SAN ANTONIO WATER SYSTEM

LIFT STATIONS REHABILITATION DESIGN- PHASE 3

SAWS Job No. 08-2504

Solicitation No. B-12-015-MF

ADDENDUM NO. 3

May 18, 2012

COMPETITIVE SEALED PROPOSAL: June 12, 2012

10:00 a.m. Central Time

Consulting Engineer: Weston Solutions, Inc. TBPE Registration No. F-3123

To: All Document Holders of Record

This addendum, applicable to work referenced above, is an amendment to the Contract Documents and modifies the original Contract Documents dated April 2012. Acknowledge receipt of this addendum by entering the addendum number and issue date in the space provided in submitted copies of the proposal. Failure to do so may subject Bidder to disqualification.

Addendum No. 3 consists of 12 items on 3 pages and Attachments, 200 pages.

A. Competitive Sealed Proposal and Contract Requirement Revisions:

Item 1: **Signature Pages**

a) REMOVE Signature Page in its entirety (1 page) and REPLACE with attached Signature Pages.

Item 2: **Table of Contents**

a) REMOVE Table of Contents in its entirety (4 pages) and REPLACE with attached Table of Contents (Pages TOC-1 to TOC-5).

Item 3: **Supplementary Instructions to Respondents**

a) REMOVE Supplementary Instructions to Respondents in its entirety (7 pages) and REPLACE with attached Supplementary Instructions to Respondents (Pages SIR-1 to SIR-7).

Item 4: **Price Proposal**

a) REMOVE Price Proposal in its entirety (7 pages) and REPLACE with attached Price Proposal, (Pages PP-1 to PP-8).

Item 5: **Supplemental Conditions**

a) REMOVE Supplemental Conditions in its entirety (3 pages) and REPLACE with attached Supplemental Conditions, (Pages SS-1 to SS-5).

Item 6: **Special Conditions**

a) REMOVE Special Conditions in its entirety (5 pages) and REPLACE with attached Special Conditions, (Pages SC-1 to SC-6).

Item 7: **Specification Section 01010, Summary of Work**

a) REMOVE Specification Section 01010, Summary of Work in its entirety (11 pages) and REPLACE with attached Specification Section 01010, Summary of Work (Pages 01010-1 to 01010-11).

Item 8: **Specification Section 01145, Use of Premises**

a) REMOVE Specification Section 01145, Use of Premises in its entirety (3 pages) and REPLACE with attached Specification Section 01145, Use of Premises, (Pages 01145-1 to 01145-3).

Item 9: **Specification Section 01370, Schedule of Values**

a) REMOVE Specification Section 01370, Schedule of Values in its entirety (2 pages) and REPLACE with attached Specification Section 01370, Schedule of Values, (Pages 01370-1 to 01370-2).

Item 10: **Part II: Specifications for Odor Control System Improvements Phase II**

a) ADD Part II: Specifications for Odor Control System Improvements Phase II following Part I: Specifications for Lift Stations Rehabilitation Design – Phase 3.

B. Drawing Revisions:

Item 1: **Drawing Coversheet, G-1**

a) REMOVE Sheet G-1, and REPLACE with attached Sheet G-1.

Item 2: **Part II: Odor Control Systems Improvements Phase II drawings**

a) ADD Part II: Odor Control System Improvements Phase II drawings (21 sheets) following Part I: Drawings for Lift Stations Rehabilitation Design – Phase 3 drawings.

C. Questions Received During Q&A Period:

No questions are being addressed with Addendum No. 3.

This Addendum, including these 3 pages, is 203 pages, with attachments, in its entirety.

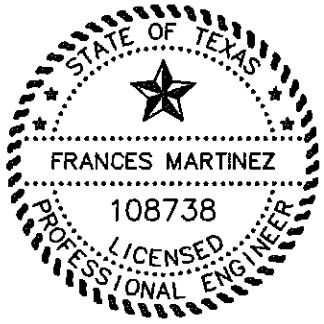
Attachments:

Signature Pages (2 pages)
Table of Contents (5 pages)
Supplementary Instructions to Respondents (7 pages)
Price Proposal (8 pages)
Supplemental Conditions (5 pages)
Special Conditions (6 pages)
Section 01010 Summary of Work (11 pages)
Section 01145 Use of Premises (3 pages)
Section 01370 Schedule of Values (2 pages)
Part II Specifications (129 pages)
Sheet G-1 (1 sheet)
Part II Drawings (21 sheets)

Each respondent is requested to acknowledge receipt of this Addendum No. 3 by his/her signature affixed hereto and to file same with and attached to his/her proposal.

Frances Martinez 05/18/2012

Approved by ENGINEER
WESTON SOLUTIONS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-3123



The undersigned acknowledges receipt of this Addendum No. 3 and the Competitive Sealed Proposal submitted herewith is in accordance with the information and stipulations set forth.

Date

Signature of Bidder

END OF ADDENDUM

CONTRACT DOCUMENTS

LIFT STATIONS REHABILITATION DESIGN– PHASE 3

SAWS JOB NO. 08-2504
SOLICITATION No. B-12-015-MF

May 2012

San Antonio Water System
2800 U.S. Hwy 281 North
San Antonio, TX 78212

Prepared by

WESTON SOLUTIONS, INC.
70 NE Loop 410, Suite 600
San Antonio, TX 78216
(210) 308-4300

05/17/2012

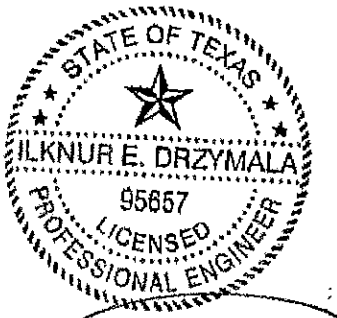
Abdel Hamed, P.E. No. 94279
Weston Solutions, Inc.
Texas Registered Engineering Firm F-3123
Part I: Lift Stations Rehabilitation Design – Phase 3

5.17.12

Maridel Jimenez, P.E. No. 91965
Weston Solutions, Inc.
Texas Registered Engineering Firm F-3123
Part I: Lift Stations Rehabilitation Design – Phase 3

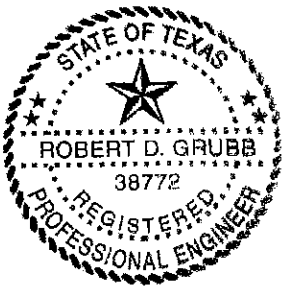
5/17/12

Annie Levesque, P.E. No. 94943
CP&Y, Inc.
Texas Registered Engineering Firm F-1741
(Electrical & Instrumentation Engineering Design)
Part I: Lift Stations Rehabilitation Design – Phase 3



5/14/12

Ilka E. Drzymala, P.E. No. 95657
San Antonio Water System
(Contract Requirements, Division 1,
Part II: Odor Control System Improvements
Phase II Division 2, 3 and 15 Specifications)



5/10/12

Robert D. Grubb, P.E. No. 38772
Grubb Engineering, Inc.
TBPE Firm No. 3904
(Part II: Odor Control System Improvements
Phase II Division 16 Specifications)

TABLE OF CONTENTS

CONTRACT DOCUMENTS

TECHNICAL SPECIFICATIONS

DIVISION 1: GENERAL REQUIREMENTS

PART I: SPECIFICATIONS FOR LIFT STATIONS REHABILITATION DESIGN – PHASE 3

DIVISION 2: SITE CONSTRUCTION

DIVISION 3: CONCRETE

DIVISION 11: EQUIPMENT

COSA STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AND SPECIAL PROVISIONS (Latest Edition)

SAWS SPECIFICATIONS FOR WATER & SANITARY SEWER CONSTRUCTION AND SPECIAL PROVISIONS (Latest Edition)

SUPPLEMENTARY INSTRUCTIONS TO RESPONDENTS

1. This document provides general information about the requirements for this Request for Competitive Sealed Proposals (RFCSP) as set forth in the selection criteria and procedures for implementation.

2. The San Antonio Water System (SAWS) Board of Trustees has determined that the Competitive Sealed Proposals method of procurement will provide the best value for SAWS for this project. The selection of the contractor will be based on the criteria described below. All procurements shall conform to Section 2267.151 of the Texas Local Government Code.

   A. EVALUATION OF PROPOSALS

      a. SAWS will conduct a comprehensive, fair and impartial evaluation of all Competitive Sealed Proposals received in response to this request within 45 days of receipt of the proposals. SAWS will appoint a selection committee to perform the evaluation. SAWS will evaluate and rank each proposal in relation to the following selection criteria:

         i. Background, Experience, Qualifications ……. 40%
         ii. Proposed Plan & Quality Control Program…….. 20%
         iii. Price …… 30%
         iv. Small, Minority, Women, Business Participation 10%

         Total: 100%

      b. The Respondent's qualifications will be evaluated in the following standard weighted major categories. SAWS expressly reserves the right to reject any or all proposals submitted, and to interpret any proposal ambiguities to SAWS' advantage.

      c. The work associated with this Project requires (1) directly associated experience with construction of sewer lift station facilities, (2) directly associated work experience with sewer bypass/sewer flow management techniques, and (3) understanding of chemical injection concept for odor control purposes in sewer lines. In addition, the Respondent shall be familiar with the requirements of SCADA and telemetry communication equipment installation.

      d. The Contractor must be qualified and experienced in the sewer lift station rehabilitation work included in this Project. The Respondent must be capable of providing documented evidence of having recently and successfully improved and/or modified sewer lift stations, as outlined in this solicitation.

i. **Background, Experience, and Qualifications**

SAWS will consider the following during the evaluation process:

- Current business organizational structure, type of business structure; stability of organization
- Organizational chart
- Debarment history
- Bond history
- Litigation history
- Number of years performing construction-contracting work under current name and/or previous business name(s)
- Availability of equipment and facilities
- Financial status

a) Summarize your Firm's construction experience and competence relevant to the proposed project. Experience must include sewer lift station facility improvements and/or modifications. Respondent shall be experienced in sewer bypass/sewer flow management techniques. Respondent shall have experience in both SCADA and telemetry communication equipment installation. Briefly describe a minimum of three (3) successfully completed similar projects that demonstrate your capabilities to perform this work. If your Firm has also been involved in odor control station or chemical feed/injection system installations, briefly describe this experience.

b) Summarize your Firm's record of on-time completion for projects relevant to the proposed projects.

c) Provide a complete financial statement for your Firm that was prepared within the past 12 months, by an independent Certified Public Accountant, as well as a point of contact for your banking institution.

d) Provide qualifications and experience of the Construction Team that will be directly involved in the Project, including their experience with similar projects, the number of years with the Firm, and their city(s) of residence. Include as applicable; Project Managers, Superintendents, Assistant Project Managers and Superintendents, Expeditors, Project Scheduler, and Safety Coordinator.

e) Provide a list of your Firm's initiated change orders over $25,000 in the past five years. Provide background description of initiated change orders.

f) Identify and describe the Construction Team's past experience for providing construction services that are related to this project within the last five (5) years. Provide the following information for each project listed:

- Project name, amount, location, and description
- Final construction cost
- Name of Project Manager (individual responsible to the Owner for the overall success of the project)
- Name of Project Superintendent (individual responsible for

coordinating the day to day work)

g) References
   - The Owner's representative who served as the day-to-day liaison during construction, including telephone number and email address
   - Architect/Engineer's name and representative who served as the day-to-day liaison during construction, including telephone number and email address

   References shall be considered relevant based on specific project participation and experience with the Respondent. The Owner may contact references during any part of this process. The Owner reserves the right to contact any other references at any time during the evaluation process.

h) Safety Program and Records
   - Provide a summary of the Firm's safety record and a list of client references, awards, and commendations
   - Submit an example Safety Procedures Plan from a previous project, which should include:
     i. Emergency Procedures
     ii. Safety Permits and Procedures
     iii. General Safety Requirements
     iv. Safety Program and Procedures
     v. Job Site Inspections
     vi. Fall Protection Policy
     vii. Lockout Tag Out Procedure
     viii. Confined Space Entry
     ix. Written Hazard Communication Program
     x. Violation and Safety Assessment Procedure
     xi. Competent Person Verification Form
     xii. Site Inspection Report
     xiii. Safety Check
     xiv. Safety Manual and Health Policy

i) Security Program
   - Maintaining site security is critical and the project work may require temporary removal or re-location of site security measures (such as fencing, gates, etc.) to perform bypasses or other work. Please narrative responses to the following:

     i. Provide a site security plan to be applied at project work locations, detailing how site security will be assured throughout the project. This includes, but is not limited to site security procedures / measures prior to, during, and following any sewer bypass/sewer flow management conditions when applicable.

ii. Submit specific examples of how the proposed security techniques / procedures were used on three (3) similar projects performed by your company. Provide the name and contact information (phone number, e-mail address and physical address) of the individual who served as the day to day liaison during the course of the contracts.

iii. Provide the name and qualifications of the Security Professional to be assigned to the Project.

ii. **Proposed Plan & Quality Control Program**

a) Describe your proposed work plan for this project.
b) Describe your construction management approach and ability to coordinate work with all subcontractors and suppliers in order to meet the deadline established above.
c) Describe your ability to complete the project within the schedule taking into account existing commitments.
d) Describe your ability to identify and resolve potential issues, delays, etc.
e) Describe your back-up/contingency plan for any unanticipated delays.
f) Describe your quality control program. Explain the methods used to ensure quality control during the Construction phase of a project. Provide specific examples of how these techniques or procedures were used from any of three (3) projects listed in response to Section i. Background, Experience, Qualifications.
g) Describe how your quality control team will measure the quality of construction as required by Owner Specification Sections 01400, and 02221 on this Project, and how will you address non-conforming work.
h) Describe your past experience dealing with congested traffic/site conditions for any project listed in the previous section – **Background, Experience, and Qualifications**.

iii. **Price**

The Proposal with the lowest price total will receive 25 of the available thirty (30) points. All other proposals will receive a percentage of the 25 points based on a comparison with the lowest priced proposal.

Example:

Proposal	Amount	Calculation	Points Earned
A	450,000	(250,000/450,000) x 25	14
B	300,000	(250,000/300,000) x 25	20.75
C	250,000	(250,000/250,000) x 25	25

The remaining five (5) points will be available for proposals that meet or are less than the estimated construction cost. The points will be distributed as follows:

- >15% below the estimated construction cost = five (5) points
- 14.99% - 11% below the estimated construction cost= four (4) points
- 10.99% -7% below the estimated construction cost = three (3) points
- 6.99% - 3% below the estimated construction cost = two (2) points
- 2.99 % or 0% below the estimated construction cost = one (1) point

iv. **Small, Minority, Women Business (SMWB) Participation**

Respondents for Competitive Sealed Proposals are required to make good faith efforts to meet or exceed the goal for SMWB participation. The SMWB goal for this project is **17%**. The weight for SMWB participation will be **ten (10) points** out of the total 100 points. The Respondent's commitment to SAWS SMWB policy will be based on the following evaluation criteria:

A. Small, Minority, Woman Business (SMWB) status of the prime - five (5) point maximum:

- If the prime contractor is a certified SMWB, and a Good Faith Effort Plan (GFEP) is completed, five (5) points will be awarded.

- If the prime contractor is not a certified SMWB, and a GFEP is completed, points will be awarded based on the total participation percent of their SMWB sub contractors. This percent is multiplied by 10. For example, if the prime contractor satisfies the goal of 17%, the score is .17 X 10 = 1.7. This total shall not exceed five (5) points.

B. Good Faith Effort Plan (GFEP) Compliance – five (5) points maximum:

- If the prime contractor is a certified SMWB, and there is SMWB sub-contractor participation, they will receive an additional two (2) points, with additional points based on the SMWB sub-contractor participation levels as follows:

    - Sub-participation totals 13% - 17% = three (3) points
    - Sub-participation totals 6% - 12.99% = two (2) points
    - Sub-participation totals 5.99% or less = one (1) point

- If the prime is not an SMWB, points will be awarded as follows:

  - If the SMWB goal of 17% is met or exceeded on the GFEP, five (5) points will be awarded.
  - If the goal of 17% is not met, but the prime contractor clearly demonstrates that an effort was made to meet the goal, the following points will be awarded based on the total participation percent of their SMWB subs as follows:

    - Sub-participation totals 14% - 16% = four (4) points
    - Sub-participation totals 11% - 13.99% = three (3) points
    - Sub-participation totals 8% - 10.99% = two (2) points
    - Sub-participation totals 7.99% or less = one (1) point

C. Good Faith Effort Plan (GFEP) Non-Compliance:

- If a GFEP is submitted, but no clear attempt was made to meet the SMWB goal, no points will be awarded.

- If a GFEP is not submitted, the proposal may be considered non responsive.

Proof of SMWB certification i.e., a valid Certification Affidavit from the South Central Texas Regional Certification Agency (SCTRCA) or equivalent for both prime and sub contractors must be submitted.

