
4. Below Grade and Wet or Damp Locations: Use dual wall heat shrink.

F. Cap spare conductors with UL listed end caps.

G. Cabinets, Panels, and Motor Control Centers:

1. Remove surplus wire, bridle and secure.
2. Where conductors pass through openings or over edges in sheet metal, remove burrs, chamfer edges, and install bushings and protective strips of insulating material to protect the conductors.

H. Control and Instrumentation Wiring:

1. Where terminals provided will accept such lugs, terminate control and instrumentation wiring, except solid thermocouple leads, with insulated, locking-fork compression lugs.
2. Terminate with methods consistent with terminals provided, and in accordance with terminal manufacturer's instructions.

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3. Locate splices in readily accessible cabinets or junction boxes using terminal strips.
4. Cable Protection:
   a. Under Infinite Access Floors: May install without bundling.
   b. All Other Areas: Install individual wires, pairs, or triads in flex conduit under floor or grouped into bundles at least 1/2 inch in diameter.
   c. Maintain integrity of shielding of instrumentation cables.
   d. Ensure grounds do not occur because of damage to jacket over shield.

I. Extra Conductor Length: For conductors to be connected by others, install minimum 6 feet of extra conductor in freestanding panels and minimum 2 feet in other assemblies.

3.05 ELECTRICAL INSULATION TESTS

A. The Contractor shall provide 10 Working Days' notice to the Engineer prior to any field testing to permit witnessing of the testing.

3.06 SUPPLEMENTS

A. The supplements listed below, following "End of Section," are part of this Specification.

1. Test Record Sheets:
   a. The test record sheets listed below shall be used to record testing of electrical equipment and of the electrical installation as required by these Specifications. Sample copies of each sheet are attached.

Sheet No.	
1	Insulation Resistance (Power, Control Wire, and Cable) Test Record
2	Insulation Resistance (Equipment) Test Record

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INSULATION RESISTANCE (POWER, CONTROL WIRE, AND CABLE) TEST RECORD

TEST EQUIPMENT: _____ TEST VOLTAGE: _____

TEST EQUIPMENT: _____ TEST VOLTAGE: _____

AMBIENT TEMPERATURE: _____ °C _____ °F DATE: _____

NOTES: 1. Perform Insulation Resistance Test (megger) between each conductor and all other conductors and metallic sheath for cables with nonshielded conductors. Test between each conductor and shield for multiconductor cables with shielded conductors. Record lowest reading for each cable.

2. Use 1,000-V test set for cable rated 600 volts and 2,500-V test set for cable rated over 600 volts.

3. Readings will vary inversely with temperature and cable length. When the use of temperature correction factors is specified, attach a second sheet with computed values. Indicate on each sheet "measured" or "temperature corrected."

Panel No. Circuit No. Feeder No.	Wire Tagging	Cable Rated Voltage	Wire or				Insulation Resistance (megohms) *	Initials
			Quantity	Size	From	To		

*Minimum acceptable values:

Cable Rated Voltage	Test Duration	Resistance for Cable Only	Cable/Wire Size or Amperage	Resistance When Cable Connected to Equipment (megohms)

DISTRIBUTION:

CONTRACTOR/DATE _____

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INSULATION RESISTANCE (EQUIPMENT) TEST RECORD

TEST EQUIPMENT: _____ SUBSTATION: _____

AMBIENT TEMPERATURE:_____°C_____°F DATE: _____

REFERENCE DRAWING: _____ REF. SEC.: _____

NOTES: 1. Use 1,000-V test set for equipment rated 600 volts and below, 2,500/5,000-V test set for equipment rated over 600 volts.

2. For equipment with solid state control circuits, consult manufacturer's literature for maximum test voltages.

Switchgear or MCC (or other)	INSULATION RESISTANCE (megohms) *						Test Voltage (kV)	Rated Voltage (kV)	Initials/Date
	ØA to G	ØB to G	ØC to G	ØA to ØB	ØB to ØC	ØC to ØA			

*Minimum acceptable values:

EQUIPMENT VOLTAGE CLASS	RESISTANCE (megohms)

TESTER'S INITIALS/DATE

DISTRIBUTION:

CONTRACTOR/DATE _____

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Institute of.Electrical and Electronics Engineers (IEEE): C2, National Electrical Safety Code (NESC).
2. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Product data for the following:
      1) Exothermic weld connectors.
      2) Mechanical connectors.
      3) Compression connectors.

1.03 QUALITY ASSURANCE

A. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, provide material and equipment labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ to provide a basis for approval under NEC.
2. Materials and equipment manufactured within the scope of standards published by UL:
   a. Confirm conformance with UL standards.
   b. Supply with an applied UL listing mark.

PART 2 PRODUCTS

2.01 GROUND ROD

A. Material: Copper-clad.

B. Diameter: Minimum 5/8-inch.

C. Length: 8 feet.

2.02 GROUND CONDUCTORS

A. As specified in Section 26 05 05, Conductors.

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2.03 CONNECTORS

A. Exothermic Weld Type:

1. Outdoor Weld: Suitable for exposure to elements or direct burial.
2. Indoor Weld: Use low-smoke, low-emission process.
3. Manufacturers:
   a. Erico Products, Inc.; Cadweld and Cadweld Exolon.
   b. Thermoweld.
   c. Or Approved Equal.

B. Compression Type:

1. Compress-deforming type; wrought copper extrusion material.
2. Single indentation for conductors 6 AWG and smaller.
3. Double indentation with extended barrel for conductors 4 AWG and larger.
4. Barrels prefilled with oxide-inhibiting and antiseizing compound and sealed.
5. Manufacturers:
   a. Burndy Corp.; Hyground Irreversible Compression.
   b. Thomas and Betts Co.
   c. ILSCO.
   d. Or Approved Equal.

C. Mechanical Type: Split-bolt, saddle, or cone screw type; copper alloy material.

1. Manufacturers:
   a. Burndy Corp.
   b. Thomas and Betts Co.
   c. Or Approved Equal.

2.04 GROUNDING WELLS

A. Ground rod box complete with cast-iron riser ring and traffic cover marked "GROUND ROD".

B. Manufacturers and Products:

1. Christy Co.; No. G5.
2. Or Approved Equal.

PART 3 EXECUTION

3.01 GENERAL

A. Grounding: In compliance with NFPA 70 and IEEE C2.

B. Ground electrical service neutral at service entrance equipment with grounding electrode conductor to grounding electrode system.

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C. Ground each separately derived system neutral with common grounding electrode conductor to grounding electrode system.

D. Bond together all grounding electrodes that are present at each building or structure served to form one common grounding electrode system.

E. Bond together system neutrals, service equipment enclosures, exposed noncurrent-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.

F. Shielded Power Cables: Ground shields at each splice or termination in accordance with recommendations of splice or termination manufacturer.

G. Shielded Instrumentation Cables:

1. Ground shield to ground bus at power supply for analog signal.
2. Expose shield minimum 1 inch at termination to field instrument and apply heat shrink tube.
3. Do not ground instrumentation cable shield at more than one point.

3.02 WIRE CONNECTIONS

A. Ground Conductors: Install in conduit containing power conductors and control circuits above 50 volts.

B. Nonmetallic Raceways and Flexible Tubing: Install equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.

C. Connect ground conductors to raceway grounding bushings.

D. Extend and connect ground conductors to ground bus in all equipment containing a ground bus.

E. Connect enclosure of equipment containing ground bus to that bus.

F. Bolt connections to equipment ground bus.

G. Bond grounding conductors to metallic enclosures at each end, and to intermediate metallic enclosures.

H. Junction Boxes: Furnish materials and connect to equipment grounding system with grounding clips mounted directly on box, or with 3/8-inch machine screws.

I. Metallic Equipment Enclosures: Use furnished ground lug; if none furnished, tap equipment housing and install solderless terminal connected to box with machine screw. For circuits greater than 20 amps use minimum 5/16-inch diameter bolt.

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3.03 MOTOR GROUNDING

A. Extend equipment ground bus via grounding conductor installed in motor feeder raceway; connect to motor frame..

B. Nonmetallic Raceways and Flexible Tubing: Install an equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.

C. Motors Less than 10 hp: Use furnished ground lug in motor connection box. If none furnished, provide compression, spade-type terminal connected to conduit box mounting screw.

D. Motors 10 hp and Above: Use furnished ground lug in motor connection box. If none furnished, tap motor frame or equipment housing; furnish compression, one-hole, lug type terminal connected with minimum 5/16-inch brass threaded stud with bolt and washer.

E. Circuits 20 Amps or Above: Tap motor frame or equipment housing. Install solderless terminal with minimum 5/16-inch diameter bolt.

3.04 GROUND RODS

A. Install full length with conductor connection at upper end.

B. Install with connection point below finished grade, unless otherwise shown.

C. Space multiple ground rods by one rod length.

D. Install to 8 feet below local frost depth.

3.05 GROUNDING WELLS

A. Install for ground rods located inside buildings, asphalt and paved areas, and where shown on Drawings.

B. Install riser ring and cover flush with surface.

C. Place 6 inches of crushed rock in bottom of each well.

3.06 CONNECTIONS

A. General:

1. Abovegrade Connections: Install exothermic weld, mechanical, or compression-type connectors; or brazing.
2. Belowgrade Connections: Install exothermic weld or compression type connectors.
3. Remove paint, dirt, or other surface coverings at connection points to allow good metal-to-metal contact.
4. Notify the City and Engineer prior to backfilling ground connections.

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B. Exothermic Weld Type:

1. Wire brush or file contact point to bare metal surface.
2. Use welding cartridges and molds in accordance with manufacturer's recommendations.
3. Avoid using badly worn molds.
4. Mold to be completely filled with metal when making welds.
5. After completed welds have cooled, brush slag from weld area and thoroughly clean joint.

C. Compression Type:

1. Install in accordance with connector manufacturer's recommendations.
2. Install connectors of proper size for grounding conductors and ground rods specified.
3. Install using connector manufacturer's compression tool having proper sized dies and operate per manufacturer's instructions.

D. Mechanical Type:

1. Apply homogeneous blend of colloidal copper and rust and corrosion inhibitor before making connection.
2. Install in accordance with connector manufacturer's recommendations.
3. Do not conceal mechanical connections.

3.07 METAL STRUCTURE GROUNDING

A. Bond metal sheathing and exposed metal vertical structural elements to grounding system.

B. Bond electrical equipment supported by metal platforms to the platforms.

C. Provide electrical contact between metal frames and railings supporting pushbutton stations, receptacles, and instrument cabinets, and raceways carrying circuits to these devices.

3.08 SURGE PROTECTION EQUIPMENT GROUNDING

A. Connect surge arrestor ground terminals to equipment ground bus.

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SECTION 26 05 33
RACEWAY AND BOXES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO): HB, Standard Specifications for Highway Bridges.
2. ASTM International (ASTM):
   a. A123/123M, Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
   b. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   c. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   d. C857, Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
   e. D149, Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
3. Telecommunications Industry Association (TIA): 569B, Commercial Building Standard for Telecommunications Pathways and Spaces.
4. National Electrical Contractor's Association, Inc. (NECA): Installation standards.
5. National Electrical Manufacturers Association (NEMA):
   a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   b. C80.1, Electrical Rigid Steel Conduit (ERSC).
   c. C80.3, Steel Electrical Metallic Tubing (EMT).
   d. C80.5, Electrical Rigid Aluminum Conduit (ERAC).
   e. C80.6, Electrical Intermediate Metal Conduit (EIMC).
   f. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   g. TC 2, Electrical Polyvinyl Chloride (PVC) Conduit.
   h. TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
   i. TC 6, Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation.
   j. TC 14, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
   k. VE 1, Metallic Cable Tray Systems.
6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
7. UL:
   a. 1, Standard for Safety for Flexible Metal Conduit.
   b. 5, Standard for Safety for Surface Metal Raceways and Fittings.
   c. 6, Standard for Safety for Electrical Rigid Metal Conduit – Steel.

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d. 6A, Standard for Safety for Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless.
e. 360, Standard for Safety for Liquid-Tight Flexible Steel Conduit.
f. 514B, Standard for Safety for Conduit, Tubing, and Cable Fittings.
g. 651, Standard for Safety for Schedule 40 and 80 Rigid PVC Conduit and Fittings.
h. 651A, Standard for Safety for Type EB and A Rigid PVC Conduit and HDPE Conduit.
i. 797, Standard for Safety for Electrical Metallic Tubing – Steel.
j. 870, Standard for Safety for Wireways, Auxiliary Gutters, and Associated Fittings.
k. 1242, Standard for Safety for Electrical Intermediate Metal Conduit – Steel.
l. 1660, Standard for Safety for Liquid-Tight Flexible Nonmetallic Conduit.
m. 1684, Standard for Safety for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
n. 2024, Standard for Safety for Optical Fiber and Communication Cable Raceway.

1.02 SUBMITTALS

A. Action Submittals:

1. Manufacturer's Literature:
   a. Rigid galvanized steel conduit.
   b. Rigid aluminum conduit.
   c. PVC Schedule 40 conduit.
   d. Flexible metal, liquid-tight conduit.
   e. Flexible, nonmetallic, liquid-tight conduit.
   f. Conduit fittings.
   g. Device boxes for use in hazardous areas.
   h. Junction and pull boxes used at or below grade.
   i. Large junction and pull boxes.
   j. Terminal junction boxes.
2. Equipment and machinery proposed for bending metal conduit.
3. Method for bending PVC conduit less than 30 degrees.
4. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals: Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.

1.03 QUALITY ASSURANCE

A. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.

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2. Materials and equipment manufactured within scope of standards published by UL. shall conform to those standards and shall have an applied UL listing mark.

B. PVC-Coated, Rigid Galvanized Steel Conduit Installer: Certified by conduit manufacturer as having received minimum 2 hours of training on installation procedures.

PART 2 PRODUCTS

2.01 CONDUIT AND TUBING

A. PVC-Coated, Rigid Galvanized Steel Conduit (RGS):

1. Meet requirements of NEMA C80.1 and UL 6.
2. Material: Hot-dip galvanized with chromated protective layer.

B. Rigid Aluminum Conduit:

1. Meet requirements of NEMA C80.5 and UL 6A.
2. Material: Type 6063, copper-free aluminum alloy.

C. PVC Schedule 40 Conduit:

1. Meet requirements of NEMA TC 2 and UL 651.
2. UL listed for concrete encasement, underground direct burial, concealed or direct sunlight exposure, and 90 degrees C insulated conductors.