B. FORMAT OF PROPOSALS

a. Proposals shall be prepared SIMPLY AND ECONOMICALLY, providing a straightforward, CONCISE description of the respondent's ability to meet the requirements of this RFCSP. Emphasis shall be on the QUALITY, completeness, clarity of content, responsiveness to the requirements, and an understanding of Owner's needs.

b. Proposals shall be a MAXIMUM OF FIFTY (50) PRINTED PAGES. The cover, table of contents, divider sheets, and Price Proposal do not count as printed pages.

c. Proposals shall be submitted as two (2) separate documents 1) Qualifications, and 2) Pricing in a single sealed envelope.

d. Respondents shall carefully read the information contained in this RFCSP and submit a complete response to all requirements and questions as directed. Incomplete Proposals will be considered non-responsive and subject to rejection.

e. Proposals and any other information submitted by respondents in response to this RFCSP shall become the property of the Owner.

f. Proposals shall be printed on letter-size (8-1/2" x 11") paper and assembled with spiral-type bindings or staples. DO NOT USE METAL-RING HARD COVER BINDERS.

g. Separate and identify each criteria response of this RFCSP by use of a divider sheet with an integral tab for ready reference.

h. Proposals shall include the "Table of Contents/Submittal Checklist" provided in this solicitation and provide page numbers for each part of the Qualifications portion of the submittal.

i. Proposals shall include one copy on compact disc (CD) in .pdf format in addition to the required number of hard copies. The CD shall contain the entire proposal package as submitted, and be encased in a paper CD envelope, clearly marked with the RFCSP information.

Job No.: 08-2504
Project Title: Lift Stations Rehabilitation Design – Phase 3
Solicitation # B-12-015-MF

PRICE PROPOSAL

PROPOSAL OF _____, a corporation

a partnership consisting of _____

an individual doing business as _____.

THE SAN ANTONIO WATER SYSTEM:

Pursuant to Instructions and Invitations to Respondents, the undersigned proposes to furnish all labor and materials as specified and perform the work required for the construction of the Lift Stations Rehabilitation Design - Phase 3 Project, San Antonio Water System Job. No. 08-2504, in accordance with the Plans and Specifications for the following prices, to wit:

ITEM NO.	DESCRIPTION & ESTIMATED QUANTITIES (Lump Sum Price to be written in words)	UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
1.	**Lift Station Rehab: LS# 163 – Potranco #2** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
2.	**Lift Station Rehab: LS# 176 – Southwest Middle School** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
3.	**Lift Station Rehab: LS# 188 – Valley Hi** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, inclusive of a spare pump, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
4.	**Lift Station Rehab: LS# 189 – Threadneedle** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$

ITEM NO.	DESCRIPTION & ESTIMATED QUANTITIES (Lump Sum Price to be written in words)	UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
5.	**Lift Station Rehab: LS# 190 – Alamo Dome** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
6.	**Lift Station Rehab: LS# 205 – Carowinds** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
7.	**Lift Station Rehab: LS# 207 – Wood Glen** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
8.	**Lift Station Rehab: LS# 210 – Horseshoe Bend** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
9.	**Lift Station Rehab: LS# 211 – Villa Espranza** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$

ITEM NO.	DESCRIPTION & ESTIMATED QUANTITIES (Lump Sum Price to be written in words)	UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
10.	**Lift Station Rehab: LS# 228 – Southwest High School** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
11.	**Lift Station Rehab: LS# 237 – Shaenfield** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
12.	**Lift Station Rehab: LS# 239 – Southside High School** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
13.	**Lift Station Rehab: LS# 245 – Harris Middle School** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
14.	**Lift Station Rehab: LS# 252 – Heights of Stone Oak** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$

ITEM NO.	DESCRIPTION & ESTIMATED QUANTITIES (Lump Sum Price to be written in words)	UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
15.	**Lift Station Rehab: LS# 253 – Palo Alto** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
16.	**Lift Station Rehab: LS# 257 – Ranch at Iron Horse** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
17.	**Lift Station Rehab: LS# 258 – Alamo Ranch** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
18.	**Lift Station Rehab: LS# 263 – Indian Springs** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
19.	**Lift Station Rehab: LS# 264 – Westwinds** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$

ITEM NO.	DESCRIPTION & ESTIMATED QUANTITIES (Lump Sum Price to be written in words)	UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
20.	**Lift Station Rehab: LS# 265 – The Villages of Bulverde** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
21.	**Lift Station Rehab: LS# 270 – Champions Ridge** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
22.	**Repeater Site: Callaghan Tank** Inclusive of furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of repeater site and related demolition as shown on the Drawings and specified in the Contract Documents, Complete and In-Place for the Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
23.	**Odor Control Site: Mission Trails** All labor, materials, tools, equipments, incidentals and work necessary for constructing a new facility to include new containment slab, chemical feed connections, eye-wash/shower station, water service, drainage, fencing and gate, SCADA monitoring capabilities, electrical connections, and all associated appurtenances to ensure a fully operational injection site as shown on the plans and described in the specifications, per Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$
24.	**Odor Control Site: North West Service Center** All labor, materials, tools, equipments, incidentals and work necessary for relocating the facility to include new containment slab, chemical feed connections, eye-wash/shower station, water service, drainage, fencing and gate, SCADA monitoring capabilities, electrical connections, and all associated appurtenances to ensure a fully operational injection site as shown on the plans and described in the specifications, per Lump Sum price: _____Dollars And _____Cents	$XXXXX.XX	$

ITEM NO.	DESCRIPTION & ESTIMATED QUANTITIES (Lump Sum Price to be written in words)	UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
25.	**All Permitting Fees** – Contractor to pay and be reimbursed actual amount by SAWS. Fifty Thousand Dollars And No Cents	$50,000.00	$50,000.00
26.	**CPS Energy Fee** – Contractor to pay and be reimbursed actual amount by SAWS. Ninety Five Thousand Dollars And No Cents	$95,000.00	$95,000.00
LINE ITEM "A." SUBTOTAL BASE PRICE AMOUNT		**$** _____.__	
27.	**Mobilization and Demobilization** – This item includes project move-in and move-out of personnel and equipment, set-up of temporary facilities, and clean-up of site upon completion of Work, complete in place, per lump sum (See Item No. 100 Special Provisions to Mobilization). Percent of the Line Item "A." Sub-total Base Bid written in words. _____Percent (Maximum of 5% of Line Item "A." Subtotal Base Price Amount)	$XXXXX.XX	$
MOBILIZATION AND DEMOBILIZATION SUB-TOTAL		**$** _____.__	
TOTAL PRICE AMOUNT (Line Item A. + Item No. 27)		**$** _____.__	
_____**DOLLARS AND** _____ **CENTS**			

Mobilization and Demobilization lump sum price shall be limited to a maximum 5% of the Line Item "A." Subtotal Base Price Amount. The Line Item "A." Subtotal Base Price Amount is defined as all price items **EXCLUDING** Item 27, Mobilization and Demobilization. **In the event of a discrepancy between the written percentage and dollar amount shown for Item 27, Mobilization and Demobilization, the written percentage will govern. If the percentage written exceeds the allowable maximum stated for mobilization, SAWS reserves the right to cap the amount at the percentage shown and adjust the extensions of the price item accordingly.**

_____
RESPONDENT'S SIGNATURE & TITLE

_____
FIRM'S NAME (TYPE OR PRINT)

_____
FIRM'S ADDRESS

_____
FIRM'S PHONE NO./FAX NO.

_____
FIRM'S EMAIL ADDRESS

Job No.: 08-2504
Project Title: Lift Stations Rehabilitation Design – Phase 3
Solicitation # B-12-015-MF

The Contractors herein acknowledges receipt of the following:

Addendum No's.: _____

OWNER RESERVES THE RIGHT TO ACCEPT THE OVERALL MOST RESPONSIBLE PRICE.

The respondent offers to construct the Project in accordance with the Contract Documents for the contract price and to complete the Project within **Four-hundred and twenty (420) calendar days** after the start date, as set forth in the Authorization to Proceed. **The respondent understands and accepts the provisions of the Contract Documents relating to liquidated damages of the Project if not completed on time.**

Complete the additional requirements of the Proposal which are included on the following pages.

PROPOSAL CERTIFICATION

Accompanying this proposal is a Bid Bond or Certified or Cashier's Check on a State or National Bank payable to the Order of the San Antonio Water System for _____ dollars ($_____), which amount represents five percent (5%) of the total bid price. Said bond or check is to be returned to the bidder unless the proposal is accepted and the bidder fails to execute and file a contract within **10** calendar days after the award of the Contract, in which case the check shall become the property of said San Antonio Water System, and shall be considered as payment for damages due to delay and other inconveniences suffered by said San Antonio Water System due to the failure of the bidder to execute the contract. The San Antonio Water System reserves the right to reject any and all bids.

It is anticipated that the Owner will act on this proposal within **60** calendar days after the bid opening. Upon acceptance and award of the contract to the undersigned by the Owner, the undersigned shall execute standard San Antonio Water System Contract Documents and make Performance and Payment Bonds for the full amount of the contract within **10** calendar days after the award of the Contract to secure proper compliance with the terms and provisions of the contract, to insure and guarantee the work until final completion and acceptance, and the guarantee period stipulated, and to guarantee payment of all lawful claims for labor performed and materials furnished in the fulfillment of the contract.

It is anticipated that the Owner will provide written Authorization to Proceed within 30 days after the award of the Contract.

The Contractor hereby agrees to commence work under this Contract within seven (7) calendar days after issuance by the SAWS of the written Authorization to Proceed. Under no circumstances shall the work commence prior to Contractor's receipt of SAWS issued, written Authorization to Proceed. Work shall be completed in full within **420** consecutive calendar days.

The undersigned certifies that the bid prices contained in the proposal have been carefully checked and are submitted as correct and final.

In completing the work contained in this proposal the undersigned certifies that bidder's practices and policies do not discriminate on the grounds of race, color, religion, sex or national origin and that the bidder will affirmatively cooperate in the implementation of these policies and practices.

Signed: _____
Company Representative

_____
Company Name

_____

_____
Address

Please return bidder's check to: _____
Company Name

_____

_____
Address

SUPPLEMENTAL CONDITIONS

SCOPE: The Supplemental Conditions amend the General Conditions and the other provisions of the Contract Documents as indicated herein. All provisions which are not so amended or supplemented remain in full force and effect.

GENERAL CONDITIONS

Article IV. CONTRACT ADMINISTRATION

4.11 Protection of Private Property. After sub-paragraph .2 add the following new paragraph:

".3 No trees shall be removed outside the permanent easement, except where authorized by the OWNER. Whenever practicable, CONTRACTOR shall tunnel beneath trees in yards and park when on or near the line of trench, hand excavation shall be employed as necessary to prevent injury to trees. Trees left standing shall be adequately protected against damage from construction operations."

".4 Access gates: The CONTRACTOR shall maintain the status of all internal and external gates at all times during the project. The CONTRACTOR shall be subject to financial penalty of $1,000 per occurrence for violations of this condition."

Article V. CONTRACT RESPONSIBILITIES

Delete subparagraph 5.2.1.a Staking the Work in its entirety.

Delete paragraph 5.2.3 Materials Testing and sub-paragraphs in its entirety. Replace with "Materials testing is defined in technical specification Section 01400 – Quality Requirements."

Add to paragraph 5.29.3 "Trench excavation protection shall be accomplished as required by the provisions of Part 1926, Subpart P- Excavation, Trenching, and Shoring of the Occupational Safety and Health's Standards and Interpretations. The Contractor shall also comply with the provisions included in Item 550, Trench Excavation Safety Protection, of the current San Antonio Water System Specifications for Water and Sanitary Sewer Construction."

Add the following paragraphs:

"5.3.6 Staking – Contractor shall be responsible for securing the services of a Professional Surveyor Licensed in the State of Texas to provide staking of the Work for construction."

"5.3.7 Permits – Unless otherwise provided, Contractor shall obtain and pay for all construction permits, inspections, and licenses from Price Item No. 25 "All Permitting Fees". Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable

at the time of opening of Proposals. Contractor shall pay all charges of utility owner's for connections to the Work."

5.4 SUPERINDENTENT. Amend by striking the first two sentences and replacing with the following:

"The Contractor shall keep on site pursuant to this Project during its progress a competent full time Superintendent who is a direct employee of the prime contractor and any necessary assistants, all satisfactory to the Owner. The appointment of a designee in lieu of a full time superintendent shall not be allowed as part of this provision, therefore any reference to "designee" shall not be applicable."

Delete subparagraph 5.7.1.1.8 Builders Risk in its entirety.

Delete paragraph 5.9.4 in its entirety and replace as follows:

"The Contractor shall be responsible for disposing of all non-hazardous material as the term is defined in Article I herein including old concrete or any other non-hazardous material which is required to be removed from the project in accordance with local, state and federal regulations. All completed bills of lading, manifests or other shipping documents for this material will be provided to SAWS at no additional cost to the Owner. Such material shall not be deposited in any sanitary sewer, creek, river, water course or municipal separate, storm sewer system, (MS4) as the term is defined herein."

Delete paragraph 5.9.5 in its entirety and replace as follows:

"Contractor will advise SAWS of final disposition of hazardous wastes prior to hazardous waste disposal, and provide documentation at that time which shows transporters and disposal facilities are permitted for their respective activities. All completed hazardous waste manifests will be provided to SAWS" with no additional cost to the Owner."

5.10 TESTING. Amend by striking the last two sentences and adding "Testing, inspection and certifications specified in the Technical Sections of this Project Manual shall be paid by the Contractor and shall be by agencies agreeable to the Engineer. This provision shall take precedence even if indicated otherwise in other sections of the Contract Documents.

Delete Section 5.13 in its entirety and replace with the following:

"5.13 SHOP DRAWINGS AND SAMPLES. Requirements for shop drawings, samples, and submittal procedures shall be as specified in Section 01300 – Submittals. Fabrication that proceeds prior to acceptance of submittals by CONSULTANT shall be at CONTRACTOR'S risk."

Delete Section 5.14 in its entirety and replace with the following:

"5.14 PROGRESS SCHEDULE. Schedule requirements shall be provided as detailed in Section 01320 – Construction Progress Documentation."

Delete Paragraph 5.15.1 Phases of Construction in its entirety and replace with the following:

"0.1 Phases of Construction shall be provided as detailed in specification Section 01010 – Summary of Work and the Special Conditions of the Contract Documents."

5.16 CONSTRUCTION STAKES. Delete Section 5.16 in its entirety. Project controls shall be provided as detailed in specification Section 01050 – Field Surveying. All construction staking shall be provided by the CONTRACTOR.

5.17 PUBLIC UTLITIES. Add the following subparagraph:

"All existing underground utilities shown on the Plans are approximate, based on available information. It shall be the Contractor's responsibility to determine the exact location and elevation of existing utilities prior to construction and notify SAWS Inspector and the Engineer of any conflicts with proposed work. Contractor shall use utility location methods such as vacuum potholing that minimize the disturbance and possibility of damage to SAWS facilities.

The Contractor is responsible for maintaining, supporting, and protecting the integrity of underground utilities and power poles during construction. It shall be the Contractor's responsibility to excavate over, under and around such utility, and if necessary, provide a temporary building during construction so as to maintain continuous service while constructing the proposed SAWS facilities. It will be the Contractor's responsibility to backfill around the utility facility and to complete construction in a manner such as to leave the utility facility securely bedded in its original position. All this Work will be at no additional cost to the SAWS.

Where overhead power lines are in close proximity to the proposed work, the Contractor shall be in accordance with the requirements established by Chapter 752, Texas Health and Safety Code."

Delete Section 5.24 in its entirety and replace with the following:

"5.24. USE OF EXPLOSIVES. The use of explosives of any kind for this project is strictly prohibited."

Article VII. CONTRACT PAYMENTS

Add the following paragraph at the end of Section 7.2:

"Payment for delivery or stored items will be allowed for major equipment and materials. No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings or preliminary operation and maintenance manuals are acceptable to the Owner. Only approved materials stored on the job site will be eligible for partial payments. All partial payments shall be approved by the Owner. Materials that will not be paid for separately

include, but are not limited to, bulk quantities such as nails, fasteners, conduits, conductors, concrete steel reinforcement, formwork, sand and gravel.

The Contractor's request for payments for materials stored on the job site shall include copies of paid invoices provided by approved supply sources in accordance with the General Conditions of the Contract. Payment for materials stored on the job site shall be based upon costs listed in the supplier's paid invoices and shall be in accordance with the General Conditions of the Contract.

A maximum payment of 85% will be allowed for stored items, the remaining 15% will be paid upon delivery of the approved O&M manuals. Equipment and materials shall not be installed or put into place before O&M manuals have been received.

Payment for installed equipment shall not be more than 85% of the installed cost until the training materials have been submitted and training has been completed to the satisfaction of Owner."

Article VIII. CONTRACT COMPLETION TIME

Add the following subparagraph at the end of Section 8.3:

".3 WEATHER DELAY CLAUSE. Contract performance is based on a firm, fixed duration and as such, consideration for weather days has been incorporated. Contractor must complete all work no later than Substantial Completion. Weather delay extensions will NOT be considered."

Add the following sentence to the first paragraph of Section 8.6:

"For purposes of assessing liquidated damages, the amount of the contract noted on the table below is defined as the original contract sum awarded."