D. Flexible, Nonmetallic, Liquid-Tight Conduit:

1. Material: PVC core with fused flexible PVC jacket.
2. UL 1660 listed for:
   a. Dry Conditions: 80 degrees C insulated conductors.
   b. Wet Conditions: 60 degrees C insulated conductors.
3. Manufacturers and Products:
   a. Carlon; Carflex or X-Flex.
   b. T & B; Xtraflex LTC or EFC.
   c. Or Approved Equal.

2.02 FITTINGS

A. Rigid Galvanized Steel:

1. General:
   a. Meet requirements of UL 514B.
   b. Type: Threaded, galvanized. Set screw and threadless compression fittings not permitted.
2. Bushing:
   a. Material: Malleable iron with integral insulated throat, rated for 150 degrees C.

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b. Manufacturers and Products:
    1) Appleton; Series BU-I.
    2) O-Z/Gedney; Type HB.
    3) Or Approved Equal.

3. Grounding Bushing:
    a. Material: Malleable iron with integral insulated throat rated for 150 degrees C, with solderless lugs.
    b. Manufacturers and Products:
        1) Appleton; Series GIB.
        2) O-Z/Gedney; Type HBLG.
        3) Or Approved Equal.
4. Conduit Hub:
    a. Material: Malleable iron with insulated throat with bonding screw.
    b. UL listed for use in wet locations.
    c. Manufacturers and Products:
        1) Appleton, Series HUB-B.
        2) O-Z/Gedney; Series CH.
        3) Meyers; ST Series.
        4) Or Approved Equal.
5. Conduit Bodies:
    a. Sized as required by NFPA 70.
    b. Manufacturers and Products (For Normal Conditions):
        1) Appleton; Form 35 threaded unilets.
        2) Crouse-Hinds; Form 7 or Form 8 threaded condulets.
        3) Killark; Series O electrolets.
        4) Thomas & Betts; Form 7 or Form 8.
        5) Or Approved Equal.
    c. Manufacturers (For Hazardous Locations):
        1) Appleton.
        2) Crouse-Hinds.
        3) Killark.
        4) Or Approved Equal.
6. Couplings: As supplied by conduit manufacturer.
7. Unions:
    a. Concrete tight, hot-dip galvanized malleable iron.
    b. Manufacturers and Products:
        1) Appleton; Series SCC bolt-on coupling or Series EC three-piece union.
        2) O-Z/Gedney; Type SSP split coupling or Type 4 Series, three-piece coupling.
        3) Or Approved Equal.
8. Conduit Sealing Fitting:
    a. Manufacturers and Products:
        1) Appleton; Type EYF, EYM, or ESU.
        2) Crouse-Hinds; Type EYS or EZS.
        3) Killark; Type EY or Type EYS.
        4) Or Approved Equal.

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9. Drain Seal:
    a. Manufacturers and Products:
        1) Appleton; Type EYD.
        2) Crouse-Hinds; Type EYD or Type EZD.
        3) Or Approved Equal.
10. Drain/Breather Fitting:
    a. Manufacturers and Products:
        1) Appleton; Type ECDB.
        2) Crouse-Hinds; ECD.
        3) Or Approved Equal.
11. Expansion Fitting:
    a. Manufacturers and Products:
        1) Deflection/Expansion Movement:
            a) Appleton; Type DF.
            b) Crouse-Hinds; Type XD.
            c) Or Approved Equal.
        2) Expansion Movement Only:
            a) Appleton; Type XJ.
            b) Crouse-Hinds; Type XJ.
            c) Thomas & Betts; XJG-TP.
            d) Or Approved Equal.
12. Cable Sealing Fitting:
    a. To form watertight nonslip cord or cable connection to conduit.
    b. For Conductors with OD of 1/2 inch or Less: Neoprene bushing at connector entry.
    c. Manufacturers and Products:
        1) Appleton; CG-S.
        2) Crouse-Hinds; CGBS.
        3) Or Approved Equal.

B. Rigid Aluminum Conduit:

1. General:
    a. Meet requirements of UL 514B.
    b. Type: Threaded, copper-free. Set screw fittings not permitted.
2. Insulated Bushing:
    a. Material: Cast aluminum, with integral insulated throat, rated for 150 degrees C.
    b. Manufacturer and Product: O-Z/Gedney; Type AB or Approved Equal.
3. Grounding Bushing:
    a. Material: Cast aluminum with integral insulated throat, rated for 150 degrees, with solderless lugs.
    b. Manufacturer and Product: O-Z/Gedney; Type ABLG or Approved Equal.
4. Conduit Hub:
    a. Material: Cast aluminum, with insulated throat.
    b. UL listed for use in wet locations.
    c. Manufacturers and Products:
        1) O-Z/Gedney; Type CHA.
        2) Thomas & Betts; Series 370AL.

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3) Meyers; Series SA.
4) Or Approved Equal.

5. Conduit Bodies:
   a. Manufacturers and Products (For Normal Conditions):
      1) Appleton; Form 85 threaded unilets.
      2) Crouse-Hinds; Mark 9 or Form 7-SA threaded condulets.
      3) Killark; Series O electrolets.
      4) Or Approved Equal.
   b. Manufacturers (For Hazardous Locations):
      1) Appleton.
      2) Crouse-Hinds.
      3) Killark.
      4) Or Approved Equal.
6. Couplings: As supplied by conduit manufacturer.
7. Conduit Sealing Fitting:
   a. Manufacturers and Products:
      1) Appleton; Type EYF-AL or Type EYM-AL.
      2) Crouse-Hinds; Type EYS-SA or Type EZS-SA.
      3) Killark; Type EY or Type EYS.
      4) Or Approved Equal.
8. Drain Seal:
   a. Manufacturers and Products:
      1) Appleton; Type EYDM-A.
      2) Crouse-Hinds; Type EYD-SA or Type EZD-SA.
      3) Or Approved Equal.
9. Drain/Breather Fitting:
   a. Manufacturers and Products:
      1) Appleton; Type ECDB.
      2) Crouse-Hinds; ECD.
      3) Or Approved Equal.
10. Expansion Fitting:
    a. Manufacturers and Products:
       1) Deflection/Expansion Movement: Steel City; Type DF-A or Approved Equal.
       2) Expansion Movement Only: Steel City; Type AF-A, or Approved Equal.
11. Cable Sealing Fittings:
    a. To form watertight nonslip cord or cable connection to conduit.
    b. Bushing: Neoprene at connector entry.
    c. Manufacturers and Products: Appleton; CG-S, or Approved Equal.

C. PVC Conduit and Tubing:

1. Meet requirements of NEMA TC 3.
2. Type: PVC, slip-on.

D. Flexible, Nonmetallic, Liquid-Tight Conduit:

1. Meet requirements of UL 514B.
2. Type: High strength plastic body, complete with lock nut, O-ring, threaded ferrule, sealing ring, and compression nut.

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3. Body/compression nut (gland) design to ensure high mechanical pullout strength and watertight seal.
4. Manufacturers and Products:
    a. Carlon; Type LT.
    b. O-Z/Gedney; Type 4Q-P.
    c. Thomas & Betts; Series 6300.
    d. Or Approved Equal.

E. Flexible Coupling, Hazardous Locations:

1. Approved for use in atmosphere involved.
2. Rating: Watertight and UL listed for use in Class I, Division 1 and 2 areas.
3. Outer bronze braid and an insulating liner.
4. Conductivity equal to a similar length of rigid metal conduit.
5. Manufacturers and Products:
    a. Crouse-Hinds; Type ECGJH or Type ECLK.
    b. Appleton; EXGJH or EXLK.
    c. Or Approved Equal.

2.03 JUNCTION AND PULL BOXES

A. Outlet Box Used as Junction or Pull Box: As specified under Article Outlet and Device Boxes.

B. Conduit Bodies Used as Junction Boxes: As specified under Article Fittings.

C. Large Sheet Steel Box:

1. NEMA 250, Type 1.
2. Box: Code-gauge, galvanized steel.
3. Cover: Full access, screw type.
4. Machine Screws: Corrosion-resistant.

2.04 SURFACE METAL RACEWAY

A. General:

1. Meet requirements of UL 5.
2. Material: Two-piece, code-gauge steel.
3. Finish: Factory applied rust inhibiting primer and gray semi-gloss finish suitable for field painting.
4. Configuration: Single, 1-17/32-inch by 2-3/4-inch section, unless otherwise indicated.

B. Fittings and Accessories:

1. Wire clips at 30 inches on center.
2. Couplings, cover clips, supporting clips, ground clamps, and elbows as required; to comply with manufacturer's recommendations.

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2.05 ACCESSORIES

A. Identification Devices:

1. Raceway Tags:
   a. Material: Permanent, nonferrous metal.
   b. Shape: Round.
   c. Raceway Designation: Pressure stamped, embossed, or engraved.
   d. Tags relying on adhesives or taped-on markers not permitted.
2. Warning Tape:
   a. Material: Polyethylene, 4-mil gauge with detectable strip.
   b. Color: Red.
   c. Width: Minimum 3 inches.
   d. Designation: Warning on tape that electric circuit is located below tape.
   e. Identifying Letters: Minimum 1-inch high permanent black lettering imprinted continuously over entire length.
   f. Manufacturers and Products:
      1) Panduit; Type HTDU.
      2) Reef Industries; Terra Tape.
      3) Or Approved Equal.
3. Buried Raceway Marker:
   a. Material: Sheet bronze, consisting of double-ended arrows, straight for straight runs and bent at locations where runs change direction.
   b. Designation: Engrave to depth of 3/32 inch; ELECTRIC CABLES, in letters 1/4-inch high.
   c. Minimum Dimension: 1/4-inch thick, 10 inches long, and 3/4-inch wide.

B. Heat Shrinkable Tubing:

1. Material: Heat-shrinkable, cross-linked polyolefin.
2. Semi-flexible with meltable adhesive inner liner.
3. Color: Black.
4. Manufacturers:
   a. Raychem.
   b. 3M.
   c. Or Approved Equal.

C. Wraparound Duct Band:

1. Material: Heat-shrinkable, cross-linked polyolefin, precoated with hot-melt adhesive.
2. Width: 50 mm minimum.
3. Manufacturers and Products: Raychem; Type TWDB, or Approved Equal.

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PART 3 EXECUTION

3.01 GENERAL

A. Conduit and tubing sizes shown are based on use of copper conductors. Reference Section 26 05 05, Conductors, concerning conduit sizing for aluminum conductors.

B. Comply with NECA Installation Standards.

C. Crushed or deformed raceways not permitted.

D. Maintain raceway entirely free of obstructions and moisture.

E. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.

F. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.

G. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.

H. Group raceways installed in same area.

I. Proximity to Heated Piping: Install raceways minimum 12 inches from parallel runs.

J. Follow structural surface contours when installing exposed raceways. Avoid obstruction of passageways.

K. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes.

L. Block Walls: Do not install raceways in same horizontal course or vertical cell with reinforcing steel.

M. Install watertight fittings in outdoor, underground, or wet locations.

N. Paint threads and cut ends, before assembly of fittings, galvanized conduit, PVC-coated galvanized conduit, or IMC installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound.

O. Metal conduit shall be reamed, burrs removed, and cleaned before installation of conductors, wires, or cables.

P. Do not install raceways in concrete equipment pads, foundations, or beams without City and Engineer approval.

Q. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.

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R. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.

S. Install conduits for fiber optic cables, telephone cables, and Category 6 data cables in strict conformance with the requirements of TIA 569B.

3.02 REUSE OF EXISTING CONDUITS

A. Where Drawings indicate existing conduits may be reused, they may be reused only where they meet the following criteria.

1. Conduit is in useable condition with no deformation, corrosion, or damage to exterior surface.
2. Conduit is sized per the NEC.
3. Conduit is of the type specified in Contract Documents.
4. Conduit is supported as specified in Contract Documents.

B. Conduit shall be reamed with wire brush, then with a mandrel approximately 1/4-inch smaller than raceway inside diameter then cleaned prior to pulling new conductors.

3.03 CONDUIT APPLICATION

A. Diameter: Minimum 3/4-inch.

B. Exterior, Exposed: Rigid aluminum.

C. Interior, Exposed: Rigid galvanized steel.

D. Direct Earth Burial: PVC Schedule 40.

E. Under Slabs-On-Grade:

1. Rigid galvanized steel.
2. PVC Schedule 40.

F. Transition from Underground or Concrete Embedded to Exposed: PVC-Coated, Rigid galvanized steel.

G. Transition from rigid galvanized steel to rigid aluminum shall be with stainless fitting.

H. Exterior Light Pole Foundations: Rigid galvanized steel conduit.

I. Hazardous Gas Areas Exterior Exposed: Rigid aluminum.

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3.04 FLEXIBLE CONNECTIONS

A. For motors, wall or ceiling mounted fans and unit heaters, dry type transformers, electrically operated valves, instrumentation, and other locations approved by the Engineer where flexible connection is required to minimize vibration:

1. Conduit Size 4 Inches or Less: Flexible, liquid-tight conduit.
2. Conduit Size Over 4 Inches: Nonflexible.
3. Wet or Corrosive Areas: Flexible, nonmetallic liquid-tight.
4. Dry Areas: Flexible, metallic liquid-tight.
5. Hazardous Areas: Flexible coupling suitable for Class I, Division 1 and 2 areas.

B. Outdoor Areas, Process Areas Exposed to Moisture, and Areas Required to be Oiltight and Dust-Tight: Flexible metal, liquid-tight conduit.

C. Flexible Conduit Length: 18 inches minimum, 36 inches maximum; sufficient to allow movement or adjustment of equipment.

3.05 PENETRATIONS

A. Make at right angles, unless otherwise shown.

B. Notching or penetration of structural members, including footings and beams, not permitted.

C. Apply heat shrinkable tubing to metallic conduit protruding through concrete slabs to a point 2 inches above and 2 inches below concrete surface.