Delete schedule "Amount of Liquidated Damage" in 8.6 and replace as follows:

"Substantial Completion past the contract performance period $600 per day."

Article IX. PROJECT COMPLETION AND ACCEPTANCE

Add the following paragraph to 9.2:

"9.2.3 Substantial Completion of the Project will be considered only after the Work has been tested, placed into operation, and made ready for the Owner's continuous use as intended.

To be considered Substantially Complete at a project level, the following portions of the Work must be operational and ready for Owner's continuous use as intended:

1. All work for lift station sites and odor control station sites, as intended.

Portions of the Work not essential which can be completed without interruption of Owner's operations may be completed after the Work is accepted as substantially complete, and may include the following items:

Minor Clean up Work

(1) Final Grading

(2) Landscaping

Contract time will continue to be charged against the Contractor until the Owner approves Final Acceptance of the Project."

END OF SECTION

SPECIAL CONDITIONS

1. Part I plans and specifications apply to the Lift Stations Rehabilitation – Phase 3 project. Part II plans and specifications apply to the Odor Control Improvements Phase II project. Contractor shall designate and reference Part I or Part II for any questions or required documentation (submittals, RFIs, RFPs, etc.) for this project.

2. It should be noted that most of the lift station sites may be viewed without accessing the fenced parameters of the lift station and do not necessarily require the OWNER's or OWNER's representative to be present. An existing and functional odor control site may be visited upon request after the Pre-proposal Meeting in the presence of the OWNER or OWNER's representative.

3. Health and Safety Program – Any successful supplier/contractor performing any type of construction or service related work at a SAWS facility or project site as a result of this bid must comply with all requirements shown in SAWS Construction Specifications, Item 902 - Construction Safety and Health Program, which can be obtained at www.saws.org, Business Center, Construction & Materials Specs, Construction Specifications. In particular, suppliers/contractors must prepare and submit a project specific safety and health plan to SAWS for review prior to commencement of the work for the Project. Any supplier/contractor who fails to provide a project-specific safety and health plan will not be allowed to mobilize and will not be granted any additional days due to failure to submit the required safety and health plan as required. SAWS will issue/go over the facility's Emergency Evacuation Plan with the CONTRACTOR prior to start of work.

4. Communication – All communication from the SAWS Inspector to the CONTRACTOR shall be through the Prime CONTRACTOR's Project Manager and/or Superintendent, as decided during the Pre-construction Conference. Communication to/from subcontractors shall be routed through the Prime CONTRACTOR to the SAWS Inspector. Contact information for SAWS and the Prime CONTRACTOR will be provided in the Pre-construction Conference.

5. Coordination with Others – The CONTRACTOR agrees to cooperate and coordinate its work with the work conducted by other supplier(s)/contractor(s) within the project area so that this project can be completed in an orderly and coordinated manner, reasonably free of significant disruption to any party. Without limitation of the foregoing, CONTRACTOR understands and agrees that access areas to the project site may be utilized by other supplier(s)/contractor(s). All parties shall be solely required and obligated to coordinate and cooperate with each other to accomplish the scope of work required by their respective contracts, meaning SAWS shall have no duty to administer, perform or supervise the coordination for the use of the project site by all suppliers/contractors. The CONTRACTOR agrees that any delay or hindrance caused by or contributed to by failure to cooperate and/or coordinate among all parties will be governed by this Section and Section 6.7.1 of the General Conditions (commonly referred to as a "no damages for delay" clause).

6. Work Restrictions – The CONTRACTOR shall coordinate the work schedule detailing sequence of construction at each lift station and odor control station site with the SAWS Inspector and coordinate the following work aspects with the SAWS Inspector.

   A. The lift stations listed in the following table will require the CONTRACTOR to coordinate and provide advance notice of work to nearby residences and businesses. The OWNER can take part in coordination efforts and community outreach, however, it is the responsibility of the CONTRACTOR to coordinate with the OWNER and notify affected residences and businesses accordingly.

Lift Station Number / Name	Lift Station Address
LS# 176 / Southwest Middle School	9620 SW Loop 410
LS# 189 / Threadneedle	9603 Ray Ellison Road
LS# 205 / Carowinds	9803 Carowinds
LS# 207 / Wood Glen	2401 Village Parkway
LS# 210 / Horseshoe Bend	5622 S. Horseshoe Bend
LS# 211 / Villa Espranza	2114 Calle Estrella
LS# 228 / Southwest High School	11914 Dragon Lane
LS# 237 / Shaenfield	9011 Shaenwest
LS# 239 / Southside High School	1680 Martinez Losoya Road
LS# 245 / Harris Middle School	300 Cass Avenue
LS# 252 / Heights of Stone Oak	25103 Estancia Circle
LS# 257 / Ranch at Iron Horse	12903 Walking Horse
LS# 258 / Alamo Ranch	11860 Thoroughbred Trail
LS# 264 / Westwinds	12402 Alstroemeria
LS# 270 / Champions Ridge	127 Champion View

   B. Construction within City of San Antonio Street and Other Right-of-Way (ROW) – Construction within City of San Antonio street and other ROW shall be between the hours of 8 AM and 5 PM, unless approval is obtained in advance from the City of San Antonio. In addition, CONTRACTOR shall provide a minimum of one uniformed police officer to assist with traffic control in work areas at the CONTRACTOR's sole expense.

   C. CONTRACTOR shall be mobilized at no more than 7 lift stations at any time. CONTRACTOR shall advance to additional lift stations sites as demobilization occurs at completed sites and upon written approval from SAWS Staff/Inspector.

D. CONTRACTOR shall provide spare submersible pump for LS# 188. CONTRACTOR shall coordinate with SAWS Staff/Inspector for spare pump delivery and storage.

E. Auto dialer shall remain in service until new SCADA system has been fully operational for at least 30 days or until OWNER authorizes the removal.

F. CONTRACTOR shall confirm and finalize the location of proposed eyewash / shower station at each odor control site after installation of the chemical tank piping and pump stand. CONTRACTOR shall coordinate with PENCCO, Inc. on-site.

G. CONTRACTOR shall contact 48 hrs prior to starting construction SAWS Inspector and Mr. Joseph Frank Snyder (Production & Treatment, 210-233-3931) for all odor control sites. SAWS Inspector shall be responsible for notifying Ms. Kim Pebley (Resident Manager, 210-534-8111) of the construction at the Mission Trails site.

H. CONTRACTOR shall provide a guard from U.S. Security Assoc. to be on-site for the duration of construction work at North West Service Center odor control site.

7. Street Cut/ROW Permits – SAWS is responsible for obtaining the necessary street cut or right-of-way (ROW) permits. CONTRACTOR is responsible for notifying SAWS a minimum of 10 business days before permit is required, with SAWS as the holder of the permit. CONTRACTOR shall comply with any regulations, provisions, or requirements of any permit that may need to be issued for work to be performed within a specified entity's ROW. CONTRACTOR will be limited to the work limits specifically defined in the approved permit.

   SAWS will pay only for the first permit for each project phase that is within the City of San Antonio ROW. If a permit extension is required, CONTRACTOR must notify SAWS a minimum of 10 business days prior to the expiration date of the permit in writing or by e-mail. If the permit expires and needs to be renewed due to CONTRACTOR's failure to notify SAWS in advance, CONTRACTOR will be required to reimburse SAWS for the cost of the permit. In addition, CONTRACTOR is responsible to reimburse SAWS for all permit fines or fees that are associated with failure to keep permit current.

9. Storm Water Permit – The CONTRACTOR shall be responsible for preparing and filing all documents and forms associated with the Texas Commission on Environmental Quality's (TCEQ's) Storm Water Management Program. This includes, but is not limited to, obtaining a TCEQ Storm Water Permit and implementing a Storm Water Pollution Prevention Plan. The CONTRACTOR shall be responsible for paying all associated fees. CONTRACTOR will be reimbursed for permit fees.

10. Construction Staging Area – CONTRACTOR shall confine his construction operations within the limits if/when indicated on the Drawings; if not indicated on the Drawings, CONTRACTOR shall make arrangements for storage in location off the construction site. CONTRACTOR shall use due care in placing construction tools, equipment, excavated materials, and supplies so as to cause

the least possible damage to property and interference with traffic. If the CONTRACTOR requires additional easement for his operations, the CONTRACTOR is solely responsible for acquisition and maintenance of the easement. No additional compensation will be provided by the OWNER. Refer to Section 01500 Temporary Facilities and Controls for additional information.

11. Construction Sequencing – CONTRACTOR shall submit proposed schedule detailing sequence of construction to include anticipated dates for mobilization, substantial completion, and demobilization at each lift station and odor control station.

    CONTRACTOR shall be mobilized at no more than 7 lift stations at any time. CONTRACTOR shall advance to additional lift stations sites as demobilization occurs at completed sites and upon written approval from SAWS Staff/Inspector.

    CONTRACTOR shall include North West Service Center odor control site in the first group of 7 lift stations. The Mission Trails odor control site shall be included in the second group of lift stations.

12. Substantial to Final Completion - The CONTRACTOR shall have 60 calendar days from the effective substantial completion date in the Letter of Conditional Approval to repair, correct, and fix outstanding items and receive Final Acceptance from the OWNER.

13. Pre-Construction and Post-Construction Videos – The CONTRACTOR shall provide pre-construction videos prior to commencement of the project in accordance with Section 01321, Construction Photographs and Video. The video shall identify the condition of all existing site and equipment features within the project limits. Submit two copies of the completed video prior to request for mobilization.

    The CONTRACTOR shall also submit two copies of the completed post-construction video of all site and equipment features within the project limits within ten (10) days following the date of final completion.

14. Existing Subsurface Conditions – Existing subsurface conditions shall be confirmed by the CONTRACTOR.

    If damages occur to existing facilities due to the CONTRACTOR's actions, it will be the CONTRACTOR's full responsibility to repair, replace, or pay for the repair or replacement of any damaged items at no additional cost to SAWS.

15. Pollution Abatement Compliance - The CONTRACTOR shall complete and submit the ACKNOWLEDGEMENT OF POLLUTION ABATEMENT COMPLIANCE certificate with the Bid Proposal.

16. Site Restoration – Restore site to condition existing before construction to satisfaction of SAWS Inspector and in accordance with the Contract Documents. CONTRACTOR shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect or misconduct in the execution of the Work by CONTRACTOR, it shall be restored at his expense to a condition equal to that existing before the damage was done.

17. Table of Existing Pumps and Approximate Rated Capacity

Lift Station Number	Lift Station Name	Existing Pumps*	Approximate Rated Capacity**
LS# 163	Potranco #2	2 – 6" Self Priming pumps	700 GPM
LS# 176	Southwest Middle School	2 – 3" Self Priming pumps	215 GPM
LS# 188	Valley Hi	3 – 8" Self Priming pumps	900 GPM
LS# 189	Threadneedle	2 – 3" Self Priming pumps	175 GPM
LS# 190	Alamo Dome	2 – 3" Self Priming pumps	150 GPM
LS# 205	Carowinds	2 – 4" Self Priming pumps	400 GPM
LS# 207	Wood Glen	2 – 3" Self Priming pumps	100 GPM
LS# 210	Horseshoe Bend	2 – 4" Self Priming pumps	250 GPM
LS# 211	Villa Espranza	2 – 3" Self Priming pumps	150 GPM
LS# 228	Southwest High School	2 – 4" Self Priming pumps	500 GPM
LS# 237	Shaenfield	2 – 4" Self Priming pumps	150 GPM
LS# 239	Southside High School	2 – 3" Self Priming pumps	300 GPM
LS# 245	Harris Middle School	2 – 4" Self Priming pumps	180 GPM
LS# 252	Heights of Stone Oak	2 – 4" Self Priming pumps	467 GPM
LS# 253	Palo Alto	2 – 4" Self Priming pumps	170 GPM
LS# 257	Ranch at Iron Horse	2 – 6" Submersible pumps	440 GPM
LS# 258	Alamo Ranch	3 – 8" Submersible pumps	780 GPM
LS# 263	Indian Springs	2 – 4" Submersible pumps	150 GPM
LS# 264	Westwinds	2 – 4" Submersible pumps	385 GPM
LS# 265	The Villages of Bulverde	2 – 4" Submersible pumps	235 GPM
LS# 270	Champions Ridge	2 – 4" Submersible pumps	146 GPM

*** Please note that existing pumps may have been replaced with different brand/model of pumps by SAWS operation and maintenance personnel.**
**** Listed rated capacities are approximate. Contractor shall be responsible for confirming brand/model in operation and rated capacity at each lift station, as required for flow management/by-passing of the lift station.**

18. All test runs for bypass pumping must take place on weekday only, not a weekend.

19. Testing Equipment: The CONTRACTOR shall furnish the following equipment to the OWNER prior to any surface preparation or painting operations. The CONTRACTOR or his representative shall instruct the OWNER on the proper use, care and calibration of all such gauges. The below required testing gauges and calibration materials shall be furnished to OWNER and shall remain the property of the OWNER upon completion of the job. The cost of furnishing all of the above required gauges to the OWNER shall be subsidiary to Bid Proposal

Items no. 1 through 21:

1. Dew point meter as manufactured by DeFelsko, model DPM.
2. Moisture detector meter as manufactured by Delmhorst, model BD-2100W/CS.
3. Wet film thickness gauge.

20. Rain gauges are currently installed at Indian Springs and Champion Ridge. Contractor is responsible for preserving these gauges and for ensuring that they are kept in service throughout construction. Rain gauges are to be relocated by others under a separate contract. Minimum 48-hours notification to SAWS is required for any rain gauge related work.

END OF SECTION

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General Conditions of Contract, Special Conditions, Supplementary Specifications, and Division 1 requirements.

1.02 General

A. LOCATION OF PROJECT

The Project includes work at the following lift station locations:

LS#	LS Name	Address	Zip
1. LS# 163	Potranco #2	9765 Potranco Road	78251
2. LS# 176	Southwest Middle School	9620 SW Loop 410	78242
3. LS# 188	Valley Hi	874 New Valley Hi Drive	78227
4. LS# 189	Threadneedle	9603 Ray Ellison	78227
5. LS# 190	Alamo Dome	127 Hoefgen Avenue	78203
6. LS# 205	Carowinds	9803 Carowinds	78251
7. LS# 207	Wood Glen	2401 Village Parkway	78251
8. LS# 210	Horseshoe Bend	5622 Horseshoe Bend	78228
9. LS# 211	Villa Espranza	2114 Calle Estrella	78226
10. LS# 228	Southwest High School	11914 Dragon Lane	78252
11. LS# 237	Shaenfield	9011 Shaenwest	78254
12. LS# 239	Southside High School	1680 Martinez Losoya Road	78221
13. LS# 245	Harris Middle School	300 Cass Avenue	78204
14. LS# 252	Heights of Stone Oak	25103 Estancia Circle	78258
15. LS# 253	Palo Alto	3708 Twining	78211
16. LS# 257	Ranch at Iron Horse	12903 Walking Horse	78023
17. LS# 258	Alamo Ranch	11860 Thoroughbred Trail	78253
18. LS# 263	Indian Springs	25658 Rabbit Brush	78261
19. LS# 264	Westwinds	12402 Alstroemeria	78253
20. LS# 265	The Villages of Bulverde	24514 Invitation Oak	78259
21. LS# 270	Champions Ridge	127 Champion View	78258

The Project includes work at the following odor control station locations:

Odor Control Station Name	Address	Zip
1. North West Service Center	6003 Wurzbach Road	78238
2. Mission Trails	1515 Mission Road	78210

B. SCOPE OF WORK

1. This section describes the Project in general and provides an overview of the extent of the Work to be performed by the CONTRACTOR. Detailed requirements and extent of Work is stated in the applicable Specification Sections and shown on the Drawings. CONTRACTOR shall, except as otherwise specifically stated herein or in any applicable part of these Contract Documents, provide and pay for all labor, materials, equipment, tools, construction equipment, and other facilities and services necessary for proper execution, testing, and completion of the Work as per the plans and specifications.

2. Any part or item of the Work which is reasonably implied or normally required to make the installation satisfactorily operable shall be performed by the CONTRACTOR and the expense thereof shall be included in the applicable unit prices or lump sum prices bid for the Work. It is the intent of these Specifications to provide the OWNER with the complete system. All miscellaneous appurtenances and other items of Work that are incidental to meeting the intent of the Specifications shall be considered as having been included in the applicable unit prices or lump sum prices bid for the Work even though these appurtenances and items may not be specifically called for in the Bid Proposal.

3. The Work shall include furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of lift station modifications and related demolition at **21** separate sanitary sewer lift station sites throughout San Antonio, Bexar County, Texas. The various lift station rehabilitation items include the following:

   a. Conversion of existing self-priming pump lift station to submersible pump lift station. Conversion shall include removal of existing top concrete slab together with access cover(s)/hatch(es), vents, junction box(es), suction piping, self-priming pumps and motors, check valves, gate valves, floats, pipe supports, and other accessories and pipe fittings as shown on the drawings. New piping, valves, fittings, pumps and accessories shall be installed as shown on the drawings and to include the following:

      1) Submersible pumps in accordance with Section 11310, and 11311 of the specifications.

      2) Grouting of wet well floor a min. of 10% to pump.

      3) Flanged ductile iron discharge piping conforming to SAWS Material Specification 05-11. Pipe shall be coated and painted as described in specifications.

      4) 316 stainless steel upper and intermediate guide bar brackets and guide rail support bars as per pump manufacturer's recommendations.

      5) New concrete top slab.

      6) Pump access hatch with safety grate. The access hatch shall be lockable with a minimum 36" x 48" clear opening or as required by selected pump manufacturer

provided with a safety grate made of aluminum or non-corrosive fiberglass reinforced composite material for fall protection. CONTRACTOR shall coordinate with pump manufacturer to ensure proper size and location of hatches. CONTRACTOR shall install 45 degree bends at pump discharge as necessary to allow for clearance between pump discharge pipe and access hatch frame.

7) 4-inch diameter 316 stainless steel goose neck vent with 316 stainless steel screen.

8) 90° flange bend.

9) 45° flange bend

10) Restrained, Megaflanged coupling adaptors.

11) Pressure gauges with isolation ball valves, minimum. 4-inch dial, 5% accuracy, liquid filled.

12) Swing type check valves with external weight and lever.

13) Gate valves, resilient wedge with flanged joints.

14) Emergency bypass connection complete with quick-disconnect 4 inch stainless steel male fitting with dust cap gate valve and check valve.

15) Air release valve and piping assembly.

16) Pressure transmitter with isolation ball valve and heat tracing.

17) 316 stainless steel pipe supports.

18) 316 stainless steel junction box for submersible pressure transducer and 316 stainless steel junction boxes for motor leads and the high level float (separate boxes).

19) Seal on sleeved or cored discharge pipe openings (link seal or approved equal).

20) Pipe reducers, eccentric type, as required.

21) Gate valve, resilient wedge with flanged joints on force main.

22) Electrical service will be changed from 120/240 Volts, 3 phase, 4 wire to 277/480 Volts, 3 phase, 4 wire, where indicated.

23) Pump control panel.

Conversion of self-priming pump lift station to submersible pump lift station is required at: LS# 188, LS# 205, LS# 211, LS# 237, LS# 239, and LS# 252.

b. Abandonment of Dry Well Vault. The abandonment of dry well vaults will be required at LS# 188, LS# 189, and LS# 237. These lift stations are proposed for conversion from self-priming pump to submersible pump lift stations with new discharge piping to be installed aboveground. Upon removal of interior equipment and accessories, the existing concrete

structure shall be drilled with holes on bottom and shall be filled with pea gravel or approved controlled low strength material (Flowable Backfill in accordance with COSA Standard Specification Item No. 413).

c. Coating of Interior Concrete Surfaces within Wet Wells. Coating for corrosion protection shall conform to contract documents and specifications. Refer to SAWS Specification Item No. 850 Sanitary Sewer Structures and the Special Provisions to Item No. 850 Sanitary Sewer Structures. Surface preparation, cleaning, removal of existing coating/liner, thickness, mixing and application shall be in accordance with the manufacturer's instructions and recommendations. Wet well joints shall be sealed per the manufacturer's recommendations. SAWS approved manufacturers are as listed in SAWS Standard Specification, Article 850.2 (5.). Coating of wet well interior is required at: LS# 163, LS# 176, LS# 188, LS# 189, LS# 190, LS# 205, LS# 207, LS# 210, LS# 211, LS# 228, LS# 237, LS# 239, LS# 245, and LS# 252.

d. Installation of New Self-Priming Pumps. Replacement of existing self-priming pumps with new self-priming pumps as indicated on the drawings and in accordance with Section 11216 of the specifications is required at: LS# 176, LS# 189, LS# 190, and LS# 207.

e. Replacement of Suction Piping. Existing suction piping shall be replaced with new ductile iron pipe. Suction piping shall be replaced at LS# 176, LS# 189, LS# 190, and LS# 207 as indicated in the drawings.

f. Installation of Emergency Bypass Connections. The emergency by-pass connection shall be installed complete with quick-disconnect 4 inch stainless steel male fitting with dust cap gate valve and check valve. Emergency by-pass connections shall be provided in conjunction with the modifications for lift stations proposed for conversion from self-priming pump lift station to submersible pump lift stations. Emergency by-pass connections proposed at other sites (lift stations not being converted) include: LS# 163, LS# 176, LS# 189, LS# 190, LS# 207, LS# 210, LS# 228, LS# 245, LS# 257, LS# 258, and LS# 263.

g. Installation of Gate Valves on Force Main and/or Replacement of Gate Valves. If space permits, lift stations shall be modified to include a gate valve at the force main. Gate valves, resilient wedge with flanged joints shall be installed on force main at LS# 189. Replacement of existing gate valves (in addition to sites proposed for conversion to submersible pump lift stations) is required at LS# 163, LS# 176, LS# 190, LS# 207, LS# 210, LS# 228, and LS# 245.

h. Coating and Painting of Pipe, Valves, and Fittings Outside the Wet Well. Pipe, valves, and fittings outside the wet well shall receive after installation a 100% solids epoxy coating system with a top coat system of urethane. Color shall be grey pantone # 431U. Approved manufacturers include Tnemec, Carboline, Sherwin-Williams, PPG, and M.A.B. Paints. Coating and painting of piping, valves and fittings outside the wet well proposed (in addition to those lift stations being converted to submersible pump lift stations) include all lift stations.

i. Coating and Painting of Pipe and Fittings Inside the Wet Well. Pipe and fittings within the wet well shall receive after installation a 100% solids coal tar epoxy coating system. Color shall be grey pantone #431U. Approved manufacturers include Tnemec, Carboline, Sherwin-Williams, PPG, and M.A.B. Paints. Coating and painting of piping, valves and

fittings inside the wet well proposed (in addition to those lift stations being converted to submersible pump lift stations) include: LS# 163, LS# 176, LS# 189, LS# 190, LS# 207, LS# 210, LS# 228, LS# 245, LS# 253, LS# 257, LS# 258, LS# 263, LS# 264, and LS# 265.

j. Replacement of Pipe Supports. CONTRACTOR shall replace any damaged pipe supports with new 316 stainless steel pipe supports, as required. Pipe support replacement (in addition to those required for conversion to submersible pump lift stations) is required at LS# 163, LS# 176, LS# 189, LS# 190, LS# 207, LS# 245, LS# 257, and LS# 258.

k. Installation of Access Hatch with Access Hatch Fall Protection and Locks. Existing manhole covers shall be replaced with new lockable access hatches with min. 36" x 48" clear opening (or as required by pump manufacturer, if submersible pump lift station) provided with a safety grate made of aluminum or non-corrosive fiberglass reinforced composite material for fall protection. Manhole cover replacement with new access hatch and safety grate is required at LS# 163, LS# 176, and LS# 189. Existing access hatches shall be retrofitted with safety grate made of aluminum or non-corrosive fiberglass reinforced composite material for fall protection as per access cover manufacturer's recommendations. Access hatches which require retrofitting with safety grating include: LS# 190, LS# 207, LS# 228, LS# 245, LS# 253, and LS# 257. A non-corrosive locking bar shall be provided on wet well access hatches not currently equipped with locks complete with padlock at: LS# 190, LS# 245, and LS# 257.

l. Installation of Vent Pipe with Insect Screen. Unless mechanical ventilation is proposed, all wet well new top slabs shall be provided with a 4" diameter 316 stainless steel goose neck vent with 316 stainless steel screen. Insect screens are required for installation in existing vents at LS# 190 and LS# 245. Existing 3" vents will be replaced with 4" diameter 316 stainless steel goose neck vents with 316 stainless steel screens at LS# 176 LS# 207, LS# 257 and LS# 253. Additionally, new vents with screens are required at lift stations proposed for conversion to submersible pump lift stations. Vents within the 100-year floodplain (LS# 210) shall be installed with vent opening 1 foot above the 100-year floodplain elevation.

m. Installation of Pressure Gauges. Lift station piping shall be fitted with pressure gauges with isolation ball valves (min. 4" dial, 5% accuracy, and liquid filled). Lift stations requiring addition of pressure gauges include: LS# 163, LS# 176, LS# 188, LS# 189, LS# 190, LS# 205, LS# 207, LS# 210, LS# 211, LS# 228, LS# 237, LS# 239, LS# 245, LS# 252, LS# 253, LS# 257, LS# 258, LS# 263, LS# 264, LS# 265, and LS# 270. Pressure gauges will also be required at all lift stations proposed for conversion to submersible pump lift stations.

n. Installation of Pressure Transmitters. Lift station piping shall be fitted with pressure transmitters with isolation ball valves and tee for calibration. Pressure transmitters are to be installed at all lift stations.

Installation of Emergency Shower and Eye Wash Stations. Freeze-proof emergency shower and eye wash stations shall be provide at all lift stations that currently have water service and those stations proposed for new water service. Emergency safety eyewash / showers shall be Guardian Model -G1941 (or approved equal) with stainless steel showerhead; eyewash bowl with cover; and freeze protection valve that prevents the need for heat trace wire. New shower and eye wash stations will be required at LS# 163, LS# 176, LS# 189, LS# 190,

LS# 205, LS# 207, LS# 210, LS# 211, LS# 228, LS# 237, LS# 239, LS# 245, LS# 252, LS# 253, LS# 257, LS# 258, LS# 263, LS# 264, and LS# 270.

o. Installation of Backflow Prevention Devices on Existing Water Spigots. Hose bibb vacuum breakers shall be provided on all existing water spigots not currently protected with hose bibb vacuum breakers. HBVBs are required at LS# 163, LS# 189, LS# 190, LS# 205, LS# 207, LS# 211, LS# 228, LS# 237, LS# 239, LS# 253, and LS# 257.

p. Installation of Driveway. A new driveway will be required at LS# 228.

q. Pavement of Entire Lift Station Site. The fenced parameters of each lift station site shall be completely paved with either concrete or asphalt pavement. The CONTRACTOR shall pave remaining areas not currently paved to complete the entire site with pavement. CONTRACTOR shall match existing pavement types (i.e. sites existing now with partially paved asphalt shall be completed with asphalt pavement and sites existing now with partially paved concrete shall be completed with asphalt pavement). Asphalt paving will be required at LS# 163, LS# 189, LS# 228, LS# 237, LS# 239, LS# 252, and LS# 263. At LS# 228 and LS# 237 the existing site is covered with gravel surface; the CONTRACTOR shall remove the existing gravel and pave entire site with asphalt. LS#245 shall be concrete paved.

r. Repair and/or Replacement of Barbed Wire Fencing. Lift station sites shall be protected with intruder resistant fencing consisting of a chain link fence, 6 feet minimum in height, with a 1-foot section above consisting of 3 strands of barbed wire "up-riggers." CONTRACTOR shall inspect, and make necessary repairs or replacements of barbed wire and fencing. The required sections to be repaired or replaced shall be determined by the CONTRACTOR and OWNER's Representative prior to this work. Repair or replacement of barbed wire will be paid at the unit price bid for this work. Lift station sites that will require repair or replacement include LS# 207. LS# 264 will require complete fence addition/replacement.

s. Installation of Disk Lock: All existing lift station gates shall be equipped with a 9-inch diameter disk lock.

t. Demolition for Proposed Modifications. Demolition as indicated on the drawings to include equipment and accessory removal, disposal and/or return of items to SAWS. CONTRACTOR shall submit proposed demolition and removal schedule for approval and notify OWNER's representative in writing at least 48 hours before starting demolition. CONTRACTOR shall submit approved copy of COSA demolition permit prior to commencement of demolition operations. CONTRACTOR shall return to SAWS the following equipment and materials: pumps, motors, valves, pipe, fittings, controls and accessories.

u. Electrical Service for Proposed Pump Stations. The electrical service for LS# 176, LS# 189, LS# 205, LS# 211, and LS# 228, shall be converted from 120/240 Volts, three phase, four wire to 277/480 Volts, three phase, four wire. Contractor shall coordinate this change-out with CPS and pay all costs involved.

v. Utility Riser Poles. Riser Poles are to be replaced for the following lift stations: LS# 163, LS# 176, LS# 188, LS# 189, LS# 205, LS# 210, LS# 211, LS# 228, LS# 237, LS# 239, LS# 245, LS# 257, and LS# 258.

w. Control Panels for Submersible Pump Stations. New control panels shall be furnished for all proposed submersible pump lift stations. These panels shall be installed on the electrical support rack. Control panels shall be housed in NEMA 4X, 316 SS enclosures and shall include H-O-A switches, Start-Stop pushbuttons, Local-Remote selector switches, On and Off indicating lights, elapsed time meters, audible alarm and test switch and visual alarm with test switch. Control panel shall also include the Hydroranger level controller.

x. Control Panel Upgrades. Existing pump control panels will be replaced consisting of new controls and starters. These panels shall be installed on the electrical support rack. Control panels shall be housed in NEMA 4X, 316 SS enclosures and shall include H-O-A switches, Start-Stop pushbuttons, Local-Remote selector switches, On and Off indicating lights, elapsed time meters, audible alarm and test switch and visual alarm with test switch. Control panel shall also include new Hydroranger level controller. New control panels shall be furnished for the following lift stations: LS# 163, LS# 176, LS# 189, LS# 190, LS# 207, LS# 210, LS# 228, LS# 245, and LS# 258.

y. Soft Starters. Provide solid state soft starters inside new control panels for lift stations LS# 163 and LS# 188. Existing soft starter at LS# 258 shall be incorporated into the new control panel.

z. Electrical Support Racks. Electrical support racks with protective canopies and with concrete pads will be installed at the following lift stations: LS# 163, LS# 176, LS# 188, LS# 189, LS# 190, LS# 205, LS# 207, LS# 210, LS# 211, LS# 228, LS# 237, LS# 239, LS# 245, LS# 252, LS# 253, LS# 257, LS# 258 and LS# 263. The concrete pads will be a minimum of 2-inches above the finished surface on which they sit and will extend 12-inches beyond the canopy in front unless otherwise noted in the drawings. Canopies will extend 4-feet 0-inch in front and back where possible. Each rack shall include vapor-tight fluorescent lights, a light switch and a weatherproof ground fault interrupter receptacle.

aa. SCADA System Upgrades. New SCADA panels with radio shall be installed at each lift station site. The panel shall be located on the electrical rack. The antenna shall be installed on a self supporting tower expandable to 40 ft. Enclosures shall be NEMA 4X, 316 SS. The SCADA Panel shall have an internal air conditioning system that does not take in outside air. Auto dialer shall remain in service until new SCADA system has been fully operational for at least 30 days or until OWNER authorizes the removal.

bb. 120/240 Volt Electrical Provisions. 120/240 Volt Single phase power for the lift stations converting to 277/480 Volts shall be provided by a unitized power center consisting of a transformer with main breaker and a Panelboard housed in a common Nema 4X, 316 SS enclosure. This power center shall be installed on the support rack.

cc. Mini Power Center. Mini Power Centers shall be provided for the 120/240 Volt Single phase power requirements for the following lift stations: LS# 163, LS# 176, LS# 188, LS# 189, LS# 205, LS# 207, LS# 228, LS# 237, LS# 245, LS# 252, and LS# 258. The unitized power center consisting of a transformer with a main breaker and a Panelboard housed in a common Nema 4X, 316 SS enclosure. This power center shall be installed on the support rack.

dd. 120/240V Panelboards. 120/240 Volt Single phase panelboards with a main breaker in a NEMA 4x, 316SS enclosure shall be provided for the following lift stations: LS# 190, LS# 207, LS# 210, and LS# 239.

ee. Manual Transfer Switch Replacement. The existing manual transfer switches at the following lift stations will be replaced with new manual transfer switches with new generator connections: LS# 163, LS# 176, LS# 188, LS# 189, LS# 190, LS# 205, LS# 207, LS# 210, LS# 211, LS# 228, LS# 237, and LS# 245.

ff. Standby Natural Gas Emergency Generator. A Natural Gas Emergency generator with an automatic transfer switch shall be provided for lift station LS# 252. Provide a sound attenuated weatherproof enclosure with a resulting sound level not to exceed 78dbA@23 feet.

gg. Sound Attenuation Enclosure for Emergency Generator. Provide a sound attenuated weatherproof enclosure with a resulting sound level not to exceed 78dbA@23 feet for the existing emergency generator located at lift station LS# 270.

hh. Area Lighting. Shoe box type metal halide fixtures on poles shall be installed at the following sites: LS# 163, LS# 176, LS#188, LS# 189, LS# 190, LS# 205, LS# 207, LS# 210, LS# 211, LS# 237, LS# 245, LS# 252, LS# 253, LS# 257, and LS# 263. Lights shall illuminate the wet well and valve or pump pad area as applicable.

ii. Disconnect switches shall be furnished for every self prime pump. These switches shall be installed on a channel iron support and be located adjacent to each pump motor. Switches shall be housed in NEMA 4X 316 SS enclosures. Switches shall have auxiliary contacts interlocked with the control circuit.

jj. Rigid Alluminum Conduit: Replace all exposed conduits, supports, and fittings including wiring at all pump stations that do not have Rigid Alluminum Conduit as a standard for exposed conduits. Electrical mounting hardware shall be replaced with new stainless steel hardware for these pump stations.

kk. Submersible Pressure Level Transducers: Submersible pressure level transducers shall be installed at all lift stations noted on the drawings, including all lift stations not being converted to submersible pump lift stations. The pressure level transducer shall be connected to a pump controller installed in the control panel. All existing float switches, except the high level float, shall be removed and the pumps shall be controlled by the new pump controller.

ll. Repeater Sites: The work also includes the addition of a TransNET radio 900 repeater site to include radio panel, electrical rack extension, antenna, and antenna mast at the Callaghan Tank.

mm. Power System Studies: Short Circuit Studies, Protective Device Evalutation Studies, Arc Flash Studies and Protective Device Coordination Studies, shall be performed for all lift stations by an electrical testing service firm regularly engaged in power system studies. The studies shall include all portions of the electrical distribution system from the normal power source or sources down to, and including, the 120/208-Volt distribution system, including 208V main 3 phase circuit breaker and all 208V, 3 phase loads. Study shall include all manufacturer supplied equipment. Normal system connections and those, which result in maximum fault conditions, shall be adequately covered in the study.