D. Concrete Walls, Floors, or Ceilings (Aboveground): Provide nonshrink grout dry-pack, or use watertight seal device.

3.06 SUPPORT

A. Support from structural members only, at intervals not exceeding NFPA 70 requirements. Do not exceed 10 feet in any application. Do not support from piping, pipe supports, or other raceways.

B. Application/Type of Conduit Strap:

1. Rigid Steel or EMT Conduit: Zinc coated steel, pregalvanized steel or malleable iron.

C. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:

1. Hollow Masonry Units: Toggle bolts.
2. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.
3. Steelwork: Machine screws.

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4. Location/Type of Hardware:
   a. Dry, Noncorrosive Areas: Galvanized.
   b. Wet, Noncorrosive Areas: Stainless steel.
   c. Corrosive Areas: Stainless steel.

D. Nails or wooden plugs inserted in concrete or masonry for attaching raceway not permitted. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.

3.07 BENDS

A. Install concealed raceways with a minimum of bends in the shortest practical distance.

B. Make bends and offsets of longest practical radius. Bends in conduits and ducts being installed for fiber optic cables shall be not less than 20 times cable diameter, 15 inches minimum.

C. Install with symmetrical bends or cast metal fittings.

D. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.

E. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.

F. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run, and raceways are same size.

G. PVC Conduit:

1. Bends 30 Degrees and Larger: Provide factory-made elbows.
2. Use manufacturer's recommended method for forming smaller bends.

H. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

3.08 PVC CONDUIT

A. Solvent Welding:

1. Apply manufacturer recommended solvent to joints.
2. Install in order that joint is watertight.

B. Adapters:

1. PVC to Metallic Fittings: PVC terminal type.
2. PVC to Rigid Metal Conduit or IMC: PVC female adapter.

C. Belled-End Conduit: Bevel unbelled end of joint prior to joining.

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3.09 TERMINATION AT ENCLOSURES

A. Cast Metal Enclosure: Install manufacturer's premolded insulating sleeve inside metallic conduit terminating in threaded hubs.

B. Nonmetallic, Cabinets, and Enclosures:

1. Terminate conduit in threaded conduit hubs, maintaining enclosure integrity.
2. Metallic Conduit: Provide ground terminal for connection to maintain continuity of ground system.

C. Sheet Metal Boxes, Cabinets, and Enclosures:

1. General:
   a. Install insulated bushing on ends of conduit where grounding is not required.
   b. Provide insulated throat when conduit terminates in sheet metal boxes having threaded hubs.
   c. Utilize sealing locknuts or threaded hubs on sides and bottom of NEMA 3R and NEMA 12 enclosures.
   d. Terminate conduits at threaded hubs at the tops of NEMA 3R and NEMA 12 boxes and enclosures.
   e. Terminate conduits at threaded conduit hubs at NEMA 4 and NEMA 4X boxes and enclosures.
2. Rigid Galvanized Conduit:
   a. Provide one lock nut each on inside and outside of enclosure.
   b. Install grounding bushing at source enclosure.
   c. Provide bonding jumper from grounding bushing to equipment ground bus or ground pad.
3. Electric Metallic Tubing: Provide gland compression, insulated connectors.
4. Flexible Metal Conduit: Provide two screw type, insulated, malleable iron connectors.
5. Flexible, Nonmetallic Conduit: Provide nonmetallic, liquid-tight strain relief connectors.
6. PVC-Coated Rigid Galvanized Steel Conduit: Provide PVC-coated, liquid-tight, metallic connector.
7. PVC Schedule 40 Conduit: Provide PVC terminal adapter with lock nut, except where threaded hubs required above.

D. Free-Standing Enclosures:

1. Terminate metal conduit entering bottom with grounding bushing; provide grounding jumper extending to equipment ground bus or grounding pad.
2. Terminate PVC conduit entering bottom with bell end fittings.

3.10 UNDERGROUND RACEWAYS

A. Grade: Maintain minimum grade of 4 inches in 100 feet, either from one manhole, handhole, or pull box to the next, or from a high point between them, depending on surface contour.

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B. Cover: Maintain minimum 2-foot cover above conduit unless otherwise shown.

C. Make routing changes as necessary to avoid obstructions or conflicts.

D. Couplings: In multiple conduit runs, stagger so couplings in adjacent runs are not in same transverse line.

E. Union type fittings not permitted.

F. Spacers:

1. Provide preformed, nonmetallic spacers designed for such purpose, to secure and separate parallel conduit runs in a trench or concrete encasement.
2. Install at intervals not greater than that specified in NFPA 70 for support of the type conduit used, but in no case greater than 10 feet.

G. Support conduit so as to prevent bending or displacement during backfilling or concrete placement.

H. Transition from Underground to Exposed: Rigid galvanized steel conduit.

I. Installation with Other Piping Systems:

1. Crossings: Maintain minimum 12-inch vertical separation.
2. Parallel Runs: Maintain minimum 12-inch separation.
3. Installation over valves or couplings not permitted.

J. Backfill: As specified in Section 25, Aggregate Subbase for trench backfill.

3.11 UNDER SLAB RACEWAYS

A. Make routing changes as necessary to avoid obstructions or conflicts.

B. Support raceways so as to prevent bending or displacement during backfilling or concrete placement.

C. Install raceways with no part embedded within slab and with no interference with slab on grade construction.

D. Raceway spacing, in a single layer or multiple layers:

1. 3 inches clear between adjacent 2-inch or larger raceway.
2. 2 inches clear between adjacent 1-1/2-inch or smaller raceway.

E. Multiple Layers of Raceways: Install under slab on grade in trench below backfill zone, as specified in Section 25, Aggregate Subbase for trench backfill..

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F. Individual Raceways and Single Layer Multiple Raceways: Install at lowest elevation of backfill zone with spacing as specified herein. Where conduits cross at perpendicular orientation, installation of conduits shall not interfere with placement of under slab fill that meets compaction and void limitations of earthwork specifications.

G. Under slab raceways that emerge from below slab to top of slab as exposed, shall be located to avoid conflicts with structural slab rebar. Coordinate raceway stub ups with location of structural rebar.

H. Fittings:

1. Union type fittings are not permitted.
2. Provide expansion/deflection fittings in raceway runs that exit building or structure below slab. Locate fittings 18 inches, maximum, beyond exterior wall. Raceway type between building exterior wall to fitting shall be PVC-coated rigid steel.
3. Couplings: In multiple raceway runs, stagger so couplings in adjacent runs are not in same traverse line.

3.12 JUNCTION AND PULL BOXES

A. General:

1. Install plumb and level.
2. Installed boxes shall be accessible.
3. Do not install on finished surfaces.
4. Use outlet boxes as junction and pull boxes wherever possible and allowed by applicable codes.
5. Use conduit bodies as junction and pull boxes where no splices are required and allowed by applicable codes.
6. Install pull boxes where necessary in raceway system to facilitate conductor installation.
7. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.
8. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.

B. Flush Mounted:

1. Install with concealed conduit.
2. Holes in surrounding surface shall be no larger than required to receive box.
3. Make edges of boxes flush with final surface.

C. Mounting Hardware:

1. Noncorrosive Dry Areas: Galvanized.
2. Noncorrosive Wet Areas: Stainless steel.
3. Corrosive Areas: Stainless steel.

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D. Supports:

1. Support boxes independently of conduit by attachment to building structure or structural member.
2. Install bar hangers in frame construction or fasten boxes directly as follows:
   a. Wood: Wood screws.
   b. Concrete or Brick: Bolts and expansion shields.
   c. Hollow Masonry Units: Toggle bolts.
   d. Steelwork: Machine screws.
3. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.
4. Boxes embedded in concrete or masonry need not be additionally supported.

3.13 HANDHOLES

A. Do not install until final raceway grading has been determined.

B. Install such that raceway enters at nearly right angle and as near as possible to end of wall, unless otherwise shown.

C. Grounding: As specified in Section 26 05 26, Grounding and Bonding for Electrical Systems.

D. Identification: Field stamp covers with handhole number as shown. Stamped numbers to be 1-inch minimum height.

3.14 EMPTY RACEWAYS

A. Provide permanent, removable cap over each end.

B. Provide PVC plug with pull tab for underground raceways with end bells.

C. Provide nylon pull cord.

D. Identify, as specified in Article Identification Devices, with waterproof tags attached to pull cord at each end, and at intermediate pull point.

3.15 IDENTIFICATION DEVICES

A. Raceway Tags:

1. Identify origin and destination.
2. For exposed raceways, install tags at each terminus, near midpoint, and at minimum intervals of every 50 feet, whether in ceiling space or surface mounted.
3. Install tags at each terminus for concealed raceways.
4. Provide noncorrosive wire for attachment.

B. Warning Tape: Install approximately 12 inches above underground or concrete-encased raceways. Align parallel to, and within 12 inches of, centerline of run.

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C. Buried Raceway Marker:

1. Install at grade to indicate direction of underground raceway.
2. Install at bends and at intervals not exceeding 100 feet in straight runs.
3. Embed and secure to top of concrete base, sized 14-inches long, 6-inches wide, and 8-inches deep; top set flush with finished grade.

D. Tracer Wire:

1. Attach Tracer Wire to raceway with adhesive electrical tape not exceeding 8 feet interval.
2. Tracer Wire shall not be wrapped around conduits except where raceway rises out of ground.
3. Dead end of Tracer Wire shall be grounded to dedicated ground rod, see Section 26 05 26, Grounding and Bonding for Electrical Systems.
4. Install 12 inches extra length of Tracer Wire at each end coiled and secured to raceway.
5. Tracer Wire shall be installed continuously where possible. Waterproof and corrosion-proof connectors shall be used where required for continuous continuity for the whole length of the Tracer Wire. Electrical tape and wire nuts shall not be acceptable.
6. Tracer Wire installation shall be tested and test witnessed by City before raceway trench is back filled.

3.16 PROTECTION OF INSTALLED WORK

A. Protect products from effects of moisture, corrosion, and physical damage during construction.

B. Provide and maintain manufactured watertight and dust-tight seals over conduit openings during construction.

C. Touchup painted conduit threads after assembly to cover nicks or scars.

D. Touchup coating damage to PVC-coated conduit with patching compound approved by manufacturer. Compound shall be kept refrigerated according to manufacturers' instructions until time of use.

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SECTION 26 20 00
LOW-VOLTAGE AC INDUCTION MOTORS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. This section applies to low-voltage AC induction motors, whether or not referenced by a motor-driven equipment specification. If equipment specification section deviates from this section in requirements such as, application, horsepower, enclosure type, mounting, shaft type, or synchronous speed, then those listed requirements shall take precedence over this section.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Bearing Manufacturers Association (ABMA):
   a. 9, Load Ratings and Fatigue Life for Ball Bearings.
   b. 11, Load Ratings and Fatigue Life for Roller Bearings.
2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   a. 620, Guide for the Presentation of Thermal Limit Curves for Squirrel Cage Induction Machines.
   b. 841, Standard for Petroleum and Chemical Industry—Premium Efficiency Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors—Up to and Including 370 kW (500 hp).
3. National Electrical Manufacturers Association (NEMA):
   a. MG 1, Motors and Generators.
4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
5. UL:
   a. 83, Standard for Safety for Thermoplastic-Insulated Wire and Cables.
   b. 2111, Standard for Safety for Overheating Protection for Motors.

1.03 DEFINITIONS

A. CISD-TEFC: Chemical industry, severe-duty enclosure.

B. DIP: Dust-ignition-proof enclosure.

C. EXP: Explosion-proof enclosure.

D. Inverter Duty Motor: Motor meeting applicable requirements of NEMA MG 1, Section IV, Parts 30 and 31.

E. Inverter Ready Motor: Motor meeting applicable requirements of NEMA MG 1, Section IV, Part 31.4.4.2.

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F. Motor Nameplate Horsepower: That rating after any derating required to allow for extra heating caused by the harmonic content in the voltage applied to the motor by its controller.

G. ODP: Open drip-proof enclosure.

H. TEFC: Totally enclosed, fan-cooled enclosure.

I. TENV: Totally enclosed, nonventilated enclosure.

J. VPI: Vacuum pressure impregnated.

K. WPI: Open weather protected enclosure, Type I.

L. WPII: Open weather protected enclosure, Type II.

1.04 SUBMITTALS

A. Action Submittals:

1. Descriptive information.
2. Nameplate data in accordance with NEMA MG 1.
3. Additional Rating Information:
   a. Service factor.
   b. Locked rotor current.
   c. No load current.
4. Enclosure type and mounting (such as, horizontal, vertical).
5. Dimensions and total weight.
6. Conduit box dimensions and usable volume as defined in NEMA MG 1 and NFPA 70.
7. Bearing type.
8. Bearing lubrication.
9. Bearing life.
10. Motor sound power level in accordance with NEMA MG 1.
11. Maximum brake horsepower required by the equipment driven by the motor.

B. Informational Submittals:

1. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Materials, equipment, and accessories specified in this section shall be products of:

1. General Electric.
2. MagneTek.

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3. Siemens Energy and Automation, Inc., Motors and Drives Division.
4. Baldor.
5. U.S. Electrical Motors.
6. TECO-Westinghouse Motor Co.
7. Toshiba International Corp., Industrial Division.
8. WEG Electric Motors Corp.
9. Or Approved Equal.

2.02 GENERAL

A. For multiple units of the same type of equipment, furnish identical motors and accessories of a single manufacturer.

B. In order to obtain single source responsibility, use a single supplier to provide drive motor, its driven equipment, and specified motor accessories.

C. Meet requirements of NEMA MG 1.

D. Provide motors specifically designed for the use and conditions intended, with a NEMA design letter classification to fit the application.

E. Lifting lugs on motors weighing 100 pounds or more.

F. Operating Conditions:

1. Maximum ambient temperature not greater than 40 degrees C.
2. Provide motors suitable for operating conditions without reduction in nameplate rated horsepower or exceeding rated temperature rise.
3. Overspeed in either direction in accordance with NEMA MG 1.

2.03 HORSEPOWER RATING

A. As designated in motor-driven equipment Section 44 42 56.06, Gear Pumps.

B. Constant Speed Applications: Brake horsepower of driven equipment at any operating condition not to exceed motor nameplate horsepower rating, excluding service factor.