4. The Work shall include furnishing all labor, tools, materials, equipment and miscellaneous items necessary for the complete installation of new odor control injection sites or relocation and/or

upgrade/rehabilitation of existing odor control injection sites to include new concrete containment slab, water service and chemical feed line connections, drainage, eyewash/shower station, fencing and gate, SCADA monitoring capabilities, electrical connections and all associated appurtenances to ensure fully operational sites as shown on the plans and described in the specifications. The sites of this Contract are Mission Trails (relocation and upgrade) and North West Service Center (new installation) sites. Refer to plans for specific requirements of each site.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Execute all Work, including demolition, lift station proposed modifications, site improvements, odor control station installation and upgrades, start-up and testing. The Work of this Contract is specified in the Drawings and SAWS and City of San Antonio (COSA) Standard Specifications, Special Provisions and Special Specifications listed in the Table of Contents.

B. Secure all construction-related permits, other than those provided by OWNER, and pay for the same.

C. Protect existing trees in accordance with the most current City of San Antonio Tree Ordinance. Avoid damage to mature trees and native brush.

D. Provide temporary traffic control plans including barricades, signs, and traffic handling in accordance with COSA Standard Specification Item No. 530 and COSA standard traffic control details.

E. Provide Operation and Maintenance (O&M) manuals for each lift station. A separate, standalone O&M manual shall be provided for each of the 21 subject lift stations.

F. Field verify dimensions and equipment shown on the drawings and perform additional field measurements and inspections as required to complete the proposed modifications. The lift station site plans and plan and section drawings were prepared based on SAWS record drawings.

G. Prepare, maintain and implement a Storm Water Pollution Prevention Plan in accordance with Section 01501 of the Specifications.

1.04 EASEMENTS AND RIGHTS-OF-WAY

A. CONTRACTOR shall confine his construction operations within the limits indicated on the Drawings, and shall use due care in placing construction tools, equipment, excavated materials, and supplies so as to cause the least possible damage to property and interference with traffic. If the CONTRACTOR requires additional easement for his operations, the CONTRACTOR is solely responsible for acquisition and maintenance of the easement. No additional compensation will be provided by the OWNER.

1. Easements

Easements across private property are indicated on the Drawings. CONTRACTOR shall set stakes to mark the boundaries of construction easement across private property. The stakes shall be protected and maintained until completion of construction and cleanup.

2. Right-of-Way

Permits for Work in right-of-way shall be obtained by the CONTRACTOR. All Work performed and all operations of CONTRACTOR, his employees, or subcontractors, within the limits of

railroad and highway rights-of-way, shall be in conformity with the requirements and be under the control (through OWNER) of the railroad or highway authority owning, or having jurisdiction over and control of, the right-of-way in each case.

1.05 PROJECT IDENTIFICATION

A. The CONTRACTOR shall provide 8-foot width by 4-foot height project signs as shown in the plans and specified in SAWS Standard Specifications Item 869.

B. Materials: The signs shall be made of 3/4 –inch plywood, grade A-C or better and each shall be mounted on two 4-inch by 4-inch by 12-foot posts.

C. Erect on-site at a location established by the OWNER at each lift station and odor control station.

D. No other signs are allowed without the OWNER's permission, except those required by law.

1.06 OPERATION OF EXISTING FACILITIES

A. Existing water and wastewater facilities shall be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from OWNER in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.

B. CONTRACTOR shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

C. Temporary By-Pass Pumping to Maintain Wastewater Service during Construction shall be performed in accordance with SAWS Standard Specification Item No. 864 and any Special Provisions to Item 864.

1.07 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, CONTRACTOR shall make all necessary connections to existing facilities including structures, drain lines, and utilities. In each case, CONTRACTOR shall receive permission from OWNER or the owning utility prior to undertaking connections. CONTRACTOR shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaking the connection. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.08 PHASING OF CONSTRUCTION

A. CONTRACTOR shall submit proposed schedule detailing sequence of construction to include anticipated dates for mobilization, substantial completion, and demobilization at each lift station.

B. CONTRACTOR shall be mobilized at no more than 7 lift stations at any time. CONTRACTOR shall advance to additional lift stations sites as demobilization occurs at completed sites and upon written approval from OWNER’s Representative.

C. Auto dialer shall remain in service until new SCADA system has been fully operational for at least 30 days or until OWNER authorizes the removal.

D. Odor control station work shall start upon issuance of construction notice to proceed. The North West Service Center odor control site work shall be included in the first group of 7 lift stations. The Mission Trails odor control site shall be included in the second group.

1.09 UNFAVORABLE CONSTRUCTION CONDITIONS

A. No portion of the Work shall be constructed under conditions which adversely affect the quality or efficiency thereof, unless special means or precautions are taken by CONTRACTOR to perform the Work in a proper and satisfactory manner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. Measurement and payment will be made as described in Section 1150 Measurement and Payment and 1370 Schedule of Values.

END OF SECTION 01010

SECTION 01145

USE OF PREMISES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes general use of property as shown on the Drawings.

1.02 CONSTRUCTION AREA

A. The CONTRACTOR will confine site work to the limits of construction shown on the Drawings. Trespassing on abutting lands or other lands in the area is not allowed. Refer to Article IV.4.10 SAWS General Conditions.

B. The CONTRACTOR will further define and coordinate the site work areas with SAWS staff to avoid interruptions to lift stations operation and existing odor control station sites

C. For the odor control sites, the following information must be displayed on the dashboard of every vehicle that enters SAWS property:

1. Name of Project
2. Name of Contractor
3. Name of Employee
4. Vehicle License Number

1.03 The CONTRACTOR shall make arrangements for storage of materials and equipment in location(s) off the construction site. CONTRACTOR shall obtain an agreement and pay for use of storage or work areas if needed to perform the work. CONTRACTOR shall obtain a release agreement once the use of storage or work areas are no longer required. CONTRACTOR will take care to ensure that the location of any temporary facility does not impede the performance or inhibit the operation of any building or equipment, both public and private, adjacent to the temporary facility. This shall be considered incidental to the Contract and provided at the CONTRACTOR's expense.

1.04 PROTECTION OF WORK AND PROPERTY

A. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage.

B. CONTRACTOR shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect or misconduct in the execution of the Work by the CONTRACTOR, it shall be restored by the CONTRACTOR, at his expense, to a condition equal to that existing before the damage was done.

C. Perform daily clean-up of dirt outside the construction zone, and debris, scrap materials, and other disposable items. Keep streets, driveways, and sidewalks clean of dirt, debris and scrap materials. Do not leave building, roads, streets or other construction areas unclean overnight.

D. Underground Structures

1. Underground structures are defined to include, but not be limited to, all sewer, water, gas, and other piping, and manholes, chambers, electrical conduits, tunnels and other existing subsurface work located within or adjacent to the Contract limits.

2. All underground structures known to ENGINEER except water, sewer, electric, and telephone service connections are shown on the Drawings. This information is shown for the assistance of CONTRACTOR in accordance with the best information available, but is not guaranteed to be correct or complete.

3. CONTRACTOR shall explore ahead of his trenching and excavation Work and shall uncover all obstructing underground structures sufficiently to determine their location, to prevent damage to them and to prevent interruption to the services which such structures provide. If the CONTRACTOR damages an underground structure, he shall restore it to original condition at his expense.

4. Necessary changes in the location of the Work may be made by ENGINEER, to avoid unanticipated underground structures.

5. If permanent relocation of an underground structure or other subsurface facility is required and is not otherwise provided for in the Contract Documents, ENGINEER will direct CONTRACTOR in writing to perform the Work, which shall be paid for under an agreed Change Order.

E. Surface Structures are defined as all existing buildings, structures and other facilities above the ground surface. Included with such structures are their foundations or any extension below the surface. Surface structures include, but are not limited to, buildings, houses, trailer homes, fences, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface.

F. Protection of Underground and Surface Structures

1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all underground and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the work of sustaining and supporting such structure, CONTRACTOR shall satisfy the ENGINEER that the methods and procedures to be used have been approved by the party owning same.

2. CONTRACTOR shall assume all risks attending the presence or proximity of all underground and surface structures within or adjacent to the limits to the Work. CONTRACTOR shall be responsible for all damage and expense for direct or indirect injury caused by his Work to any structure. CONTRACTOR shall repair immediately all damage caused by his work, to the satisfaction of the owner of the damaged structure.

G. All other existing surface facilities, including, but not limited to, guard rails, posts, fences, gates, guard cables, signs, light poles, poles, markers, and curbs which are temporarily removed to facilitate installation of the Work shall be replaced and restored to their original condition at CONTRACTOR's expense.

H. Protection of Installed Products

1. Provide protection of installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed, prior to completion of Work.

2. Control traffic to prevent damage to equipment, materials, and surfaces.

3. Provide coverings to protect equipment and materials from damage. Cover projections, wall corners, jambs, sills, and exposed sides of openings in areas used for traffic and for passage of materials in subsequent work.

1.05 NOTIFICATION TO ADJACENT OCCUPANTS

A. Notify individual occupants in areas to be effected by the Work of the proposed construction and time schedule. Notification shall be not less than 72 hours or more than 2 weeks prior to work being performed within 200 feet of the homes or businesses. OWNER's Representative will provide a sample door hanger showing form and content to be followed.

B. Include in notification names and telephone numbers of two company representatives for resident contact, who will be available on 24-hour call. Include precautions which will be taken to protect private property and identify potential access or utility inconvenience or disruption.

C. Submit proposed notification to OWNER's Representative for approval. Consideration shall be given to the ethnicity of the neighborhood where English is not the dominant language. Notice shall be in an understandable language.

1.06 SURFACE RESTORATION

A. Restore site to condition existing before construction to satisfaction of OWNER's Representative and in accordance with the Specifications.

B. Restore in accordance with Section 02480 "Site Restoration." Water and level newly sodded areas with adjoining turf using steel wheeler rollers appropriate for sodding. Do not use spot sodding or sprigging.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. The work performed, materials furnished and all labor, tools, equipment and incidentals necessary to complete the work under this item will not be measured or paid for directly, but shall be considered subsidiary to the various bid items of the contract.

END OF SECTION 01145

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparation and submittal of a Schedule of Values for lump sum items for which the CONTRACTOR requests progress payments.

1.02 DEFINITION

A. The Schedule of Values is an itemized list that establishes the value of each part of the Work for major lump sum items. The Schedule of Values is used as the basis for preparing applications for payments. Quantities and unit prices may be included in the schedule when approved by or required by the OWNER's Representative.

B. A major lump sum item is a lump sum item in the Price Proposal which qualifies as Major Bid Item as defined in Article 1.22 of the General Conditions.

1.03 PREPARATION

A. Items should include a proportional share of CONTRACTOR's overhead and profit so that the total of all items will equal the Contract Price.

B. For lump sum equipment items where submittal of operation/maintenance data and testing are required, include a separate item for equipment operation and maintenance data submittal valued at 5 percent of the lump sum amount and a separate item for testing and adjusting valued at 5 percent of the lump sum amount.

C. Round off figures for each listed item to the nearest $100.00 except for the value of one item, if necessary, to make the total of all items in the Schedule of Values equal the lump sum amount in the Bid Proposal.

D. Provide the schedule of values on 8-1/2-inch by 11-inch white bond paper and also electronically in Microsoft Excel (.xls or .xlsx) format.

E. When requested by OWNER's Representative, support values with data that will substantiate their correctness.

F. The sum of the individual values shown on the Schedule of Values must equal the total base bid Contract Price.

G. Each item shall include a directly proportional amount of the CONTRACTOR's overhead and profit.

H. The Schedule of Values will be used as the basis for monthly progress payments. It is the CONTRACTOR's responsibility to provide enough definition in the Schedule of Values for the OWNER's Representative's evaluation of progress payments and related change order proposals. At a minimum, definition by technical specification section will be required. When used as a basis for monthly progress payments, the Schedule of Values shall indicate Stored Material costs associated with each line item.

1.04 SUBMITTAL

A. Submit the Schedule of Values in accordance with the requirements of Section 01300 "Submittals". Submit at least 10 days prior to submitting the first application for progress payment.

B. Revise the Schedule of Values and resubmit for items affected by contract modifications, change orders, and work change directives. After the changes are approved by the OWNER's Representative, make the submittal at least 10 days prior to submitting the next application for progress payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. The work performed, materials furnished and all labor, tools, equipment and incidentals necessary to complete the work under this item will not be measured or paid for directly, but shall be considered subsidiary to the various bid items of the contract.

END OF SECTION 01370

San Antonio Water System

PART II: SPECIFICATIONS FOR:

ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

May 2012

SECTION 02005
SITE WORK

PART 1 GENERAL

1.1 DESCRIPTION:

These general site work requirements apply to all site work operations. Refer to Division 2 specification sections for specific product and execution requirements.

1.2 QUALITY ASSURANCE:

A. Comply with all applicable local, state and federal requirements regarding materials, methods of work and disposal of excess and waste materials.

B. Obtain and pay for all required inspections, permits and fees. Provide notices required to governmental authorities.

1.3 PROJECT CONDITIONS:

A. Locate and identify existing underground and overhead services and utilities within contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations at CONTRACTOR's expense.

B. Arrange for disconnection, disconnect and seal or cap all utilities and services designated to be removed before start of site work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.

C. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation.

D. Locate, protect and maintain benchmarks, monuments, control points and project ENGINEERING reference points. Re-establish disturbed or destroyed items at CONTRACTOR’s expense.

E. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks, and other adjacent facilities.

F. Obtain governing authorities written permission when required to close or obstruct street, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities.

G. Control dust caused by the work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

H. Protect existing buildings, paving and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items shall be at CONTRACTOR's expense.

1.4 MEASUREMENT AND PAYMENT:

Measurement and Payment will be as outlined in Section "Measurement and Payment" of Part 1, General Provisions.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

Materials and Equipment will be as selected by CONTRACTOR, unless indicated otherwise in the contract documents.

PART 3 EXECUTION

1 PREPARATION:

A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.

B. Consult the records and drawings of adjacent work and of existing services and utilities, which may affect site work operations.

END OF SECTION

SECTION 02112

TREE PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

Work Included:

1. Protecting of existing trees.
2. Armoring.

1.02 RELATED SECTIONS

Section 02110, Site Preparation, Clearing Grubbing and Grading.

1.03 RELATED WORK BY OWNER (DELETED)

1.04 REFERENCE STANDARDS

City of San Antonio Tree Ordinance, latest revision thereof.

1.05 GENERAL PROVISIONS

A. Trees and areas scheduled for work under this contract shall be identified in the field and indicated on plans and specifications where practical. Where this is not practical, work shall be directed in field by OWNER.

B. Provision for access to the site for heavy equipment will be as directed by OWNER. Equipment shall use prescribed temporary roadways and shall not be allowed in areas other than designated construction areas and designated roadway. Open grass areas which are altered or disturbed by equipment during the work shall be returned to pre-existing conditions at no additional cost to OWNER.

C. Wood and debris shall become property of CONTRACTOR and shall be removed from site. Debris to be transported to nearest legal dump. Cost of disposal to be paid by CONTRACTOR. No burning will be permitted, except as specified in Section 02110, Site Clearing.

D. CONTRACTOR shall protect root areas and crowns of trees not designated for work under this contract from damage from operations and equipment. The CONTRACTOR shall repair such damage at no cost to OWNER. Provide fences or other barricades where necessary for such protection.

PART 2 - MATERIALS

2.01 FENCES, BARRICADES AND ARMORING

Material for fences, barricades and armoring shall be six (6') foot galvanized chain link.

A. Posts: one and one-half inch (1 1/2") I.D., eight feet (8') on center.

B. Tension Wire: No. 6 gauge at top (in lieu of rail) and as bottom.

C. Chainlink Fence: Six foot (6') height.

D. End Posts: Two inch (2") I.D.

PART 3 - EXECUTION

3.01 WORKMANSHIP

Work shall be performed in conformance with recognized horticultural and arboricultural practices. Where job requirements require deviation from normal practice, obtain direction from OWNER's representative.