2.04 SERVICE FACTOR

A. Constant Duty Motors: 1.15 minimum at rated ambient temperature, unless otherwise noted.

2.05 VOLTAGE AND FREQUENCY RATING

A. System Frequency: 60 Hz.

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B. Voltage Rating: Unless otherwise indicated in motor-driven equipment specification:

Voltage Rating		
Size	**Voltage**	**Phase**
3/4 hp through 400 hp	460	3

C. Suitable for full voltage starting.

D. Suitable for accelerating the connected load with supply voltage at motor starter supply terminals dipping to 90 percent of motor rated voltage.

2.06 EFFICIENCY AND POWER FACTOR

A. For all motors:

1. Power Factor: Guaranteed minimum at full load shall be manufacturer's standard or as indicated in motor-driven equipment specification.

2.07 LOCKED ROTOR RATINGS

A. Locked rotor kVA Code F or lower, if motor horsepower not covered by NEMA MG 1 tables.

B. Safe Stall Time: 12 seconds or greater.

2.08 INSULATION SYSTEMS

A. Three-phase and Integral Horsepower Motors: Unless otherwise indicated in motor-driven equipment specification, Class B or Class F at nameplate horsepower and designated operating.

2.09 ENCLOSURES

A. Conform to NEMA MG 1.

B. TEFC: Furnish with drain hole with porous drain/weather plug.

2.10 TERMINAL (CONDUIT) BOXES

A. Oversize main terminal boxes for motors.

B. Diagonally split, rotatable to each of four 90-degree positions. Threaded hubs for conduit attachment.

C. Except ODP, furnish gaskets between box halves and between box and motor frame.

D. Minimum usable volume in percentage of that specified in NEMA MG 1, Section 1, Paragraph 4.19 and NFPA 70, Article 430:

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E. Terminal for connection of equipment grounding wire in each terminal box.

F. Coordinate motor terminal box conduit entries versus size and quantity of conduits shown on Drawings.

2.11 BEARINGS AND LUBRICATION

A. Horizontal Motors:

1. 1 hp through 400 hp: Regreasable ball bearings in labyrinth sealed end bells with removable grease relief plugs.
2. For Direct Drive Equipment: Minimum 100,000 hours L-10 bearing life for ball and roller bearings as defined in ABMA 9 and ABMA 11.

B. Regreasable Antifriction Bearings:

1. Readily accessible, grease injection fittings.
2. Readily accessible, removable grease relief plugs.

2.12 NOISE

A. Measured in accordance with NEMA MG 1.

2.13 BALANCE AND VIBRATION CONTROL

A. In accordance with NEMA MG 1, Part 7.

2.14 EQUIPMENT FINISH

A. Protect Motor for Service Conditions:

1. ODP Enclosures: Indoor industrial atmospheres.

B. External Finish: Prime and finish coat manufacturer's standard.

C. Internal Finish: Bore and end turns coated with clear polyester or epoxy varnish.

2.15 SPECIAL FEATURES AND ACCESSORIES

A. Nameplates:

1. Raised or stamped letters on stainless steel or aluminum.
2. Display motor data required by NEMA MG 1, Paragraph 10.39 and Paragraph 10.40 in addition to bearing numbers for both bearings.
3. Premium efficiency motor nameplates to display NEMA nominal efficiency, guaranteed minimum efficiency, full load power factor, and maximum allowable kVAR for power factor correction capacitors.

B. Anchor Bolts: Provide meeting manufacturer's recommendations and of sufficient size and number for specified seismic condition.

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2.16 FACTORY TESTING

A. Tests:

1. In accordance with IEEE 112 for polyphase motors.
2. Routine (production) tests in accordance with NEMA MG 1. Test multispeed motors at all speeds.
3. For energy efficient motors, test efficiency and power factor at 50 percent, 75 percent, and 100 percent of rated horsepower:
   a. In accordance with IEEE 112, Test Method B, and NEMA MG 1, Paragraph 12.59. and Paragraph 12.60.
   b. On motors of 100 hp and smaller, furnish certified copy of motor efficiency test report on an identical motor.

B. Test Report Forms:

1. Routine Tests: IEEE 112, Form A-1.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with manufacturer's instructions and recommendations.

B. Align motor carefully and properly with driven equipment.

C. Secure equipment to mounting surface with anchor bolts.

3.02 MANUFACTURER'S SERVICES

A. Manufacturer's Certificate of Proper Installation in accordance with Section 01 43 33, Manufacturers' Field Services.

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SECTION 31 23 19.01
DEWATERING

PART 1 GENERAL (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Remove and control water during periods when necessary to properly accomplish Work in the dry season or as allowed by the City.

3.02 SURFACE WATER CONTROL

A. See Section 13, Water Pollution Control, and Section 02 65 00, Underground Storage Tank Removal.

B. Remove surface runoff controls when no longer needed.

3.03 GROUNDWATER CONTROL

A. Encountered Groundwater:

1. In the event that groundwater is encountered, Contractor shall store groundwater in temporary, approved 12,600-gallon storage tank(s) for recovered water, placed in a diked area provided with appropriate secondary containment lining, and spill control measures. Container shall have a minimum of 1 foot of freeboard. Contractor shall secure storage tank, and inspect and maintain at least daily, and after each rainfall event.
2. Contractor to assume third party entity will be responsible for testing groundwater in accordance with Section 02 65 00, Underground Storage Tank Removal. Contractor to coordinate with third party entity and provide required groundwater samples. Third party will be testing for potential volatile or semi-volatile organic compounds as it relates to appropriate treatment. Contractor responsible for storing encountered groundwater until further direction provided by the City.
3. Groundwater Management Allowance shall be paid for at the contract lump sum price, which price shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all the work involved in groundwater management, including but not limited to one 12,600-gallon storage tank for one month's duration, assisting a third party entity with collecting the groundwater samples, disposing of groundwater on Work Site. For bidding purposes, Contractor to assume disposal site is approximately 300 feet from storage tank location. The estimated cost designated by the City is noted in the Bid Schedule. Payment will be in accordance with Standard Specifications Section 9-1.04 Force Account or based on an agreed price. Standards Specifications Section 9-1.06B and 9-1.06C shall not be considered as part of this bid item.

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B. Contaminated Groundwater:

1. Contaminated groundwater shall be treated under the direction of the City.
2. Full compensation for treatment of contaminated groundwater shall be considered as included in the prices paid for under Contaminated Groundwater and Soil Management Allowance, and no additional compensation will be allowed therefor.
3. Full compensation for collecting, conveying, and disposal of contaminated groundwater shall be considered paid for in various items.

C. Noncontaminated Groundwater:

1. Noncontaminated groundwater shall be disposed of on the Work Site under the direction of the City.
2. Full compensation for collecting, conveying, and disposal of noncontaminated groundwater shall be considered as included in the prices paid for under various items and no additional compensation will be allowed therefor.

3.04 DISPOSAL OF WATER

A. Treat water collected by dewatering operations, prior to discharge as specified herein.

B. Discharge water as required by the one-time ground water discharge permit and in manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed Work, or adjacent property.

C. Remove solids from treatment facilities and perform other maintenance of treatment facilities as necessary to maintain their efficiency.

D. Payment for groundwater treatment shall be considered as included in the prices paid for under Contaminated Groundwater and Soil Management Allowance, and no additional compensation will be allowed therefor.

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SECTION 31 41 00
SHORING

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Excavation support plan sealed and signed by a registered professional engineer in the state of California.
2. Movement monitoring plan.
3. Trench excavation plan.
4. Movement measurement and data and reduced results indicating movement trends.

1.02 QUALITY ASSURANCE

A. Provide surveys to monitor movements of critical facilities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Design, provide, and maintain shoring, sheeting, and bracing as necessary to support the sides of excavations and to prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed the Work.

3.02 EXCAVATION SUPPORT PLAN

A. Prepare excavation support plan addressing following topics:

1. Details of shoring, bracing, sloping, or other provisions for worker protection from hazards of caving ground.
2. Design assumptions and calculations.
3. Methods and sequencing of installing excavation support.
4. Proposed locations of stockpiled excavated material.
5. Minimum lateral distance from the crest of slopes for vehicles and stockpiled excavated materials.
6. Anticipated difficulties and proposed resolutions.

3.03 MOVEMENT MONITORING PLAN

A. Prepare movement monitoring plan addressing following topics:

1. Survey control.
2. Location of monitoring points.

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3. Plots of data trends.
4. Interval between surveys.

3.04 REMOVAL OF EXCAVATION SUPPORT

A. Remove excavation support in a manner that will maintain support as excavation is backfilled.

B. Do not begin to remove excavation support until support can be removed without damage to existing facilities, completed Work, or adjacent property.

C. Remove excavation support in a manner that does not leave voids in the backfill.

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SECTION 40 27 00
PROCESS PIPING—GENERAL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section and any supplemental Data Sheets:

1. American Petroleum Institute (API): SPEC 5L, Specification for Line Pipe.
2. American Society of Mechanical Engineers (ASME):
   a. Boiler and Pressure Vessel Code, Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
   b. B1.20.1, Pipe Threads, General Purpose (Inch).
3. American Society for Nondestructive Testing (ASNT): SNT-TC-1A, Recommended Practice for Personal Qualification and Certification in Nondestructive Testing.
4. American Welding Society (AWS):
   a. Brazing Handbook.
   b. A5.8M/A5.8, Specification for Filler Metals for Brazing and Braze Welding.
   c. D1.1/D1.1M, Structural Welding Code - Steel.
   d. QC1, Standard for AWS Certification of Welding Inspectors.
5. ASTM International (ASTM):
   a. A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
   b. A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   c. A105/A105M, Standard Specification for Carbon Steel Forgings for Piping Applications.
   d. A106/A106M, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
   e. A181/A181M, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
   f. A182/A182M, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
   g. A183, Standard Specification for Carbon Steel Track Bolts and Nuts.
   h. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
   i. A194/A194M, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   j. A197/A197M, Standard Specification for Cupola Malleable Iron.
   k. A216/A216M, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
   l. A276, Standard Specification for Stainless Steel Bars and Shapes.

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m. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
n. D2310, Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

6. FM Global (FM).
7. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS): SP-43, Wrought and Fabricated Butt-Welding Fittings for Low-Pressure, Corrosion Resistant Applications.
8. National Electrical Manufacturers Association (NEMA): LI 1, Industrial Laminating Thermosetting Products.
9. National Fire Protection Association (NFPA): 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

1.02 DEFINITIONS

A. Submerged or Wetted:

1. Zone below elevation of:
   a. Top of tank wall or under tank cover.

1.03 DESIGN REQUIREMENTS

A. Where pipe diameter, thickness, pressure class, pressure rating, or thrust restraint is not shown or specified, design piping system in accordance with the following:

1. Fuel Service Piping: API, as applicable.
2. Buried Piping: H20-S16 traffic load with 1.5 impact factor, AASHTO HB-17, as applicable.

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Fabricated Piping:
   a. Detailed pipe fabrication or spool drawings showing special fittings and bends, dimensions, coatings, and other pertinent information.
   b. Layout drawing showing location of each pipe section and each special length; number or otherwise designate laying sequence on each piece.
2. Pipe Wall Thickness: Identify wall thickness and rational method or standard applied to determine wall thickness for each size of each different service including exposed, submerged, buried, and concrete-encased installations for Contractor-designed piping.
3. Dissimilar Buried Pipe Joints: Joint types and assembly drawings.
4. Pipe Corrosion Protection: Product data.
5. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

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B. Informational Submittals:

1. Manufacturer's Certification of Compliance.
   a. Pipe and fittings.
   b. Factory applied resins and coatings.
2. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
3. Flanged Pipe and Fittings: Manufacturer's product data sheets for gaskets including torqueing requirements and bolt tightening procedures.
4. Test logs.
5. Pipe coating applicator certification.
6. Laboratory Testing Equipment: Certified calibrations, manufacturer's product data, and test procedures.
7. Component and attachment testing seismic certificate of compliance as required.

1.05 DELIVERY, STORAGE, AND HANDLING

A. In accordance with:

1. Flanges: Securely attach metal, hardboard, or wood protectors over entire gasket surface.
2. Threaded or Socket Welding Ends: Fit with metal, wood, or plastic plugs or caps.
3. Linings and Coatings: Prevent excessive drying.
4. Cold Weather Storage: Locate products to prevent coating from freezing to ground.
5. Handling: Use heavy canvas or nylon slings to lift pipe and fittings.

PART 2 PRODUCTS

2.01 PIPING

A. As specified on Piping Data Sheet(s) located at the end of this section as Supplement and on Piping Schedule located on the Drawings.

B. Diameters Shown:

1. Standardized Products: Nominal size.

2.02 JOINTS

A. Flanged Joints:

1. Flat-faced, carbon steel, or alloy flanges when mating with flat-faced cast or ductile iron flanges.
2. Higher pressure rated flanges as required to mate with equipment when equipment flange is of higher pressure rating than required for piping.

B. Threaded Joints: NPT taper pipe threads in accordance with ASME B1.20.1.

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C. Joining FRP Piping to old FRP or dissimilar material pipes: Manufacturer and Products of Franklin Fueling Systems; EZ Fit Connections. With quick release connection components.

2.03 GASKET LUBRICANT

A. Lubricant shall be supplied by pipe manufacturer and no substitute or "or-equal" will be allowed.

B. Lubricant shall be compatible with service liquid defined in the Piping Schedule.

2.04 DOUBLE WALL CONTAINMENT PIPING SYSTEM

A. System components shall be pre-engineered, factory fabricated, tested, and assembled such that field assembly is minimized to primarily that of straight joints.

2.05 PIPE CORROSION PROTECTION

A. Coatings: See Piping Data Sheets for coating requirements.

B. Insulating Flanges, Couplings, and Unions:

1. Materials:
   a. In accordance with applicable piping material specified in Pipe Data Sheet. Complete assembly shall have ASME B31.9 or B31.3 working pressure rating equal to or higher than that of joint and pipeline.
   b. Galvanically compatible with piping.
   c. Resistant for intended exposure, operating temperatures, and products in pipeline.
2. Union Type, 2 Inches and Smaller:
   a. Screwed or solder-joint.
   b. O-ring sealed with molded and bonded insulation to body.
3. Flange Type, 2-1/2 Inches and Larger:
   a. Flanged, complete with bolt insulators, dielectric gasket, bolts, and nuts.
   b. Bolt insulating sleeves shall be provided full length between insulating washers.
   c. Ensure fit-up of components of insulated flange assembly to provide a complete functioning installation.
   d. No less than minimum thread engagement in accordance with specified bolting standards will be permitted to accommodate thicknesses of required washers, flanges, and gasket.
4. Manufacturers and Products:
   a. Dielectric Flanges and Unions:
      1) PSI, Houston, TX.
      2) Advance Products and Systems, Lafayette, LA.
      3) Or Approved Equal.

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2.06 FABRICATION

A. Shop fabricate flanged pipe in shop, not in field, and delivered to Site with flanges in place and properly faced. Threaded flanges shall be individually fitted and machine tightened on matching threaded pipe by manufacturer.

2.07 PROCESS VALVES AND OPERATORS

A. Valves and appurtenances for Fuel Storage Tanks are specified in Section 23 13 00, Fuel Storage Tanks and Dispensing Equipment.

B. Ball Valve:

1. Three-piece threaded, carbon steel body with Type 316 stainless steel ball, reinforced Teflon seats, latch lock lever handle, and conforming to API 607.
   a. Manufacturers and Products:
      1) Nibco; TM-590-CS-R-66-FS-LL.
      2) Jomar; T-CS-2001N-SS-4B.
      3) Or Approved Equal.

2.08 TRACER WIRE

A. General:

1. Provide pipe tracer wire for all buried utilities including piping, conduits, and electrical raceways.
2. All trace wire shall have HDPE insulation intended for direct bury and shall be color coated per APWA standard for the specific utility or service.

B. Manufacturers and Products:

1. Copperhead Industries.
2. Performance Wire & Cable Inc.
3. Pro-line Safety Products Company.
4. Or Approved Equal.

C. Trace Wire:

1. Material: Minimum 12-gauge solid copper or copper jacket with a steel core, with high-density polyethylene (HDPE) or high-molecular weight polyethylene (HMWPE) insulation suitable for direct bury.

D. Connectors:

1. All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
2. Direct bury wire connectors shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in

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underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion and, shall be installed in a manner so as to prevent any uninsulated wire exposure.

3. Non locking friction fit, twist on or taped connectors are prohibited.

E. Termination and Access:

1. All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level in-ground access box as applicable), specifically manufactured for this purpose.
2. All grade level in-ground access boxes shall be appropriately identified with flow stream label cast into the cap and be color coded.
3. A minimum of 2 feet of excess slack wire is required in all trace wire access boxes after meeting final elevation.
4. All trace wire access boxes shall include a manually interruptible conductive connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection.
5. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

F. Grounding:

1. Trace wire shall be properly grounded at all dead-end stubs.
2. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20 feet of #12 red HDPE insulated copper clad steel wire connected to anode (minimum 1.5 lb.) specifically manufactured for this purpose and buried at the same elevation as the utility.
3. When grounding the trace wire at dead end stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.
4. When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at or above grade, install grounding anode directly beneath and in-line with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lug connector.
5. Where the anode wire will be connected to a trace wire access box, a minimum of 2 feet of excess slack wire is required after meeting final elevation.

2.09 SIGNAGE

A. Pipe Labels:

1. Labels: Self-adhesive tape, with separate directional flow arrows.
2. Material: Pressure sensitive vinyl.
3. Letters and Arrows: Black on OSHA safety yellow background.
4. Color Field and Letter Height: ASME A13.1.
5. Message: Piping system name as indicated on Piping Schedule.

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6. Manufacturers and Products:
    a. Brady Signmark; B-946 Self-Sticking Vinyl Pipe Markers and Vinyl Arrows.
    b. Seton Identification Products; Opti-Code Markers and Directional Arrows.
    c. Or Approved Equal.

B. Equipment Labels:

1. Applies to equipment with assigned tag numbers, where specified.
2. Letters: Black bold face, 3/4 inch minimum high.
3. Background: OSHA safety yellow.
4. Materials:
    a. Aluminum or stainless steel with a baked-on finish suitable for use on wet, oily, exposed, abrasive, and corrosive areas.
    b. Or multi-layered acrylic.
5. Furnish 1-inch margin with holes at each end of label, for mounting. On fiberglass labels, furnish grommets at each hole.
6. Size:
    a. 2 inches minimum and 3 inches maximum high, by 14 inches minimum and 18 inches maximum long.
    b. Furnish same size base dimensions for all labels.
7. Message: Equipment names and tag numbers as used in sections where equipment is specified.
8. Manufacturers:
    a. Brady Signmark.
    b. Seton Identification Products.
    c. Or Approved Equal.

C. Pipe Marking Tape:

1. Solid aluminum foil, visible on unprinted side, encased in protective high visibility, inert polyethylene plastic jacket.
2. Foil Thickness: Minimum 0.35 mils.
3. Laminate Thickness: Minimum 5 mils.
4. Width: 3 inches.
5. Color: Yellow
6. Identifying Lettering: “FUEL OIL”, Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.
7. Joining Clips: Tin or nickel-coated furnished by tape manufacturer.
8. Manufacturers and Products:
    a. Reef Industries; Terra Tape, Sentry Line Detectable.
    b. Mutual Industries; Detectable Tape.
    c. Presco; Detectable Tape.
    d. Or Approved Equal.

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PART 3 EXECUTION

3.01 EXAMINATION

A. Verify size, material, joint types, elevation, horizontal location, and pipe service of existing pipelines to be connected to new pipelines or new equipment.

B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and other openings.

3.02 PREPARATION

A. See Piping Schedule and Piping Data Sheets for coating requirements.

B. Notify City at least 2 weeks prior to field fabrication of pipe or fittings.

C. Inspect pipe and fittings before installation, clean ends thoroughly, and remove foreign matter and dirt from inside.

D. Damaged Coatings and Linings: Repair using original coating and lining materials in accordance with manufacturer's instructions.

3.03 INSTALLATION—GENERAL

A. Join pipe and fittings in accordance with manufacturer's instructions, unless otherwise shown or specified.

B. Remove foreign objects prior to assembly and installation.

C. EZ Fit flexible connectors: provide connector fittings compatible with materials being joined. Provide leak proof connectors.

D. Threaded and Coupled Joints:

1. Conform to ASME B1.20.1.
2. Produce sufficient thread length to ensure full engagement when screwed home in fittings.
3. Countersink pipe ends, ream and clean chips and burrs after threading.
4. Make connections with not more than three threads exposed.
5. Lubricate male threads only with thread lubricant or tape as specified on Piping Data Sheets.

E. Soldered Joints:

1. Use only solder specified for particular service.
2. Cut pipe ends square and remove fins and burrs.
3. After thoroughly cleaning pipe and fitting of oil and grease using solvent and emery cloth, apply noncorrosive flux to the male end only.
4. Wipe excess solder from exterior of joint before hardened.
5. Before soldering, remove stems and washers from solder joint valves.

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3.04 INSTALLATION—EXPOSED PIPING

A. Piping Runs:

1. Parallel to building or column lines and perpendicular to floor, unless shown otherwise.
2. Piping upstream and downstream of flow measuring devices shall provide straight lengths as required for accurate flow measurement.

B. Group piping wherever practical at common elevations; install to conserve building space and not interfere with use of space and other work.

C. Unions or Flanges: Provide at each piping connection to equipment or instrumentation on equipment side of each block valve to facilitate installation and removal.

D. Install piping so that no load or movement in excess of that stipulated by equipment manufacturer will be imposed upon equipment connection; install to allow for contraction and expansion without stressing pipe, joints, or connected equipment.

E. Piping clearance, unless otherwise shown:

1. Over Walkway and Stairs: Minimum of 7 feet 6 inches, measured from walking surface or stair tread to lowest extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
2. Between Equipment or Equipment Piping and Adjacent Piping: Minimum 3 feet, measured from equipment extremity and extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
3. From Adjacent Work: Minimum 1 inch from nearest extremity of completed piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
4. Do not route piping in front of or to interfere with access ways, ladders, stairs, platforms, walkways, openings, doors, or windows.
5. Headroom in front of openings, doors, and windows shall not be less than the top of the opening.
6. Do not install piping containing liquids or liquid vapors in transformer vaults or electrical equipment rooms.
7. Do not route piping over, around, in front of, in back of, or below electrical equipment including controls, panels, switches, terminals, boxes, or other similar electrical work.

3.05 INSTALLATION—BURIED PIPE

A. Joints:

1. Concrete Encased or Embedded Pipe: Do not encase joints in concrete, unless specifically shown.

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B. Placement:

1. Keep trench dry until pipe laying and joining are completed.
2. Pipe Base and Pipe Zone: As specified in City Standards attached to the front of this document.
3. Exercise care when lowering pipe into trench to prevent twisting or damage to pipe.
4. Measure for grade at pipe invert, not at top of pipe.
5. Excavate trench bottom and sides of ample dimensions to permit visual inspection and testing of entire flange, valve, or connection.
6. Prevent foreign material from entering pipe during placement.
7. Close and block open end of last laid pipe section when placement operations are not in progress and at close of day's work.
8. Lay pipe upgrade with bell ends pointing in direction of laying.
9. After joint has been made, check pipe alignment and grade.
10. Place sufficient pipe zone material to secure pipe from movement before next joint is installed.
11. Prevent uplift and floating of pipe prior to backfilling.

C. Tolerances:

1. Deflection from Horizontal Line: Maximum 2 inches.
2. Deflection from Vertical Grade: Maximum 1/4 inch(es).
3. Joint Deflection: Maximum of 75 percent of manufacturer's recommendation.
4. Horizontal position of pipe centerline on alignment around curves maximum variation of 1.75 feet from position shown.
5. Pipe Cover: Minimum 3 feet, unless otherwise shown.

3.06 INSTALLATION—DOUBLE WALL CONTAINMENT PIPING SYSTEM

A. Install according to manufacturer's instructions.

B. Valves and equipment shall be supported independently from pipe. Anchor valves such that turning moment resulting from their operation will not be transmitted to pipe.

C. Centering Devices for Double Wall Containment Piping:

1. In general, in accordance to manufacturer's standard practice.
2. Center and support carrier pipe within the containment pipe with centering devices. Locate not less than every 9 feet, or within 24 inches of the termination of containment pipe on fabricated pieces.
3. Install centering devices such that leak detection cable (if specified) will be unrestricted and such that system maintains free drainage.

D. Following Installation and Testing:

1. Flush clean carrier and containment piping system.
2. Purge annular space of moisture with clean, dry air.

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3.07 LEAK DETECTION SYSTEM FOR DOUBLE WALL CONTAINMENT PIPING

A. Install in accordance with system manufacturer's instructions and recommendations. Refer to Section 40 27 00.15, Double Wall Containment Piping.

3.08 PIPE CORROSION PROTECTION

A. Carbon Steel Pipe:

1. Exposed: As specified in Piping Data Sheet.

B. Piping Accessories:

1. Exposed:
   a. Field paint black and galvanized steel, brass, copper, and bronze piping components as specified in Piping Data Sheet, as applicable to base metal material.
   b. Accessories include, but are not limited to, pipe hangers, supports, expansion joints, pipe guides, flexible couplings, vent and drain valves, and fasteners.

C. Insulating Flanges, Couplings, and Unions:

1. Applications:
   a. Dissimilar metal piping connections.
   b. Cathodically protected piping penetration to buildings.
   c. Connections to existing metallic pipe.
   d. Where required for electrically insulated connection.
2. Pipe Installation:
   a. Submerged carbon steel, ductile iron, or galvanized piping in reinforced concrete shall be isolated from the concrete reinforcement steel.
   b. Align and install insulating joints as shown on the Drawings and according to manufacturer's recommendations. Bolt lubricants that contain graphite or other metallic or electrically conductive components that can interfere with the insulating capabilities of the completed flange shall not be used.

3.09 BRANCH CONNECTIONS

A. Do not install branch connections smaller than 1/2-inch nominal pipe size, including instrument connections, unless shown otherwise.

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B. When line of lower pressure connects to a line of higher pressure, requirements of Piping Data Sheet for higher pressure rating prevails up to and including first block valve in the line carrying the lower pressure, unless otherwise shown.

C. Threaded Pipe Tap Connections:

1. Welded Steel or Alloy Piping: Connect only with welded threadolet or half-coupling as specified on Piping Data Sheet.
2. Limitations: Threaded taps in pipe barrel are unacceptable.

3.10 FIELD FINISHING

A. Notify City at least 3 days prior to start of surface preparation or coating application work.

3.11 PIPE IDENTIFICATION

A. Installation:

1. In accordance with manufacturer's recommendations.
2. Mount securely, plumb, and level in a clear line of sight.

B. Identification Labels:

1. Pipe Labels:
   a. Locate at connections to equipment, valves, or branching fittings at wall boundaries.
   b. At intervals along piping not greater than 18 feet on center with at least one label applied to each exposed horizontal and vertical run of pipe.
   c. At exposed piping not normally in view, such as above suspended ceilings and in closets and cabinets.
   d. Supplementary Labels: Provide to City those listed on Piping Schedule that do not receive arrows.
   e. Apply to pipe after painting in vicinity is complete, or as approved by City.
   f. Install in accordance with manufacturer's instructions.
2. Buried Pipe Marking Tape: Continuously install marking tape along centerline of buried piping as shown on Drawings.
3. Equipment Labels:
   a. Locate and install on equipment at eye level.
   b. Anchor to equipment or base for easy removal and replacement with ordinary hand tools.
4. Electrical Panels: Locate and install on equipment at eye level.

3.12 TRACER WIRE INSTALLATION AND TESTING

A. Install tracer wire continuously along centerline of nonmetallic buried piping.

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B. Attach wire to top of pipe using tape at maximum of 10-foot intervals. In areas where depth of cover is excessive for allowing detection of tracer wire with electronic pipe locator, install tracer wire within pipe backfill directly above pipe centerline at a minimum depth of 3 feet.

C. Install splices in accordance with manufacturer's instructions for direct bury applications. Tie ends of wire to be joined in a knot as required to reduce tension on splice.