3.02 FENCES AND BARRICADES

A. Fences and/or barricades shall be placed where shown on the drawings or as herein described.

B. In general, fences and barricades are intended to alert those working on the project that equipment and machinery are not to be stored or operated in the feeder root zone (canopy). Where trees are designated to remain, the fences and barricades shall be placed not closer than nine times(9x) the caliper of the tree or at the drip line. The exact location of fences or barricades shall be placed as shown on the drawings.

C. Posts shall be installed plumb eight feet (8') OC maximum, three feet (3') deep. Tension wires shall be located at the top of the chain link fence and six inches (6") above existing grade.

3.03 TREE PROTECTION

A. All trees to be preserved on the property shall be protected against damage during construction operations by fencing as shown; subject to the approval of the OWNER. The tree protection shall be placed before any excavating or grading is begun and maintained in repair for the duration of the construction work unless otherwise directed. No material shall be stored or construction operation shall be

carried on within a distance as shown of any tree to be saved or within the tree protection fencing. The protection shall remain until all work is completed.

B. Any damage done to existing tree crowns or root systems shall be repaired immediately by an approved tree surgeon at the OWNER's direction. Roots exposed and/or damaged during demolition and/or grading operations shall be cut off cleanly inside the exposed or damaged area, the cut surfaces painted with an acceptable tree paint, and the topsoil and mulch placed over the exposed root area immediately. The OWNER shall have his representative present on the site to observe these operations.

3.04 ADDITIONAL PROVISIONS

A. No trash or warming fires shall be placed within fifty feet (50') of the tree.

B. No pedestrian traffic shall occur within the dripline of any tree.

C. No soil shall be spread, spoiled or otherwise disposed of under any tree within the drip line.

END OF SECTION

SECTION 02223

TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Trenching for buried piping systems as well as subsequent embedment, backfill and compaction operations, necessary to install the pipe as specified.

1.02 REFERENCES

A. ASTM D698 Moisture Density Relationship of Soils using a 5.5 lb hammer and a 12-inch drop.

B. ASTM C131: Resistance to Degradation of small sizes and coarse aggregates by abrasion and impact in the Los Angeles Machine.

1.03 SYSTEM DESCRIPTION (NOT USED)

1.04 SUBMITTALS (NOT USED)

1.05 QUALITY ASSURANCE (NOT USED)

1.06 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.07 PROJECT CONDITIONS (NOT USED)

1.08 WARRANTY (NOT USED)

1.09 EXPERIENCE REQUIREMENTS (NOT USED)

1.10 MAINTENANCE (NOT USED)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PROTECTION

A. Protect trees, shrubs, and lawn areas to receive planting, and other features remaining as part of final landscaping.

B. Protect benchmarks, existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic. Install and maintain bridging, planking and cants to provide access to Work.

C. Protect excavations by shoring, bracing, sheet piling, underpinning, or by other methods, as required to prevent cave-ins or loose dirt from falling into excavations.

D. Underpin or otherwise support adjacent structures which may be damaged by excavation work. This includes service lines and pipe chases.

E. Notify the OWNER of unexpected subsurface conditions.

F. Where damage could result from continuing work, discontinue work in area until ENGINEER notifies the CONTRACTOR of the required modifications.

G. Protect bottom of excavations and soil around and beneath foundations from frost and freezing.

H. Grade around trenches to prevent surface water runoff into excavated areas.

I. Protect above or below grade utilities including lateral lines, sprinkler system lines, and all other lines which are to remain. The cost of replacing damaged lines is to be borne by the CONTRACTOR.

3.02 PREPARATION AND LAYOUT

A. Establish extent of excavation by line and elevation. Designate and identify datum elevations.

B. Set required lines and levels. Maintain benchmarks, monuments and other reference points.

3.03 UTILITIES

A. Known underground utilities may be shown on the Drawings. CONTRACTOR is responsible for locating all underground utilities prior to excavating. The CONTRACTOR will not rely solely on the Drawings to locate underground utilities.

B. Before starting excavation, establish the location and extent of underground utilities occurring in the work area.

C. As excavation approaches utilities, hand excavate to uncover utilities. Notify the ENGINEER for direction for removal and/or relocation of utility companies' lines which are in the way of excavation.

D. Maintain, re-route or extend as required, existing utility lines to remain which pass through work area with the approval of the OWNER. Relocations are at the CONTRACTOR's cost.

E. Protect utility services uncovered by excavation.

F. Accurately locate and record abandoned and active lines rerouted or extended on Project Record Documents.

3.04 TRENCHING

A. Ensure trenching does not interfere with normal 45 degree bearing splay of any foundation.

B. Excavate in accordance with lines and grades. Excavated material shall be placed adjacent to the work to be used for backfilling as required.

C. Trench depths and grading are calculated to provide adequate cover over pipes. Notify ENGINEER if adequate cover is lacking and correct as directed by ENGINEER.

D. Cut trenches sufficiently wide to enable proper installation of services and to allow for inspection. Minimum trench width for flexible pipe shall be 18 inches wider than the pipe outside diameter. Trim and shape trench bottoms and leave free of irregularities, lumps and projections. Over excavated trench depths shall be filled to the proper grade with crushed rock at no additional cost to the OWNER.

E. Trench width shall be not more than 24 inches wider than outside diameter of pipes. Walls shall be vertical to elevation equal to 12 inches above the top of the pipe. Whenever the prescribed maximum trench width is exceeded, the CONTRACTOR shall use the next higher class of embedment, at no additional cost to the OWNER.

F. Do not disturb soil within branch spread of existing trees or shrubs that are to remain. If it is necessary to excavate through roots, perform work by hand and cut roots with a sharp axe. When complete, request the ENGINEER to inspect excavations. Correct unauthorized excavation as directed, at no cost to the OWNER.

G. Unsuitable excavated subsoil including perishable, spongy material, large rock, or other material designated by the OWNER shall not be used in backfilling. Unsuitable material shall be disposed of by the CONTRACTOR in a manner approved by the OWNER.

3.05 SHEETING AND SHORING

A. In caving ground or in wet, saturated or flowing or otherwise unstable materials, the sides of all trenches and excavations shall be adequately sheeted and braced, to maintain the excavation from slides or cave-ins and to provide safety for workmen.

B. Sheeting, shoring, and bracing shall be removed unless otherwise approved by the ENGINEER. Removal of sheeting, shoring, and bracing shall be performed in a manner to prevent damage to new or existing structures and to avoid cave-ins or sliding of the banks. All holes and voids from the sheeting shall be immediately and completely filled and compacted with suitable materials. All costs associated with the abandonment of sheeting, shoring and bracing shall be borne by the CONTRACTOR.

3.06 DEWATERING

A. Keep trenches dry. Provide necessary equipment including pumps, piping and temporary drains.

B. Direct surface drainage away from excavated areas. Provisions shall be made for the satisfactory disposal of water pumped to prevent damage to public or private property.

C. Control the grading in and adjacent to excavations to prevent water running into excavated areas or onto adjacent properties or thoroughfares.

D. Furnish and operate suitable pumps on a 24 hour basis to keep excavations free of water until services have been placed and backfilling is completed.

3.07 BEDDING

A. Manually place and compact bedding material in layers not exceeding six inches.

B. Manually shape bedding material to conform to pipe barrel and bell or flanges such that the entire length of the pipe barrel is supported by the bedding material.

C. Embedment materials shall be placed as shown on the plans and compacted in six-inch layers along sides of pipe and to a minimum depth of 12 inches over the top of the pipe.

3.08 BACKFILLING

A. Do not start backfilling until services have been inspected.

B. Ensure trenches are free of building debris, snow, ice, and water and that ground surfaces are not in a frozen condition.

C. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.

D. Place and compact backfill materials in continuous layers according to the method of compaction used. Use a method which will not disturb or damage services. No excessively large rocks or debris of any sort shall be used as backfill.

E. Maintain optimum moisture content ($\pm$2 percent) of fill materials so as to attain required compaction density.

F. Acceptable backfill from the excavation shall be placed from twelve inches over the pipe to the surface.

G. Excavated unsuitable material and excess material shall be disposed of by the CONTRACTOR in a manner approved by the OWNER.

3.09 COMPACTION

A. Compact embedment materials with hand-operated devices.

B. Embedment material shall be compacted to 95 percent of maximum dry density defined by ASTM D698.

C. Outside Paved Areas: Backfill materials shall be thoroughly compacted by mechanical or pneumatic tamping. Care must be taken to avoid pipe damage.

D. Within Paved Areas: Backfill under roads shall be mechanically or pneumatically compacted to 95 percent of maximum dry density as defined as ASTM D698 in layers not exceeding six inches of compacted thickness. For lime stabilized soil refer to Lime Stabilization Specification for compaction requirements.

E. Compact backfill and embedment materials at moisture contents of -2 percent to +3 percent of optimum for cohesive materials and as necessary to achieve specified density for non-cohesive materials. Compaction tests shall be performed as directed by the OWNER and at intervals not exceeding 500 feet of trench and intervals of not more than 10 feet of backfill depth.

F. Remove and replace improperly compacted backfill material at no cost to OWNER.

Additional trench settlement following completion shall be restored to a level surface. Trench surfaces may be left crowned in open country.

G. Water jetting for consolidation will not be permitted.

3.10 CLEAN UP

Remove surplus fill materials to on-site spoil areas as directed by the OWNER.

END OF SECTION

SECTION 02224

TRENCH EXCAVATION SAFETY PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. This item will consist of the basic requirements which the CONTRACTOR must comply with in order to provide for the safety and health of workers in a trench.
2. The CONTRACTOR shall develop, design and implement the trench excavation safety protection system.
3. The CONTRACTOR shall bear the sole responsibility for the adequacy of the trench safety system and providing "a safe place to work" for the workman.
4. Should the trench excavation safety protection system require wider trenches that specified elsewhere, the CONTRACTOR shall be responsible for the costs associated with embedment to the next higher embedment class per the Pipe Embedment Details standard detail.

B. Related Sections:

1. Section 01300 - Submittals.

1.02 REFERENCES

A. United States Code of Federal Regulations Title 29 (Labor), Part 1926 (Safety and Health Regulations for Construction), Subpart P (Excavations).

B. State of Texas Statutes - Health and Safety Code, Title 9 (Safety), Chapter 756 (Miscellaneous Hazardous Conditions), Subchapter C (Trench Safety).

1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. The trench excavation safety protection system shall be used for all trench excavations five (5) feet and deeper. CONTRACTOR shall check for trench safety requirements in all trenches having a depth of 4 feet or greater.
2. The Excavating and Trenching Operation Manual of the Occupational Safety and Health Administration, U.S. Department of Labor, shall be the

minimum governing requirement of this item and is hereby made a part of this Specification as is written in its entirety.

3. The CONTRACTOR shall, in addition, comply with all other applicable federal, state and local rules, regulations and ordinances.

4. The design of the trench excavation safety protection system shall be performed by or under the supervision of a Professional Engineer licensed to practice in the State of Texas.

5. System shall be site and project specific.

1.04 SUBMITTALS

A. Record Data:

1. Trench safety system shall be submitted to the OWNER prior to beginning any excavations on-site.

2. This system will receive no review by the OWNER except to verify compliance with Article 1.03, Paragraphs A.4 and A.5 of this section.

1.05 QUALITY ASSURANCE (NOT USED)

1.06 DELIVERY, STORAGE AND HANDLING (NOT USED)

1.07 PROJECT CONDITIONS (NOT USED)

1.08 WARRANTY (NOT USED)

1.09 EXPERIENCE REQUIREMENTS (NOT USED)

1.10 MAINTENANCE (NOT USED)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

All methods used for a trench excavation safety protection system shall be measured by the linear foot paid at the unit price included in the proposal or CONTRACTOR's Schedule of Values, which shall be total compensation for furnishing design, materials, tools, labor equipment, and incidentals necessary, including removal of the system.

Measurement for pipeline trench excavation safety protection system shall be based on the linear feet along the centerline of the pipeline trench. Measurement for structural trench

excavation safety protection system shall be based on the linear feet around the outside perimeter of the structure's walls.

Where pipelines intersect structures, measurement for the pipeline shall begin/end at the outside of the structure's wall.

END OF SECTION

SECTION 02230

FLEXIBLE BASE

PART 1 GENERAL

1.1 DESCRIPTION:

A. "Flexible Base" shall consist of a foundation course for pavement leveling-up, or other base courses.

B. RELATED WORK SPECIFIED ELSEWHERE:

Section 01300: Submittals

PART 2 PRODUCTS

1.1 FLEXIBLE BASE:

Flexible base shall conform to the requirements of Item No. 247, "Flexible Base (Class 1)" of the TxDOT Specifications. Type of material shall be Type "A", Grade 4 as described in Section 247.1 and 247.2 of the above referenced item.

PART 3 EXECUTION

3.1 GENERAL CONSTRUCTION REQUIREMENTS:

Flexible base shall be compacted to an apparent dry density of not less than 95 percent of the maximum dry density as determined in accordance with TxDOT Test Method TEX 113-E. Tests for density will be made within 24 hours after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to met the density required.

3.2 COMPACTED SUBGRADE:

The subgrade on which the tank is placed must be prepared prior to the installation of fiberglass tank. Subgrade shall be compacted to 95% in place density.

END OF SECTION

SECTION 02445
TEMPORARY CONSTRUCTION FENCE

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

A. SCOPE:

This section of the specifications consists of the CONTRACTOR furnishing and installing temporary safety fencing around excavation. Prior to beginning construction operations, install temporary safety fence on three sides. Locate where indicated, or enclosed the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates. The temporary fence shall be closed at the end of each day to prevent fall hazards.

Except as required otherwise on the plans, the CONTRACTOR shall provide open-mesh, orange safety fencing with T-posts set on 10’ centers.

B. RELATED WORK SPECIFIED ELSEWHERE:

Section 01300: Submittals.

1.2 SUBMITTALS:

Submittals shall be as specified in Section 01300.

1.3 MEASUREMENT AND PAYMENT:

Measurement and payment will be as outlined in Section "Measurement and Payment" of Part 1, General Provisions.

PART 2 PRODUCTS

2.1 MATERIALS:

Fabric: Typical 4’ orange safety fence

T-Posts: 1 5/8" steel post

PART 3 EXECUTION

3.1 GENERAL:

The following general requirements shall govern fence construction:

A. There shall be a maximum spacing of 10 feet between consecutive posts in any one line of the fence. Posts shall be driven a minimum of 12 inches into the ground. In the event of hard ground, asphalt or concrete surfaces a rock drill shall be used to install the proper post holes.

B. Fabric shall be stretched taut and anchored so that there is a minimum amount of sag at the center of the panel. Tension wire shall be used at the top and bottom of the fabric.

END OF SECTION

SECTION 02712

ASPHALT TREATED BASE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This item shall consist of a mixture of flexible base and asphaltic materials mixed hot in a mixing plant. The mixture shall be in the proportions as directed by the Engineer. The asphalt treated base shall be constructed on an approved subgrade, as herein specified and in accordance with details shown on the plans.

1.02 SCOPE OF WORK

The work of this section shall include the furnishing, installation, and testing of asphalt treated base. Asphalt treated base shall be used under all asphaltic concrete paving. A completed lift shall be compacted with uniform surface reasonably true to cross-section. A completed course shall be compacted, unyielding, free from irregularities, with smooth, tight, even surface, true to grade, line, and cross-section.

1.03 STANDARD SPECIFICATIONS

When referenced in this Section, unless otherwise specified, shall mean the Current Edition of Standard Specifications for Construction of Highways, Streets, and Bridges, Texas State Department of Highways and Public Transportation. Parts of these standard specifications that are specifically referenced shall become a part of this Section containing references to them as though stated in full. In case of a discrepancy between the requirements of the standard specifications and the requirements stated in these specifications, the requirements in these specifications shall prevail.

1.04 RELATED WORK

Related work not included in this section can be found in the following sections:

A. Section 02750-Asphaltic Concrete Paving

B. Section 01400 – Quality Requirements

1.05 SUBMITTALS

A. Quality Control Submittals:

1. Certified Test Results on Source Materials: Submit copies from commercial testing laboratory 20 days prior to delivery of materials to project.

2. Certified Results of In-Place Density Tests from independent testing agency.

1.06 STOCKPILING, STORAGE, PROPORTIONING, AND MIXING

Stockpiling, storage, proportioning and mixing shall be in accordance with Item No. 292, "Asphalt Treated Base (Plant Mix)" of the Texas Highway Department Standard Specifications and subsequent revisions and Special Provisions thereto.

PART 2 - PRODUCTS

2.01 FLEXIBLE BASE

Flexible base shall conform to the requirements of Item No. 244, "Flexible Base (Class 1)" of the Texas Highway Department Standard Specifications. Type of material shall be Type "A", Grade 1 as described in Section 244.3 and 244.4 of the above referenced item.

2.02 ASPHALTIC MATERIAL

Asphalt for the mixture shall be of the type determined by the Engineer and shall meet the requirements of Item No. 300, "Asphalt, Oils and Emulsions" of the Texas Highway Department Standard Specifications. The grade of asphalt shall be designated on the plans.