D. Bring tracer wire to surface at each valve box, curb box, vault, air valve, blowoff valve, hydrant, and pipeline marker. Tracer wire shall be brought to surface at least every 1,000 feet. If distance between pipe appurtenances exceeds 1,000 feet, install valve box to allow access to tracer wire. Mark valve box cover with the word "TRACER". Coil enough excess tracer wire at each appurtenance to extend wire 12 inches above ground.

E. Testing:

1. All new trace wire installations shall be located using typical low frequency (512-Hz) line tracing equipment, witnessed by the Contractor, Engineer and facility owner as applicable, prior to acceptance of ownership. This verification shall be performed upon completion of rough grading and again prior to final acceptance of the Project.
2. Continuity testing in lieu of actual line tracing shall not be accepted.

3.13 FIELD QUALITY CONTROL

A. Pressure Leakage Testing: As specified in Section 40 80 01, Process Piping Leakage Testing.

3.14 MANUFACTURER'S SERVICES

A. Provide manufacturer's representative at Site in accordance with Section 01 43 33, Manufacturers' Field Services, to assist with unloading of the double wall containment piping system, system tests, containment pipe joint closure, installation and testing of leak detection system, and training of City's personnel in operation and maintenance of leak detection system. Manufacturer's representative shall complete a Manufacturer's Certificate of Proper Installation. Inspection and examination practices shall be according to ASME B31.3 for Normal Fluid Service.

3.15 CLEANING

A. Following assembly and testing, and prior to final acceptance, flush pipelines, except as stated below, at 2.5 fps minimum flushing velocity until foreign matter is removed.

B. Blow clean of loose debris plant process air, and instrument air lines with compressed air at 4,000 fpm; do not flush with water.

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C. Insert cone strainers in flushing connections to attached equipment and leave in-place until cleaning is complete.

D. Remove accumulated debris through drains 2 inches and larger or by removing spools and valves from piping.

3.16 SUPPLEMENTS

A. The supplements listed below, following "End of Section," are a part of this Specification:

1. Data Sheets.

Number	Title
40 27 00.02	Carbon Steel Pipe and Fittings—Special Service
40 27 00.15	Double Wall Containment Piping

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SECTION 40 27 00.02 CARBON STEEL PIPE AND FITTINGS—SPECIAL SERVICE		
Item	**Size**	**Description**
Pipe	All	Black carbon steel, ASTM A106/A106M, Grade B seamless or ASTM A53/A53M, Grade B seamless or ERW. Threaded, butt-welded, and flanged joints:
	Screwed: 1-1/2" & smaller	Standard weight.
	Welded: 2" through 10"	Standard weight or Schedule 40
Joints	1-1/2" & smaller	Threaded or socket-welded; flanged at equipment as required or shown.
	2" & larger	Butt-welded or flanged at valves and equipment.
Fittings	1-1/2" & smaller	Threaded or socket-weld, forged carbon steel, ASTM A105/A105M, 2,000-pound or 3,000-pound WOG (3,000-pound chlorine service), conforming to ASME B16.11; bore to match pipe inside diameter.
	2" & larger	Wrought carbon steel butt-welding, ASTM A234/A234M, Grade WPB meeting the requirements of ASME B16.9; fitting wall thickness to match adjoining pipe; long radius elbows unless shown otherwise.
Branch Connections	1-1/2" & smaller	Threadolet or socket in conformance with Fittings above.
	2" & larger	Butt-welding tee in accordance with Fittings above.
Flanges	1-1/2" & smaller	Forged carbon steel, ASTM A105/A105M, ASME B16.5 Class 150 or Class 300 socket-weld or threaded, 1/16-inch raised face.
	2" & larger	Forged carbon steel, ASTM A105/A105M, ASME B16.5 Class 150 or Class 300 slip-on or welding neck, 1/16-inch raised face. Weld neck bore to match pipe internal diameter. Use weld neck flanges when abutting butt-weld fittings. Weld slip-on flanges inside and outside.
Unions	1-1/2" & smaller	Threaded or socket-weld, forged carbon steel, ASTM A105/A105M, 2,000-pound or 3,000-pound WOG, integral ground steel-to-steel seats, AAR design meeting the requirements of ASME B16.11, bore to match pipe.

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SECTION 40 27 00.02 CARBON STEEL PIPE AND FITTINGS—SPECIAL SERVICE		
Item	**Size**	**Description**
Bolting	All	Carbon steel ASTM A193/A193M, Grade B7 studs; ASTM A194/A194M, Grade 2H hex head nuts and ASTM F436 hardened steel washers at nuts and bolt heads. Achieve 40 percent to 60 percent of bolt minimum yield stress. When mating flange on equipment is cast iron and gasket is flat ring, provide ASTM A307, Grade B hex head bolts; ASTM A563, Grade A heavy hex nuts and ASTM F436 hardened steel washers at nuts and bolt heads. Achieve 40 percent to 60 percent of bolt minimum yield stress. Flanged Joints in Wetted Installations: Type 316 stainless steel, ASTM A320/A320M, Grade B8M hex head bolts; ASTM A194/A194M, Grade 8M hex nuts and ASTM F436 Type 3 alloy washers at nuts and bolt heads. Achieve 40 percent to 60 percent of bolt minimum yield stress.
Gaskets	All flanges	General Service and Oil/Gas: 1/16-inch thick compressed nonasbestos composition flat ring type, rated 400 degrees F continuous. Garlock, Blue-Gard 3000; Durlon 7950.
Thread Lubricant		Fuel Gas Service: Yellow Teflon tape designed for fuel gas service. Air Force A-A-58092.

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SECTION 40 27 00.15 DOUBLE WALL CONTAINMENT PIPING	
Item	**Description**
Carrier Pipe	2-inch FRP: Red Thread IIA piping system with filament wound fiberglass reinforced epoxy, bell, and spigot, designed to withstand 250 degrees F. Pipe to be in conformance with ASTM D2310. Where possible, supply straight sections in 15-foot random lengths with 6 inches of piping exposed at each end for field joint fabrication.
Containment Pipe	4-inch FRP: The outer conduit shall be a nonmetallic fiberglass conforming to ASTM 2310 standard classification TRP-11CX and ASTM D2996, Type 1, Grade 1, Class F specification, with the following thickness: Thickness: 0.085" Lengths: 15-foot Coating: Conduit exterior shall be factory coated with a NACE and NAPCA approved Fusion Bonded Epoxy. All exterior surfaces of the conduit shall be shot blasted prior to the application of the coating.
Containment Pipe Fittings and Joints	Fittings: Red Thread IIA piping system with all fittings filament wound, heavy duty, bell and spigot type with a 0.20 interior liner in conformance with ASTM D2310. 90-degree elbows shall be long radius only. Joining FRP Piping to old FRP or dissimilar material pipes: Manufacturer and Products of Franklin Fueling Systems; EZ Fit Connections. With quick release connection components. Inner Pipe Supports: Carrier pipe shall be aligned and supported within the outer casing with nonmetallic pipe supports designed to allow free air and fluid movement within the containment pipe. The supports will be designed and spaced to carry up to 1.5 times the weight of carrier pipe full of petroleum while allowing the carrier pipe to expand and contract. End Seals: Terminal ends of containment inside manholes, pits, building wall, or above grade stub up shall be equipped with end seals. End seals with drain or vent openings located diametrically opposite on the vertical center line of the mounting plate and shall be shipped to the job site with plugs in place. Terminate all containment 2 inches beyond the inside face of the structure walls. Joints: Pipe and fittings shall be joined using thermosetting epoxy resin. Mechanical joints or O-Ring seals are not permitted.
Manufacturer:	1. NOV Fiber Glass Systems. 2. Or Approved Equal.

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SECTION 40 27 00.15 DOUBLE WALL CONTAINMENT PIPING	
Item	**Description**
Leak Detection System	Electronic Module: Capable of continuously monitoring 500 feet of sensing cable for liquid contact. Monitor sensing cable and interconnecting cable for continuity. Contact with aqueous chemical shall or lack of continuity shall result in audible alarm, a LED signal, actuation of output relay, and digital display of the distance to leak location. Shall require no operator programming and be capable of automatically calibrating system whenever power is applied. Sensing Cable: Detect presence of aqueous liquids; capable of accommodating any number of branches; corrosion resistant, constructed of two sensor wires jacketed with conductive fluoropolymer and two insulated wires all embedded in a fluoropolymer carrier rod; no metal parts shall be exposed to the environment. Shall not be damaged when exposed to diesel carried by the primary piping system when tested in accordance with exposure procedures in ASTM D543 for 7 days. Interconnect Wiring: Jumper cable shall be available to interconnect sensing cables or to facilitate remote mounting of electronic panel. Use of interconnect wiring to remotely mount electronic panel shall not reduce the maximum amount of sensor cable that electronic panel can monitor. Portable Test Kit: Provide to Engineer to permit field inspection and testing of complete cable system.

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SECTION 40 80 01
PROCESS PIPING LEAKAGE TESTING

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Testing Plan:
   a. Submit prior to testing and include at least the information that follows.
      1) Testing dates.
      2) Piping systems and section(s) to be tested.
      3) Test type.
      4) Method of isolation.
      5) Calculation of maximum allowable leakage for piping section(s) to be tested.
      6) Pipe manufacturer's recommended leakage testing procedure for specific service.
2. Certifications of Calibration: Testing equipment.
3. Certified Test Report.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

A. Notify City in writing 5 days in advance of testing. Perform testing in presence of City.

B. Pressure Piping:

1. Install temporary thrust blocking or other restraint as necessary to protect adjacent piping or equipment and make taps in piping prior to testing.
2. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
3. New Piping Connected to Existing Piping:
   a. Isolate new piping with grooved-end pipe caps, spectacle blinds, blind flanges, or as acceptable to City.
   b. Test joint between new piping and existing piping by methods that do not place entire existing system under test load, as approved by City.
4. Items that do not require testing include: Equipment seal drains, tank overflows to atmospheric vented drains, tank atmospheric vents.
5. Test Pressure: As specified herein.

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C. Gravity Piping:

1. Perform testing after service connections, manholes, and backfilling have been completed between stations to be tested.
2. Determine groundwater level at time of testing by exploratory holes or other method acceptable to City.

3.02 PNEUMATIC TEST FOR PRESSURE PIPING

A. Fluid: Oil-free, dry air.

B. Procedure:

1. Perform test on pipelines prior to backfilling to allow visual inspection.
2. Apply preliminary pneumatic test pressure, as shown on Pipe Schedule, to piping system prior to final leak testing, to locate visible leaks. Apply soap bubble mixture to joints and connections; examine for leakage.
3. Correct visible leaks and repeat preliminary test until visible leaks are corrected.
4. Gradually increase pressure in system to half of specified test pressure. Thereafter, increase pressure in steps of approximately one-tenth of specified test pressure until required test pressure is reached.
5. Maintain pneumatic test pressure continuously for minimum of 10 minutes and for such additional time as necessary to conduct soap bubble examination for leakage.
6. Correct visible leakage and retest as specified.

C. Allowable Leakage: Piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of leakage.

D. After testing and final cleaning, purge with nitrogen those lines that will carry flammable gases to assure no explosive mixtures will be present in system during filling process.

3.03 PNEUMATIC TEST FOR GRAVITY PIPING

A. Equipment:

1. Calibrate gauges with standardized test gauge provided by Contractor at start of each testing day. City's representative will witness calibration.
2. Install gauges, air piping manifolds, and valves at ground surface.
3. Provide pressure release device, such as rupture disc or pressure relief valve, to relieve pressure at 6 psi or less.
4. Restrain plugs used to close sewer lines to prevent blowoff.

B. Procedure:

1. Require that no person enter manhole where pipe is under pressure.
2. Slowly introduce air into pipe section until internal air pressure reaches 4 psi greater than average back pressure of groundwater submerging pipe.
3. Allow 2 minutes minimum for air temperature to stabilize.

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C. Allowable Leakage: zero.

D. Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.

E. Defective Piping Sections: Replace and retest as specified.

3.04 FIELD QUALITY CONTROL

A. Test Report Documentation:

1. Test date.
2. Description and identification of piping tested.
3. Test fluid.
4. Test pressure.
5. Remarks, including:
   a. Leaks (type, location).
   b. Repair/replacement performed to remedy excessive leakage.
6. Signed by Contractor and City to represent that test has been satisfactorily completed.

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SECTION 40 99 90
PACKAGE CONTROL SYSTEMS

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Provide a wall mounted control panel provided by the Gear Pumps manufacturer see Section 44 42 56.06, Gear Pumps. Control panel shall be shipped loose for mounting approximately 25 feet away from the pump skid location. Control panel shall contain motor rated circuit breakers, all operator interface and local control devices, motor starters, control power transformers, main disconnect switch, interface terminal blocks for start and stop signals from existing fuel level controller.

B. Provide two motor disconnects, one for each motor shall be mounting adjacent to control panel in direct line of site of the motors.

C. Assemble panels and install instruments, and wiring in equipment manufacturer's factory.

D. Test panels and panel assemblies for proper operation prior to shipment from equipment manufacturer's factory.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. The Institute of Electrical and Electronics Engineers, Inc. (IEEE): C62.41, IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
2. International Society of Automation (ISA): S50.1, Compatibility of Analog Signals for Electronic Process Instruments.
3. National Electrical Manufacturers Association (NEMA):
   a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   b. AB 1, Molded Case Circuit Breakers and Molded Case Switches.
   c. ICS 2, Industrial Control Devices, Controllers and Assemblies.
4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
5. UL: 508A, Standards for Safety, Industrial Control Panels.

1.03 SUBMITTALS

A. Action Submittals:

1. Bill of material, catalog information, descriptive literature, wiring diagrams, and Shop Drawings for components of control system.
2. Catalog information on electrical devices furnished with system.
3. Shop Drawings, catalog material, and dimensional layout drawings for control panels and enclosures.

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4. Panel elementary diagrams of prewired panels. Include in diagrams control devices and auxiliary devices, for example, relays, alarms, fuses, lights, fans, and heaters as applicable.
5. Plumbing diagrams of interconnecting plumbing diagrams.
6. Interconnection wiring diagrams that include numbered terminal designations showing external interfaces.
7. Seismic anchorage and bracing data sheets and drawings as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Programmable Controller Submittals:
   a. Complete set of user manuals.
   b. Fully documented ladder logic listings.
   c. Function listing for function blocks not fully documented by ladder logic listings.
   d. Cross-reference listing.
3. Manufacturer's list of proposed spares, expendables, and test equipment.
4. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Prior to shipment, include corrosive-inhibitive vapor capsules in shipping containers and related equipment as recommended by capsule manufacturer.