2.03 PAVING MIXTURE

The paving mixture shall consist of a uniform mixture of mineral aggregate and asphaltic material. It should be proportioned as directed by the Engineer after design tests have been made for the mineral aggregate approved for the project. The asphaltic material shall be of the type and grade as directed by the Engineer. Asphaltic material shall be between 4.0 and 9.0 percent of the mixture by weight, the exact amount to be determined by the test design mixture. The asphaltic material shall not vary from that proportion designated by more than 0.5 percent dry weight based upon the total mixture.

2.04 SOURCE QUALITY CONTROL

A. CONTRACTOR: Perform tests necessary to locate acceptable source of materials meeting specified requirements.

B. Final approval of aggregate material will be based on materials' test results on installed materials.

C. Should separation of coarse from fine materials occur during processing or stockpiling, immediately change methods of handling materials to correct uniformity in grading.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

Obtain acceptance of subgrade from OWNER before placement of asphalt treated base.

3.02 EQUIPMENT

A. Mixing Plants: Mixing plants that will not consistently produce a paving mixture meeting all the requirements of this specification will be condemned. Mixing plants may be of the weight-batching type, the continuous mixing type or the dryer-drum type meeting all the requirements of Item No. 345, "Asphalt Stabilized Base (Plant Mix)" of the Texas Highway Department Standard Specifications and subsequent revisions and Special Provisions thereto.

B. Asphalt Material Heating Equipment: Asphalt material heating equipment shall conform to Paragraph 345.4 (3) of Item No. 345, "Asphalt Stabilized Base (Plant Mix)" of the Texas Highway Department Standard Specifications and subsequent revisions and Special Provisions thereto.

C. Spreading and Finishing Machine: The spreading and finishing machine shall be of a type approved by the Engineer, and shall be capable of producing a surface that will be smooth and true to the established line, grade and cross-section and acceptable to the Engineer. Unacceptable finish shall be corrected by the addition of mixture placed and finished at the entire expense of the CONTRACTOR.

3.03 HAULING AND SPREADING

A. Hauling Materials:

1. Do not haul over surfacing in process of construction.
2. Loads: Of uniform capacity.
3. Maintain consistent gradation of material delivered; loads of widely varying gradations will be cause for rejection.

B. Spreading Materials:

1. Distribute material to provide required density, depth, grade and dimensions with allowance for subsequent lifts.
2. Produce even distribution of material upon roadway without segregation.

3. Should segregation of coarse from fine materials occur during placing, immediately change methods of handling materials to correct uniformity in grading.

3.04 CONSTRUCTION OF COURSES

A. General: Complete each lift in advance of laying succeeding lift to provide required results and adequate inspection.

B. Asphalt Treated Base:

1. Completed Asphalt Treated Base Total Thickness: 6 inches.
2. Spread lift on preceding course to required cross-section.
3. Lightly blade and roll surface until thoroughly compacted.
4. Blade or broom surface to maintain true line, grade, and cross-section. This surface shall be smooth and in conformity with the grades as shown on the plans.

3.05 ROLLING AND COMPACTION

A. Commence compaction of each layer of base after spreading operations and continue until density of 95 percent of maximum dry density has been achieved as determined by TXDOT Test Method TEX 126-E.

B. Roll each course of surfacing until material shall not creep under roller before succeeding course of surfacing material is applied.

C. Commence rolling at outer edges of surfacing and continue toward center; do not roll center of road first.

D. Place and compact each lift to required density before succeeding lift is placed.

E. Bind up preceding course before placing surfacing. Remove floating or loose stone from surface.

F. Blade or otherwise work surfacing as necessary to maintain grade and cross-section at all times, and to keep surface smooth and thoroughly compacted.

C. Surface Defects: Remedy surface defects by loosening and rerolling. Reroll entire area, including surrounding surface, until thoroughly compacted.

1. Finished Surface: True to grade and crown before proceeding with surfacing.

3.06 SURFACE TOLERANCES

A. Finished Surface of Asphalt Treated Base: Within plus or minus 0.04-foot of grade shown at any individual point.

B. Compacted Surface of Asphalt Treated Base: Within 0.04-foot from lower edge of 10-foot straightedge placed on finished surface, parallel to centerline.

C. Overall Average: Within plus or minus 0.01-foot from crown and grade specified.

3.07 FIELD QUALITY CONTROL

A. In-Place Density Tests:

1. Construct asphalt treated base so areas shall be ready for testing.
2. Allow reasonable length of time for testing laboratory to perform tests and obtain results during normal working hours.
3. Show proof that areas meet specified requirements before identifying density test locations.
4. Perform a minimum of 2 tests on completed asphalt treated base in accordance with TXDOT Test Method TEX 126-E at locations acceptable to OWNER.

B. Provide testing services as specified in Section 01400, QUALITY CONTROL.

3.08 CLEANING

A. Remove excess material; clean stockpile areas of aggregate.

END OF SECTION

SECTION 02750
ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 SCOPE

This section shall govern for the construction of a base course, a level-up course, a surface course or any combination of these courses as shown on the plans, each course being composed of a compacted mixture of aggregate and asphalt cement mixed hot in a mixing plant, in accordance with the details shown on the plans and the requirements herein.

1.02 SUBMITTALS

The CONTRACTOR shall submit the following in accordance with the provisions of Section 01300, Submittals:

A. A list identifying the types and sources of materials proposed for this work.

B. Laboratory test reports demonstrating compliance with these specifications for each mix design proposed for use.

C. Material certificates, signed by the material producer and the CONTRACTOR, certifying that each material item complies or exceeds specified requirements.

PART 2 - PRODUCTS

2.01 GENERAL

Materials and mix designs used in the production of asphaltic concrete, unless otherwise shown in the plans or specified herein, shall generally conform to the standards presented in the Standard Specification for Construction of Highways, Streets and Bridges published by the Texas Department of Transportation (1993), or latest revision thereof.

2.02 PAVING MIXTURES

A. Paving mixtures used shall be Types B, C, or D as shown on the plans. The paving mixtures shall consist of a uniform mixture of aggregate, hot asphalt cement, and additives if allowed or required. The mix shall be designed in accordance with TXDOT Construction Bulletin C-14 and Test Method Tex-204-F. The mixture shall be designed to produce an acceptable mixture at an optimum density of 96.0 percent, when tested in accordance with Test Method Tex-207-F and Test Method Tex-227-F. The operating range for control of laboratory density during production shall be optimum density plus or minus 1.5 percent. The materials used

in the mixture design shall produce a mixture with a stability value of at least 35, unless otherwise shown on the plans, when tested in accordance with Test Method Tex-208-F.

B. The aggregate gradation of the job mix formula shall conform to the master grading limits shown in table 1 for the type of mix specified in the plans.

Table 1
Master Grading
Percent Passing by Weight or Volume

Sieve Size	**Type**		
	B Fine Base	C Coarse Base	D Fine Surface
1-1/2"			
1-1/4"			
1"	100		
7/8"	95-100	100	
5/8"	75-95	95-100	
½"			100
3/8"	60-80	70-85	85-100
¼"			
No. 4	40-60	43-63	50-70
No. 10	27-40	30-40	32-42
No. 40	10-25	10-25	11-26
No. 80	3-13	3-13	4-14
No. 200	1-6*	1-6*	1-6*
VMA % minimum	12	13	14

* 2 - 8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.

C. The gradation of the aggregate and the asphalt cement content of the produced mix shall not vary from the job-mix formula by more than the tolerances shown in table 2. When within applied tolerances, the gradation of the produced mixture may fall outside the master grading limits for any of the sieve sizes from the largest sieve on which aggregate may be retained down through the No.80 sieve. Only the quantity passing the No. 200 sieve is further restricted to conform to the master grading limitations shown in table 1 or as modified in Test Method Tex-299-F. A tolerance of 2 percent is allowed on the sieve size for each mixture type which shows 100 percent passing in table 1.

Table 2
Tolerances
Percent by Weight or Volume, as applicable

Passing the 1-1/4" to No. 10 sieve	Plus or minus 5
Passing the No. 40 to No. 200 sieve	Plus or minus 3
Asphalt weight	Plus or minus 0.5
Asphalt volume	Plus or minus 1.2

2.03 TACK COAT

Asphaltic materials shown on the plans for tack coat shall comply with the requirements in Item 300 - Asphalts, Oils, and Emulsions as presented in the Standard Specifications for Construction of Highways, Streets and Bridges published by the Texas Department of Transportation (1993).

PART 3 - EXECUTION

3.01 GENERAL

A. It shall be the responsibility of the CONTRACTOR to produce, transport, place and compact the specified paving mixture in accordance with the requirements herein.

B. The asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall be placed when the air temperature is at least 50°F and rising.

C. The asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is below 55°F and is falling, but may be placed when the air temperature is above 45°F and is rising. The air temperature shall be taken in the shade away from artificial heat. The maximum depth of asphalt mixture placed with a motor grader will not exceed 5 inches of compacted material.

D. Mat thickness of 1½ inches and less shall not be placed when the temperature of the surface on which the mat is to be placed is below 50°F.

E. It is further provided that the tack coat or asphaltic mixture shall be placed only when the humidity, general weather conditions, temperature and moisture condition of the base, in the opinion of the OWNER are suitable.

F. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture falls below 200°F, all or any part of the load may be rejected and payment will not be made for the rejected material.

3.02 TACK COAT

The surface upon which the tack coat is to be placed shall be cleaned thoroughly to the satisfaction of the OWNER. The surface shall be given a uniform application of tack coat using asphaltic materials of this specification. Thick tack coat shall be applied, as directed by the OWNER, with an approved sprayer at a rate not to exceed 0.10 gallon residual asphalt per square yard of surface. Where the mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be eliminated by the OWNER. All contact surfaces of curbs and structures and all joints shall be painted with a thin uniform application of tack coat. During the application of tack coat, care shall be taken to prevent splattering of adjacent pavement, curb and gutter and structures.

3.03 TRANSPORTING ASPHALTIC CONCRETE

The asphaltic mixture shall be hauled to the work site in tight vehicles previously cleaned of all foreign material. The dispatching of the vehicles shall be arranged so that all material delivered is placed and all rolling completed during daylight hours unless otherwise on the plans. In cool weather or for long hauls, covering and insulating of the truck bodies may be required. If necessary, to prevent the mixture from adhering to the inside of the truck body, the inside of the truck may be given a light coating of release agent satisfactory to the OWNER.

3.04 PLACING

A. The asphaltic mixture shall be dumped and spread on the approved prepared surface with the laydown machine. Minimum thickness of asphaltic concrete paving shall be 3-inches as shown on the plans. When properly compacted, the finished pavement, shall be smooth, of uniform texture and density and shall meet the requirements of the typical cross sections and the surface tests. In addition, the placing of the asphaltic mixture shall be done without tearing, shoving, gouging or segregating the mixture and without producing streaks in the mat.

   Unloading into the finishing machine shall be controlled so that bouncing or jarring the spreading and finishing machine shall not occur and the required lines and grades shall be obtained without resorting to hand finishing.

B. When approved by the OWNER, level-up courses may be spread with a motor grader.

C. The spreading and finishing machine shall be operated at a uniform forward speed consistent with the plant production rate, hauling capability, and roller train capacity to result in a continuous operation. The speed shall be slow enough that stopping between trucks is not ordinarily required. If, in the opinion of the OWNER, sporadic delivery of material is adversely affecting the mat, the OWNER may require paving operations to cease until acceptable methods are provided to minimize starting and stopping of the paver.

The hopper flow gates of the spreading and finishing machine shall be adjusted to provide an adequate and consistent flow of material. These shall result in enough material being delivered to the augers so that they are operating approximately 85 percent of the time or more. The augers shall provide means to supply adequate flow of material to the center of the paver. Augers shall supply an adequate flow of material for the full width of the mat, as approved by the OWNER and should be kept approximately one-half to three-quarters full of mixture at all times during the paving operation.

D. When the asphaltic mixture is placed in a narrow strip along the edge of an existing pavement, or used to level up small areas of an existing pavement, or placed in small irregular areas where the use of a finishing machine is not practical, the finishing machine may be eliminated when authorized by the OWNER.

E. Adjacent to flush curbs, gutters and structures, the surface shall be finished uniformly high so that when compacted it will be slightly above the edge of the curb or structure.

F. Provide construction joints so successive courses of asphaltic material shall be offset at least 6 inches. Construction joints on surface courses shall coincide with lane lines, or as directed by the OWNER.

G. If a pattern of surface irregularities or segregation is detected, the CONTRACTOR shall make an investigation into the cause and immediately take the necessary action. With the approval of the OWNER, placement may continue for no more than one full production day from the time the CONTRACTOR is first notified and while corrective actions are being taken. If the problem still exists after that time, paving shall cease until the CONTRACTOR further investigates the causes and the OWNER approves further corrective action to be taken.

3.05 COMPACTING

A. The pavement shall be compacted thoroughly and uniformly with the necessary rollers to obtain the compaction and cross section of the finished paving mixture meeting the requirements of the plans and specifications.

B. When rolling with the three-wheel, tandem or vibratory rollers, rolling shall start by first rolling the joint with the adjacent pavement and then continue by rolling longitudinally at the sides and proceed toward the center of the pavement, overlapping on successive trips by at least 1 foot, unless otherwise directed by the OWNER. Alternate trips of the roller shall be slightly different in length. On super-elevated curves, rolling shall begin at the low side and progress toward the high side, unless otherwise directed by the OWNER.

When rolling with vibratory steel-wheel rollers, equipment operation shall be in accordance with the manufacturer's recommendations, unless otherwise directed by the OWNER. Vibratory rollers shall not be left vibrating while not rolling or when changing directions. Unless otherwise shown on the plans or approved by the OWNER, vibratory rollers shall not be allowed in the vibrating mode on mats with a plan depth of less than 1 ½ inches. In case of over vibration resulting in disruption of the compacted material, the CONTRACTOR shall rework and recompact or replace the damaged material at his own expense. The vibratory roller shall be operated at a speed that will produce not less than 10 impacts (blows) per liner foot unless otherwise shown on the plans or approved by the OWNER. The drums of the vibratory roller shall be kept in a moist condition with water.

The motion of the rollers shall be slow enough to avoid other than usual initial displacement of the mixture. If any displacement occurs, it shall be corrected to the satisfaction of the OWNER. The roller shall not be allowed to stand on pavement which has not been fully compacted. To prevent adhesion of the surface mixture to the steel-wheel rollers, the wheels shall be kept thoroughly moistened with water, but an excess of water will not be permitted. Necessary precautions shall be taken to prevent the dropping of diesel, gasoline, oil, grease or other foreign matter on the pavement, either when the rollers are in operation or when standing.

C. The edges of the pavement along curbs, headers and similar structures, and all places not accessible to the roller, or in such positions as will not allow thorough compaction with the rollers, shall be thoroughly compacted with lightly oiled tamps.

D. Rolling with a trench roller will be required on widened areas, in trenches and other limited areas where satisfactory compaction cannot be obtained with the approved rollers.

3.06 IN-PLACE COMPACTION CONTROL

In place compaction control is required for all mixtures.

A. Ordinary Compaction Control. One (1) three-wheel roller, one (1) pneumatic-tire roller, and one compaction operation except as provided below or approved by the OWNER. The use of a tandem roller may be waived by the OWNER when the surface is already adequately smooth and further steel-wheel rolling is shown to be ineffective. With approval of the OWNER, the CONTRACTOR may substitute a vibratory roller for the three-wheel roller and/or the tandem roller. Use of at least one (1) pneumatic-tire roller is required. Additional or heavier rollers shall be furnished if required by the OWNER.

Rolling patterns shall be established by the CONTRACTOR to achieve the maximum compaction. The selected rolling pattern shall be followed unless

changes in the mixture or placement conditions occur which affect compaction. When changes in the mixture or placement conditions occur, a new rolling pattern shall be established.

B. Compaction Cessation Temperature. Regardless of the method required for in-place compaction control, all rolling for compaction shall be completed before the mixture temperature drops below 175°F.

C. Cold Patches. Temporary patching of asphaltic pavements may be accomplished using mixtures and procedures specified in Item 511 of the City of San Antonio Standard Specifications for Public Works Construction.

3.07 OPENING TO TRAFFIC

If the surface ravels, flushes, ruts or deteriorates in any manner prior to final acceptance of the work, it will be the CONTRACTOR's responsibility to correct this condition at his expense, to the satisfaction of the Inspector and in conformance with the requirements of this specification.

END OF SECTION

SECTION 02900

VEGETATION RESTORATION

PART 1- GENERAL

1.01 Scope

This section shall govern the work of restoring grass, trees, and shrubs damaged or removed by construction operations associated with the project as identified in the contract documents for this project.

1.02 Quality Assurance

A. Seeds shall meet the requirements of the Texas Seed Law (Texas Administrative Code, Title 4; Chapter 9) and shall be as near identical to native samples present on or near the disturbed area of soil.

B. All planting of grasses shall be completed as soon as practical to avoid erosion of topsoil and damage incurred as a result of siltation and flooding unless otherwise directed by the ENGINEER.