1.05 EXTRA MATERIALS

A. Spares, Expendables, and Test Equipment:

1. Selector Switch, Pushbutton, and Indicating Light: 20 percent, one minimum, of each type used.
2. Light Bulb: 100 percent, 2 minimum, of each type used.
3. Fuse: 100 percent, 5 minimum, of each type used.
4. Surge Suppressors: 20 percent, one minimum, of each type used.

PART 2 PRODUCTS

2.01 GENERAL

A. See Notes on Contract Drawings.

2.02 SIGNAL CHARACTERISTICS

A. Discrete Signals:

1. Two-state logic signals.
2. Utilize 120V ac sources for control and alarm signals.

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3. Alarm signals shall be normally open, close to alarm isolated contacts rated for 5-ampere at 120V ac and 2-ampere at 30V dc.

2.03 CORROSION PROTECTION

A. Corrosion-Inhibiting Vapor Capsule Manufacturers:

1. Northern Instruments; Model Zerust VC.
2. Hoffmann Engineering; Model A-HCI.
3. Or Approved Equal.

2.04 CONTROL PANEL

A. Panel Construction and Interior Wiring: In accordance with the National Electrical Code (NEC), UL 508, state and local codes, and applicable sections of NEMA, ANSI, and ICECA.

B. Conform to NEMA ratings as specified in individual equipment sections.

C. Minimum Metal Thickness: 14 gauge.

D. NEMA 250, Type 4X Panels: Type 316 stainless steel construction unless otherwise specified.

E. Doors:

1. Three-point latching mechanisms in accordance with NEMA 250 Type 1 and 12 panels with doors higher than 18 inches.
2. For other doors, stainless steel quick release clamps.

F. Cutouts shall be cut, punched, or drilled and finished smoothly with rounded edges.

G. Access: Front, suitable for installation with back and sides adjacent to or in contact with other surfaces, unless otherwise specified.

H. Temperature Control:

1. Size panels to adequately dissipate heat generated by equipment mounted on or in the panel.
2. Furnish cooling fans with air filters if required to dissipate heat.
3. For panels outdoors or in unheated areas, furnish thermostatically controlled heaters to maintain temperature above 40 degrees F.

I. Push-to-Test Circuitry: For each push-to-test indicating light, provide a fused push-to-test circuit.

J. Lighting: Minimum of one hand switch controlled internal 100-watt incandescent light for panels 12 cubic feet and larger.

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K. Minimum of one 120-volt GFCI duplex receptacle for panels 12 cubic feet and larger.

L. Finish:

1. Metallic External Surfaces (Excluding Aluminum and Stainless Steel): Manufacturer's standard gray unless otherwise specified.
2. Internal Surfaces: White enamel.

M. Panel Manufacturers:

1. Hoffman.
2. H.F. Cox.
3. Or Approved Equal.

N. Breather and Drains: Furnish with NEMA 250, Type 4 and 4X panels.

1. Manufacturers and Products: Cooper Crouse-Hinds; ECD Type 4X Drain, Breather; Drain Model ECD1-N4D, Breather Model ECD1-N4B, or Approved Equal.

2.05 CONTROL PANEL ELECTRICAL

A. UL Listing Mark for Enclosures: Mark stating "Listed Enclosed Industrial Control Panel" per UL 508A.

B. I&C and electrical components, terminals, wires, and enclosures UL recognized or UL listed.

C. Control Panels with Three-Phase Power Supplies and Motor Starters:

1. Interlock main circuit breaker with panel door.
   a. Mount logic controls, branch circuit breakers, overload reset switches, and other control circuit devices.
   b. Mount operator controls and indications on front access door.
2. Circuit Breakers:
   a. In accordance with NEMA AB 1.
   b. 18,000-ampere RMS symmetrical rating, minimum at 480 volts, unless otherwise specified.
   c. Breakers, except Motor Branch Breakers: Molded case thermal magnetic.
   d. 14,000-ampere RMS symmetrical rating, minimum at 480 volts, unless otherwise specified in package system equipment Specification sections.
   e. Tripping: Indicate with operator handle position.
3. Magnetic Motor Starters:
   a. Full voltage, NEMA ICS 2, Class A, Size O minimum.
   b. Include three-pole bimetallic or eutectic alloy thermal overload relays sized for each motor.
   c. Manual reset type with reset button mounted on panel door.

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4. Motor Control: 120V ac (except intrinsically safe circuits where applicable).
    a. Power Control Transformer:
        1) Sufficient capacity to serve connected load, including 200VA for duplex outlet plus 100VA (minimum).
        2) Limit voltage variation to 15 percent during contact pickup.
        3) Fuse one side of secondary winding and ground the other.
        4) Furnish primary winding fuses in ungrounded conductors.
5. Power Distribution Blocks: Furnish to parallel feed tap on branch circuit protective devices. Do not "leap frog" power conductors.
6. Terminations for Power Conductors: Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.

D. Wiring:

1. AC Circuits:
    a. Type: 600-volt, Type MTW stranded copper.
    b. Size: For current to be carried, but not less than 14 AWG.
2. Other dc Circuits.
    a. Type: 600-volt, Type MTW stranded copper.
    b. Size: 18 AWG, minimum.
3. Separate analog and other dc circuits by at least 6 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.
4. Enclose wiring in sheet metal raceways or plastic wiring ducts.
5. Wire Identification: Numbered and tagged at each termination.
    a. Wire Tags: Machine printed, heat shrink.
    b. Manufacturers:
        1) Brady PermaSleeve.
        2) Tyco Electronics.
        3) Or Approved Equal.

E. Wiring Interface:

1. For analog and discrete signal, terminate at numbered terminal blocks.
2. For special signals, terminate power (240 volts or greater) at manufacturer's standard connectors.
3. For panel, terminate at equipment on/with which it is mounted.

F. Terminal Blocks:

1. Quantity:
    a. For external connections.
    b. Wire spare or unused panel mounted elements to their panels' terminal blocks.
    c. Spare Terminals: 20 percent of connected terminals, but not less than 10.
2. General: Group to keep 120V ac circuits separate from 24V dc circuits.
    a. Connection Type: Screw connection clamp.
    b. Compression Clamp:
        1) Hardened steel clamp with transversal grooves penetrating wire strands providing a vibration-proof connection.

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2) Guides strands of wire into terminal.
c. Screws: Hardened steel, captive, and self-locking.
d. Current Bar: Copper or treated brass.
e. Insulation:
1) Thermoplastic rated for minus 55 to plus 110 degrees C.
2) Two funnel shaped inputs to facilitate wire entry.
f. Mounting:
1) Rail.
2) Terminal block can be extracted from an assembly without displacing adjacent blocks.
3) End Stops: One at each end of rail, minimum.
g. Wire Preparation: Stripping only.
h. Jumpers: Allow jumper installation without loss of space on terminal or rail.
i. Marking System:
1) Terminal number shown on both sides of terminal block.
2) Allow use of preprinted and field marked tags.
3) Terminal strip numbers shown on end stops.
4) Mark terminal block and terminal strip numbers as shown.

3. Terminal Block, 120-Volt Power:
a. Rated Voltage: 600V ac.
b. Rated Current: 30 amp.
c. Wire Size: 22 through 10 AWG.
d. Rated Wire Size: 10 AWG.
e. Color: Gray body.
f. Spacing: 0.25 inch, maximum.
g. Manufacturers and Products: Entrelec; Type M4/6, or Approved Equal.

4. Terminal Block, Ground:
a. Wire Size: 22 through 12 AWG.
b. Rated Wire Size: 12 AWG.
c. Color: Green and yellow body.
d. Spacing: 0.25 inch, maximum.
e. Grounding: Ground terminal blocks electrically grounded to the mounting rail.
f. Manufacturer and Product: Entrelec; Type M4/6.P, or Approved Equal.

5. Terminal Block, Blade Disconnect Switch:
a. Use: Provide one for each discrete input and output field interface wire.
b. Rated Voltage: 600V ac.
c. Rated Current: 10 amp.
d. Wire Size: 22 through 12 AWG.
e. Rated Wire Size: 12 AWG.
f. Color: Gray body, orange switch.
g. Spacing: 0.25 inch, maximum.
h. Manufacturer and Product: Entrelec; Type M4/6.SN, or Approved Equal.

6. Terminal Block, Fused, 24V dc:
a. Rated Voltage: 600V dc.

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b. Rated Current: 6.3 amp.
c. Wire Size: 22 through 12 AWG.
d. Rated Wire Size: 12 AWG.
e. Color: Gray body.
f. Fuse: 5 by 20 GMA fuses.
g. Fuse Marking: Fuse amperage rating shown on top of terminal block.
h. Indication: LED diode 24V dc.
i. Leakage Current: 5.2 mA, maximum.
j. Spacing: 0.32 inch, maximum.
k. Manufacturer and Product: Entrelec; Type M4/6.SFD, or Approved Equal.

7. Terminal Block, Fused, 120V ac:
a. Rated Voltage: 600V ac.
b. Rated Current: 6.3 amp.
c. Wire Size: 22 through 12 AWG.
d. Rated Wire Size: 12 AWG.
e. Color: Gray body.
f. Fuse: 5 by 20 GMA fuses.
g. Fuse Marking: Fuse amperage rating shown on top of terminal block.
h. Indication: Neon lamp 110V ac.
i. Leakage Current: 1.8 mA, maximum.
j. Spacing: 0.32 inch, maximum.
k. Manufacturer and Product: Entrelec; Type M4/6.SFL, or Approved Equal.

G. Grounding: Internal copper grounding bus for ground connections on panels, consoles, racks, and cabinets.

H. Relays:

1. General:
a. Relay Mounting: Plug-in type socket.
b. Relay Enclosure: Provide dust cover.
c. Socket Type: Screw terminal interface with wiring.
d. Socket Mounting: Rail.
e. Furnish holddown clips.

2. Control Circuit Switching Relay, Nonlatching:
a. Type: Compact general purpose plug-in.
b. Contact Arrangement: 3 Form C contacts.
c. Contact Rating: 10A at 28V dc or 240V ac.
d. Contact Material: Silver cadmium oxide alloy.
e. Coil Voltage: As noted or shown.
f. Coil Power: 1.8 watts (dc), 2.7VA (ac).
g. Expected Mechanical Life: 10,000,000 operations.
h. Expected Electrical Life at Rated Load: 100,000 operations.
i. Indication Type: Neon or LED indicator lamp.
j. Push-to-test button.
k. Manufacturer and Product: Potter and Brumfield; Series KUP, or Approved Equal.

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I. Front-of-Panel Devices in Conjunction with NEMA 250, Type 1 and 12 Panels:

1. Indicating Lights:
   a. Heavy-duty, push-to-test type, oiltight, industrial type with integral transformer for 120V ac applications.
   b. Screwed on prismatic glass lenses in colors noted and factory engraved legend plates for service legend.
   c. Manufacturers and Products:
      1) Eaton/Cutler-Hammer; Type 10250T.
      2) General Electric; CR2940U.
      3) Or Approved Equal.
2. Pushbutton, Momentary:
   a. Heavy-duty, oiltight, industrial type with full guard and momentary contacts rated for 10 amperes continuous at 120V ac.
   b. Standard size legend plates with black field and white markings for service legend.
   c. Manufacturers and Products:
      1) Square D; Class 9001, Type K.
      2) Eaton/Cutler-Hammer; Type T.
      3) General Electric; Type CR-2940.
      4) Or Approved Equal.
3. Selector Switch:
   a. Heavy-duty, oiltight, industrial type with contacts rated for 120V ac service at 10 amperes continuous.
   b. Standard size, black field, legend plates with white markings, for service legend.
   c. Operators: Black knob type.
   d. Single-hole mounting, accommodating panel thicknesses from 1/16 inch to 1/4 inch.
   e. Manufacturers and Products for Units with up to Four Selection Positions:
      1) Eaton/Cutler-Hammer; Type T.
      2) Square D; Type K.
      3) Or Approved Equal.
   f. Manufacturers and Products for Units with up to 12 Selection Positions:
      1) Rundel-Idec; Standard Cam Switch.
      2) Electroswitch; 31.
      3) Or Approved Equal.

2.06 INSTRUMENT TAG NUMBERS

A. A shorthand tag number notation is used. For example:

AI-1-12(2)(3)[pH]

Notation	Explanation
AI	ISA designator for Analysis Indicator
1	Unit process number

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12 Loop number

(2) First unit number; number of same component types in a given loop; -1 and 1-2 in this example

(3) Second unit number; number of same component types with same first unit number in a given loop; -1, -2, and -3 in this example

[pH] Same notation shown at 2 o'clock position on ISA circle symbol on Process and Instrument Diagram

B. In this example, AI-1-12(2)(3)[pH] is shorthand for:

AI-1-12-1-1[pH], AI-1-12-1-2[pH], AI-1-12-1-3[pH]

AI-1-12-2-1[pH], AI-1-12-2-2[pH], AI-1-12-2-3[pH]

2.07 NAMEPLATES, NAMETAGS, AND SERVICE LEGENDS

A. Nametags: Permanently mounted bearing entire ISA tag number.

1. Panel Mounted: Plastic, mounted to instrument behind panel face.
2. Field Mounted: Engraved Type 316 stainless steel, 22-gauge minimum thickness, attached with stainless steel.

B. Service Legends (Integrally Mounted with Instrument) and Nameplates:

1. Engraved, rigid, laminated plastic type with adhesive back. Furnish service legends and nameplates to adequately describe functions of panel face mounted instruments.
2. Color: White with black letters.
3. Letter Height: 3/16 inch.
4. For each panel, face mounted laminated nameplate inscribed with the panel name and tag number. Color shall be white with black letters 1/2-inch high.

C. Standard Light Colors and Inscriptions: Unless otherwise specified in individual equipment specifications, use the following color code and inscriptions:

Tag	Inscription(s)	Color
ON	ON	Red
OFF	OFF	Green
OPEN	OPEN	Red
CLOSED	CLOSED	Green
LOW	LOW	Amber
FAIL	FAIL	Amber
HIGH	HIGH	Amber
AUTO	AUTO	White

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Tag	Inscription(s)	Color
MANUAL	MANUAL	Yellow
LOCAL	LOCAL	White
REMOTE	REMOTE	Yellow
FORWARD	FORWARD	Red
REVERSE	REVERSE	Blue

1. Lettering: Black on white and amber lenses; white on red and green lenses.
2. Standard Pushbutton Colors and Inscriptions:
   a. Use following unless otherwise noted.

Tag Function	Inscription(s)	Color
OO	ON OFF	Black Black
OC	OPEN CLOSE	Black Black
OCA	OPEN CLOSE AUTO	Black Black Black
OOA	ON OFF AUTO	Black Black Black
MA	MANUAL AUTO	Black Black
SS	START STOP	Black Black
RESET	RESET	Black
EMERGENCY STOP	EMERGENCY STOP	Red

   b. Lettering Color:
      1) Black on white and yellow buttons.
      2) White on black, red, and green buttons.

PART 3 EXECUTION

3.01 ELECTRICAL POWER AND SIGNAL WIRING

A. Restrain control and signal wiring in control panels by plastic ties or ducts. Secure hinge wiring at each end so bending or twisting will occur around the longitudinal axis of wire. Protect bend area with a sleeve.

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B. Arrange wiring neatly, cut to proper length, and remove surplus wire. Install abrasion protection for wire bundles passing through holes or across edges of sheet metal.

C. Use manufacturer's recommended tool with sized anvil for crimp terminations. No more than one wire may be terminated in a single crimp lug. No more than two lugs may be installed on a single screw terminal.

D. Do not splice or tap wiring except at device terminals or terminal blocks.

3.02 PROTECTION

A. Protect enclosures and other equipment containing electrical, instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules.

B. During Work, periodically replace capsules in accordance with capsule manufacturer's recommendations. Replace capsules at Substantial Completion.

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SECTION 44 42 56.06
GEAR PUMPS

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Provide two separate skid mounted pumps with totally enclosed fan cooled motors, isolation valves, and relief valves as shown on Drawings. Also see Section 01 31 13, Project Coordination.

B. Provide dual motor starters in a single panel and two motor disconnects shipped loose for mounting separately see Section 40 99 90, Package Control Systems.

C. Skids shall be configured to connect to existing fuel piping. Both skids shall be sized to fit inside an existing 3 feet by 4 feet pump vault. (Dimensions listed here and shown on Drawings are from the Engineers record drawings, actual dimensions shall be verified by Contractor before starting construction.)

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Bearing Manufacturers Association (ABMA).
2. American Iron and Steel Institute (AISI):
   a. Type 416 Stainless Steel.
   b. Type 1035 Steel.
   c. Type 1045 Carbon Steel.
   d. Type 4140 Alloy Steel.
3. ASTM International (ASTM):
   a. A48/A48M, Standard Specification for Gray Iron Castings.
   b. A53/A53M, Standard specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
   c. A276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
   d. A576, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
   e. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
   f. B148, Standard Specification for Aluminum Bronze Sand Castings.
   g. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
4. Hydraulic Institute Standards.
5. Institute of Electrical and Electronics Engineers (IEEE): 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
6. National Electrical Manufacturer's Association (NEMA): MG 1, Motors and Generators.

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1.03 DEFINITIONS

A. Terminology pertaining to pumping unit performance and construction shall conform to ratings and nomenclature of the Hydraulic Institute Standards.

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Make, model, weight, and horsepower of each equipment assembly.
   b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
   c. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.
   d. Pump maximum downthrust or upthrust in pounds.
   e. Detailed mechanical and electrical drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.
   f. Power and control wiring diagrams, including terminals and numbers.
   g. Complete motor nameplate data, as defined by NEMA, motor manufacturer.
   h. Factory finish system data sheets.
   i. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Factory Functional and Performance Test Reports and Log.
3. Special shipping, storage and protection, and handling instructions.
4. Manufacturer's printed installation instructions.
5. Suggested spare parts list to maintain the equipment in service for a period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
6. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
7. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
8. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

1.05 EXTRA MATERIALS

A. Furnish for this set of pumps:

1. Complete set bearings.
2. Complete set gaskets and O-ring seals.

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3. Complete set keys, dowels, pins, etc.
4. Complete mechanical seal.
5. One set of gear impellers.
6. One complete set of any special tools required to dismantle pump.

PART 2 PRODUCTS

2.01 GENERAL

A. Coordinate pump requirements with drive manufacturer and be responsible for pump and drive requirements.

B. Where adjustable speed drives are required, furnish a coordinated operating system complete with pump, drive, and speed controller.

2.02 SUPPLEMENTS

A. Some specific requirements are attached to this section as supplements.

2.03 ACCESSORIES

A. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.

B. Lifting Lugs: Equipment weighing over 100 pounds.

C. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, and as specified in Section 01 88 15, Anchorage and Bracing, and Section 05 05 19, Cast-in-Place and Post Installed Anchors.

2.04 FACTORY FINISHING

A. Provide standard factory finish coating.

2.05 SOURCE QUALITY CONTROL

A. Factory Inspections: Inspect control panels for required construction, electrical connection, and intended function.

B. Factory Tests and Adjustments: Test all equipment and control panels actually furnished.

C. Factory Test Report: Include test data sheets, and curve test results.

D. Performance Test Logs: Certified correct by a registered professional engineer.

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E. Functional Test:

1. Conduct on each Pump: Perform manufacturer's standard, motor test on equipment. Include vibration test, as follows:
   a. Dynamically balance rotating parts of each pump and its driving unit before final assembly.
   b. Limits:
      1) Driving Unit Alone: Less than 80 percent of NEMA MG 1 limits.

F. Performance Test:

1. Conduct on each pump.
2. Perform under simulated operating conditions.
3. Test for a continuous 3-hour period without malfunction.
4. Test Log: Record the following:
   a. Total head.
   b. Capacity.
   c. Horsepower requirements.
   d. Flow measured by factory instrumentation and storage volumes.
   e. Average distance from suction source to pump discharge centerline for duration of test.
   f. Pump discharge pressure converted to feet of liquid pumped and corrected to pump discharge centerline.
   g. Calculated velocity head at the discharge flange.
   h. Field head.
   i. Driving motor voltage and amperage measured for each phase.

G. Hydrostatic Tests: Pump casing(s) tested at 150 percent of shutoff head. Test pressure maintained for not less than 5 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Level base by means of steel wedges (steel plates and steel shims). Wedge taper not greater than 1/4 inch per foot. Use double wedges to provide level bearing surface for pump and driver base. Accomplish wedging so that there is no change of level or springing of baseplate when anchor bolts are tightened.

C. Adjust pump assemblies so driving units are properly aligned, plumb, and level with driven units and all interconnecting shafts and couplings. Do not compensate for misalignment by use of flexible couplings.

D. After pump and driver have been set in position, grout space between bottom of baseplate and concrete foundation with poured, non-shrinking grout. Remove wedges after grout is set and pack void with grout.

E. Connect suction and discharge piping without imposing strain to pump connections.

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F. Anchor Bolts: Accurately place using equipment templates and as specified in Section 01 88 15, Anchorage and Bracing, and Section 05 05 19, Cast-in-Place and Post Installed Anchors.

3.02 FIELD FINISHING

A. Touch up as needed with factory approved coating per factory specifications.

3.03 FIELD QUALITY CONTROL

A. Functional Tests:

1. Conduct on each pump.
2. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.

B. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.

3.04 MANUFACTURER'S SERVICES

A. Manufacturer's Representative present at Site or classroom designated by City, for minimum person-days listed below, travel time excluded:

1. 1/3 person-day for inspection and facility startup.
2. 1/3 person-day for performance testing and completion of Manufacturer's Certificate of Proper Installation.
3. 1/3 person-day for post-startup training of City's personnel. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by City.

B. See Section 01 43 33, Manufacturers' Field Services.

3.05 SUPPLEMENTS

A. The supplement listed below, following "End of Section," is a part of this Specification.

1. Diesel Fuel Pump 1, Diesel Fuel Pump 2 Data Sheet.

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DIESEL FUEL PUMP 1, DIESEL FUEL PUMP 2 DATA SHEET

Tag Numbers: DFP117111, DFP117112

Pump Name: Diesel Fuel Pump 1, Diesel Fuel Pump 2

Manufacturer and Model Number: (1) Simplex; series SKS and Parker Series H Pump.
(2) Or Approved Equal.

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): No. 2 Diesel Fuel

Pumping Temperature (Fahrenheit): Normal: 70 Max 100 Min 32

Specific Gravity @ 60 Degrees F: 0.85 Viscosity Range: 20

Vapor Pressure @ 60 Degrees F: 0.40 mm Hg Liquid pH: N/A

Abrasive (Y/N) N Possible Scale Buildup (Y/N): N

Total Suspended Solids (mg/l) N/A

Suction Pressure (ft): Maximum 10 Rated _____ at Vacuum (in. Hg) _____

Altitude (ft msl): 85 Area Classification: Class I Div 2

Location (indoor/outdoor): Indoor

PERFORMANCE REQUIREMENTS

Capacity (US gpm): Rated 17

Total Dynamic Head (psig): Rated -5

Minimum Hydraulic Efficiency (%): _____

Maximum Shutoff Pressure (psig): _____

Minimum Continuous Flow (gpm): 17

Pump Speed at Design Point (rpm): 1800

Constant (Y/N): Y Adjustable (Y/N): N

Maximum Power (BHP): 1 Rated Power (BHP): _____

DESIGN AND MATERIALS

Foot Mounted (Y/N): N Bracket Mounted (Y/N): Y

Centerline Case (Y/N): N Near Centerline Case (Y/N): N

Pump Shaft Diameter (in): _____

Suction Orientation: 0.750" at Side Rotation (view from end of coupling): CW

Internal Gear (Y/N): Y External Gear (Y/N): N Material: _____

Casing Materials: Die-Cast Aluminum

Gland Type Material: _____

Gland Plate Taps Required: _____

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Shaft Material: ____ Shaft Sleeve Material: _____

Shaft Seals: Packing: _____ Material: Buna-N_____ Size/No. Rings: _____

Mechanical (Y/N) _____ Type: _____

Lubrication: _____

Bearing Type/No.: Radial: _____ Thrust: _____

ABMA B-10 Bearing Life (hrs.): _____ Lubrication: _____

Coupling: Falk (Y/N) _____ Fast (Y/N): _____ Spring-Grid (Y/N): _____

Gear Type (Y/N): _____ Spacer (Y/N): _____ Manufacturer: _____

Standard (Y/N): _____

Driver Half Coupling Mounted by: Pump Mfr._____

Baseplate:_____ Design: _____ Material: _____

Pump Control: Constant: _____ Variable: _____

Vent and Drain Connections Tapped and Plugged (Y/N): _____

Suction and Discharge Gauge Connections Tapped and Plugged (Y/N): _____

DRIVE MOTOR (See Section 26 20 00, Low-Voltage AC Induction Motors)

Horsepower: 1 Hp Voltage: 460__ Phase: 3_____ Synchronous Speed (rpm) 1,800___

Service Factor: 1.15_____ Inverter Duty: N/A_____

Motor nameplate horsepower shall not be exceeded at any head-capacity point on pump curve.

Enclosure: TEFC

TESTING

Pump Tests: Factory Functional (Y/N) Y___ Factory Performance (Y/N) Y____

Factory Hydrostatic Casing Pressure Test (Y/N): Y____Other: _____

Field Functional (Y/N) _Y_____ Field Performance (Y/N) Y_____

Motor Test: Short Commercial (Y/N) N___ Other N/A_____

REMARKS Contractor shall provide manufacturer's datasheets with all relevant pump information including sections left intentionally unspecified herein.

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C I T Y O F S A N T A R O S A

STATE OF CALIFORNIA

LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT

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:

CITY OF SANTA ROSA
C02192 - LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT
UNIT PRICE SCHEDULE

Bidder Name: _____

Item No.	Description	Quantity	Units	Unit Price	Total Price
1	UTILITY CLEARANCES	1	LS	$_____	$_____
2	HOT ASPHALT MIX	210	TON	$_____	$_____
3	DEMOLITION	1	LS	$_____	$_____
4	GROUNDWATER MANAGEMENT ALLOWANCE	1	LS	$ 30,000.00	$ 30,000.00
5	UNDERGROUND STORAGE TANK REMOVAL	1	LS	$_____	$_____
6	CONTAMINATED GROUNDWATER AND SOIL MANAGEMENT	1	LS	$ 40,000.00	$ 40,000.00
7	FUEL STORAGE TANKS AND DISPENSING EQUIPMENT	1	LS	$_____	$_____
8	ELECTRICAL AND INSTRUMENTATION	1	LS	$_____	$_____
9	PIPELINE AND GEAR PUMP INSTALLATION	1	LS	$_____	$_____
			GRAND TOTAL BID		**$**_____

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 8-1.04.

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: _____

CONTRACT

CITY OF SANTA ROSA

CALIFORNIA

CONTRACT NO. C02192
LAGUNA TREATMENT PLANT EMERGENCY GENERATOR FUEL TANK AND FLEET FUELING STATION REPLACEMENT

This Contract is made and entered into as of _____ at Santa Rosa, California, between the City of Santa Rosa ("City") and _____ of _____ ("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 Standard Specifications of the State of California Department of Transportation, dated 2010, 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, dated 2010 (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.

The work to be performed is further shown upon a plan consisting of 22 sheets entitled, Laguna Treatment Plant Emergency Generator Fuel Tank and Fleet Fueling Station Replacement, File Number 2022-0008, approved by the Deputy Director of Transportation and Public Works, hereinafter referred to as the Project Plan(s).

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

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 8-1.04C 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:	**Contractor:**
City of Santa Rosa, a Municipal corporation	Name of Contractor, Type of entity
By: _____	By: _____
Title: _____	Name: _____
ATTEST: By: _____	Title: _____
Title: _____	By: _____
Approved as to form:	Name: _____
By: _____ Office of City Attorney	Title: _____