1.03 Submittals

A. Submit the following materials certification:

1 Topsoil source and pH value.

2 Seeds.

3 Wood Cellulose Fiber Mulch.

4 Fertilizer.

5 Tactifier and binder.

6 Herbicide.

1.04 Delivery, Storage and Handling

A. Deliver fertilizer materials in original, unopened and undamaged containers showing weight, analysis and name of manufacturer. Store in a manner to prevent wetting and deterioration and to assure maximum effectiveness.

B. Provide dry, loose topsoil from the original disturbed construction when possible. Frozen or muddy topsoil is not acceptable.

C. Deliver seed materials in original, unopened and undamaged containers showing weight, analysis and name of manufacturer. Store in manner to prevent wetting and deterioration and to assure maximum effectiveness.

1.05 Project Conditions

A. Work notification. Notify ENGINEER and OWNER at least seven (7) work days prior to installation.

B. Protect existing utilities, paving and other facilities from damage caused by landscaping operations and incurred during transplanting and restoration.

C. Perform seeding work only after other work affecting ground surface has been completed.

D. Restrict traffic until grass is established. Erect signs and barriers as required.

1.06 Warranty

A. During the grass installation and until the contract is complete, it shall be the CONTRACTOR's responsibility to ensure that the grass is a continuing healthy growth. This care shall include labor, water and material necessary to keep the project in a presentable condition. Repair and reseed any and all damaged areas. This period shall include the two year warranty period

B. Water application shall be accomplished each week from March through October, and as necessary during other periods of the year. An even application of one-inch minimum of water shall be required over all sodded or seeded areas weekly or less, depending on rainfall frequency. The rate and frequency of water application may be changed, as directed by the OWNER, depending on weather, and soil conditions.

PART 2 - PRODUCTS

2.01 Materials

A. Topsoil to be furnished shall be in quantities and in locations as required for restoration, preferably from the area disturbed by construction of the potable water transmission line. If the quantity of excavated topsoil is inadequate, sufficient additional topsoil shall be furnished. Topsoil furnished shall be natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well drained areas. Topsoil shall be without admixture of sub-soil and free from Bermuda grass, nut grass (Cyperus Rotundus), and other objectionable grass, weeds and toxic substances. Topsoil shall be checked by the Construction Observer/Inspector.

B. Commercial fertilizer shall be Carefree, Vertagreen, approved equal organic fertilizer containing the following minimum percentages of available plant food by weight: 15-15-15 for seeded areas, mixed Nitrogen not less than 50% from organic source or inorganic chemical nitrogen not derived from the sodium form of nitrate or from the ammonia nitrate. Fertilizer shall be delivered to the site in unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer

which becomes caked or otherwise damaged making it unsuitable for use will be rejected.

C. Sulfur shall be commercial floured.

D. Tactifier and binder: Natural vegetable gum containing gelling and hardening agents that when mixed with water and properly cured shall form an insoluble network.

E. Herbicide: Herbicide used shall be an easy to apply, effective in a short term, chemical agent to inhibit or destroy weed growth, while being harmless to seed and grass being implanted.

F. Only non-potable (gray) water (NPW) is available onsite for establishing vegetation. The CONTRACTOR will be required to meter and pay for water usage and fulfill all city utility department requirements before the NPW line is accessed. Hoses or other methods of transportation shall be furnished by CONTRACTOR.

G. Twine. Two-ply jute material.

H. Seed

1. All seed must meet the requirements of the Texas Seed Law including the labeling requirements. These labels shall show purity, germination, name and type of seed. Seed furnished shall be of the previous season's crop for the date of the project, and the date of analysis shown on each bag shall be within nine (9) months of the time of use on the project. Bermuda grass shall be hulled and treated and have a purity of 95% and germination of no less than 90%. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety of seed shall be furnished for analysis and testing when directed by the OWNER. Annual Rye grass will be free of Johnson grass, field bind weed, dodder seed, and free of other seed to the limits allowable under the Federal Seed Act and applicable Texas Seed Law. Annual Rye grass will be added into slurry between October 1 through March 15. No additional cost will be charged to the OWNER.

I. Mulch

1. Wood Cellulose Fiber Mulch. Wood cellulose fiber mulch shall be natural cellulose fiber mulch produced from grinding clean, whole wood chips, or fiber produced from ground newsprint with a labeled ash content not to exceed 7%. The mulch shall be designed for use in conventional mechanical planting, hydraulic planting of seed or hydraulic mulching of grass seed, either alone or with fertilizer and other additives. The mulch shall be such that when applied, the material shall form a strong, moisture-retaining mat without the need of an asphalt binder. The mulch material will also be dyed with a green color to assist in determining coverage and to provide an immediate pleasing appearance. The wood cellulose fiber

is also required to be dispersed rapidly in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit with the specified materials.

1. Straw Mulch or Hay Mulch. Straw mulch shall be oat, wheat or rice straw. Hay mulch shall be prairie grass, bermudagrass or other hay as approved by the ENGINEER. The straw mulch or hay mulch shall be free of Johnson grass or other noxious weeds and foreign materials. It shall be kept in a dry condition and shall not be molded or rotted.

PART 3 - EXECUTION

3.01 Installation

A. Security of stored materials will be the sole responsibility of the CONTRACTOR at no additional expense to the OWNER.

B. It is the CONTRACTOR's responsibility to verify the location of all utility lines, electric cables, sprinkling systems and conduits so that the proper precautions must be taken not to disturb or damage any subsurface improvements. Should obstructions be found, the CONTRACTOR will promptly notify the OWNER. Any damage caused by the CONTRACTOR shall be repaired by himself at no cost to the OWNER. Any such repairs shall be subject to approval the by OWNER.

C. Examine proposed areas and conditions of installation including finished surfaces, grades, topsoil quality and depth. Do not start seeding work until unsatisfactory conditions are corrected.

D. Seeding. Seed all areas shown within contract limits as specified as well as all other areas disturbed during construction.. All areas to be seeded shall be loosened and fine raked to break up lumps and produce a smooth, even grade free from all unsightly variations, ridges or depressions. Remove stones 1 inch or larger, sticks, roots, or other debris that is exposed during this operation. All fine grading shall be subject to observation by the Construction Observer/OWNER.

1. Broadcast Seeding 02900-4

a. The seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed by the ENGINEER. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed as well as fertilizer, may be distributed simultaneously provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after components are placed in the

equipment. After planting, the planted area shall be rolled with a light corrugated drum roller or another type of roller approved by the ENGINEER. All rolling of the sloped areas shall be along the contour of the slopes.

b. The pure live seed planted per acre shall be of the type specified in Table 1 for rural areas (warm season), Table 2 for urban areas (warm season).

Table 1

Optimum Planting Dates	Common Names	Rate, lbs./acre
February 1 - May 1	Bermuda Grass	1.2

Table 2

Optimum Planting Dates	Common Names	Rate, lbs./acre
February 1 - May 1	Bermuda Grass	1.5

2. Straw or Hay Mulch Seeding

a. The seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed by the ENGINEER. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed, as well as fertilizer, may be distributed simultaneously provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after all components are placed in the equipment.

b. Immediately upon completion of planting of the seed, straw or hay mulch shall be spread uniformly over the seeded area at the rate of approximately 1.5 to 2.0 tons of hay mulch or 2.0 to 2.5 tons of straw mulch per acre. When a mulching machine is used it must be approved by the ENGINEER and may be equipped to inject a tacking agent into the straw or hay mulch uniformly as it leaves the equipment at a rate of 0.05 to 0.10 gallon of tacking agent per square

yard of mulched area. When the tacking agent is placed by hand, then the rate of application for the tacking agent shall be approximately 0.15 gallon per square yard.

3. Cellulose Fiber Mulch Seeding

   a. The seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed by the ENGINEER. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used all varieties of seed, as well as fertilizer, may be distributed simultaneously, provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to that area to be seeded within 30 minutes after all components are placed in the equipment.

   b. Immediately upon completion of planting of the seed, cellulose fiber mulch shall be spread uniformly over the seeded area at the following rates:

      (1) Sandy soils with 3:1 slope or less - min. 200 lbs/acre

      (2) Sandy soils with greater than 3:1 slope - min. 2300 lbs/acre

      (3) Clay soils with 3:1 slope or less - min. 2500 lbs/acre

      (4) Clay soils with greater than 3:1 slope - min. 3000 lbs/acre

   c. Cellulose fiber mulch rates are based on dry weight of mulch per acre. When used, a mulching machine, approved by the ENGINEER, shall be equipped to eject the thoroughly wet mulch material at a uniform rate to provide the mulch coverage specified.

4. Seeding for Cool Season Temporary Erosion Control.

   a. Standard Seeding. When specified on the plans or directed by the ENGINEER, temporary erosion control measures shall be performed. These measures shall consist of the sowing of seed mixtures appropriate for the season and the work and materials as required in this section. These measures shall be performed over the areas shown on the plans or where directed by the ENGINEER. The pure live seed, of the cool season plants, planted per acre shall be of

the type specified, with the mixture, rate and planting as follows in Table 3, except as shown on the plans.

Table 3

Optimum Planting Dates	Common Name	Rate, lbs./acre Dates
September 1 - November 30	Tall Fescue	4.0
	Oats	21.0*
	Wheat (Red, Winter)	30.0

* May substitute Barley at 72,0 lb./acre divided by the number of species in the mix.

b. Legume Seeding. When specified on the plans or directed by the ENGINEER, the following regionally adapted legumes in Table 4 shall be planted.

Table 4

Optimum Planting Dates	Common Name	Rate, lbs./acre
September 1 - November 30	Hairy Vetch	8.0

5. Seeding for Warm Season Temporary Erosion Control. When specified on the plans or directed by the ENGINEER, temporary erosion control measures shall be performed. This measure shall consist of the sowing of seed appropriate for the season and the work and materials as required in this section. These measures shall be performed over the areas shown on the plans or where directed by the ENGINEER. The pure live seed planted per acre shall be of the type specified, rate and seed planting date as follows in Table 5 except as shown on the plans.

Table 5

Optimum Planting Dates	Common Name	Rate, lbs./acre
May 1 - August 31	Foxtail Millet	30.0

E. Mulching

1. Straw or Hay Mulching. Mulch shall be spread uniformly over the area indicated on plans or as designated by the ENGINEER at the rate of approximately 1.5 to 2.0 tons of hay mulch or 2.0 to 2.5 tons of straw mulch per acre. When used, a mulching machine approved by the ENGINEER shall be equipped to inject a tacking agent into the straw or hay mulch uniformly as it leaves the equipment at a rate of 0.05 to 010 gallon of tacking agent per square yard of mulched area. If the straw or hay mulch and tacking agent are placed by hand, then the rate of application for the tacking agent shall be approximately 0.15 gallon per square yard.

3.02 Maintenance

Maintain planting until completion and Final Acceptance of the entire Project.

A. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.

B. Maintain seeded areas until a full, uniform stand of grass (90% coverage) free of weed, undesirable grass species, disease and insects is achieved.

C. Maintain seeded areas until completion and Final Acceptance of the entire project by the OWNER.

3.03 Acceptance

A. Field observations to determine recommendations on acceptance of seeded areas will be made by the Construction Observer/Inspector upon CONTRACTOR's request. Provide notification at least ten (10) working days before requested field observation. Seeded and sodden areas will be acceptable to the OWNER provided all requirements, including maintenance, have been complied with and a healthy, even colored viable grass is established, free of weeds, undesirable grass species, disease and insects.

Acceptance of hydromulching shall be based on a uniform stand of grass and a uniform grade at the time of final inspection. Areas of two square feet or more and areas not having a uniform grade for any cause before final inspection shall be regraded, rehydromulched, and reseeded as specified at the CONTRACTOR's expense.

B. Upon acceptance, the OWNER will assume maintenance.

3.04 Cleaning

Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess material, soil, debris and equipment. Repair damage resulting from planting operations.

END OF SECTION

SECTION 03100
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. The work performed under this section of the Specifications shall consist of furnishing and installing formwork for cast-in-place concrete, with shoring, bracing, anchorage and all necessary accessories. Openings in the formwork for other work shall be provided. All stripping activities shall be included under this section.

B. Related Sections

1. Section 03200 - Concrete Reinforcement
2. Section 03300 - Concrete

1.02 REFERENCES

A. ACI 347-01 - Recommended Practice for Concrete Formwork.

B. ACI 301-99 - Specifications for Structural Concrete for Building.

C. PS-1 - Construction and Industrial Plywood.

D. ACI 318-99/318R-99 - Building Code Requirements for Reinforced Concrete.

1.03 SYSTEM DESCRIPTION

A. Design Requirements

CONTRACTOR shall be responsible for the design, engineering and construction of formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension. Design and construction of formwork shall take into account live loads, dead loads, weight of moving equipment operating on formwork, concrete mix, height of concrete drop, vibrator frequency, temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to the safety of personnel and structures. CONTRACTOR shall provide shores, struts, and trussed supports as necessary.

B. All corners of exposed concrete to have a ¾ inches chamber.

1.04 QUALITY ASSURANCE

A. Work shall be performed in accordance with the standards referenced in Part 1.03 of this specification.

B. Conform to applicable codes for design, fabrication, erection and removal of formwork.

C. Coordinate this section with other sections of the Work, which require attachment of components to formwork. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, replace formwork or reset reinforcing to provide minimum specified concrete cover.

PART 2 - PRODUCTS

2.01 WOOD FORM MATERIALS

Form Materials: At the discretion of the CONTRACTOR.

2.02 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16-gage (1.5 mm) matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

C. Pan Type: Steel glass fiber of sizes and profile required.

D. Tubular Column Type: Round, spirally wound laminated fiber, wood or glass fiber material, surface treated with release agent, non-reusable, of sizes and profile required.

E. Void Forms: Voids formed under beams and slabs where indicated on the Plans or general notes may be formed through the use of 8-inch thick corrugated fiberboard boxes as manufactured by Voidco, Savway Carton Forms, Jay Void Carton or approved equivalent. Void forms shall be moisture resistant, biodegradable and structurally sufficient to support the weight of wet concrete mix until initial set. For slab, form boxes shall be covered with sheathing of the same material and shall be taped at the joints.

2.04 FORMWORK ACCESSORIES

A. Form Ties:

1. Metal form ties of the removable or snap-off type, steel, fixed or adjustable length cone type with waterproof washer (for water bearing structures or basements) shall be used to hold forms in place. Such ties shall have provision to permit ease of removal of the metal as hereinafter specified. The use of wire form ties will not be permitted. All metal appliances used inside of the forms to hold them in correct alignment shall be removed to a depth of at least 1/2-inch from the surface of the concrete and shall be so constructed that metal may be removed without undue injury to the surface from chipping or spalling. Such devices, when removed, shall leave a smooth opening in the concrete surface not larger than 7/8-inch in diameter. Burning off of rods, bolts, or ties will not be permitted. Metal ties shall be held in place by devices attached to wales. Each device shall be capable of developing the strength of the tie. Metal and wooden spreaders, which are separate from the forms shall be wired to the top of form and shall be entirely removed as the concrete is being placed. The use of metal form ties of a type that are encased in paper or other material to allow the removal of complete tie, leaving a hole through the concrete structure, will not be permitted in the construction of basement or water bearing walls.
   After the tie rods are broken back or removed, the holes shall be thoroughly cleaned to remove all grease and loose particles; then the mortar (non-shrink cement-sand mortar, as dry as practicable) shall be carefully packed into the holes in small quantities. After the holes are completely filled, all excess mortar shall be struck off flush and the surface finished in such a manner as to render the filled hole as inconspicuous as possible. If these patches appear to be darker than the other surface of the concrete, white cement shall be used in the mortar as required.

2. "Supertie" fiberglass form tie system as manufactured by RJD Industries, Inc., 26945 Cabot Road, Suite 107, Leguna Hill, California, 800/344-4753. Provide spreader rod, ties, gripper and all necessary accessories and installation devices. Provide gray color rod. Install Supertie in accordance with supplier's instructions. After removal of forms, grind Supertie flush to wall.

B. Form Release Agent:

1. Wastewater Applications: Colorless mineral oil, which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

2. Water Applications: Colorless food grade oil, which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Corners: Chamfered, rigid plastic or wood strip type; 3/4" x 3/4" size; maximum possible lengths. Accurately formed to produce uniformly straight lines and tight edge joints.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Plans.

3.02 EARTH FORMS

Earth forms shall not be used without specific, written approval from ENGINEER. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with the requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval from ENGINEER before framing openings in structural members, which are not indicated on Plans.

F. Provide chamfer strips on external corners of beams, joists, columns, elevated slabs and walls.

G. Void forms shall be installed in accordance with the manufacturer's recommendations and in such a manner so as to provide tight joints. Void forms shall be anchored to prevent displacement or flotation during concrete placement. Forms shall be protected from moisture or crushing prior to placement. Damaged forms shall be replaced prior to concrete placement.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings, which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS AND EMBEDDED PARTS

Provide form openings where required for items to be embedded in or passing through concrete work. Locate and set in place items, which will be cast directly into concrete.

3.06 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

Construct formwork so as to maintain tolerances required by ACI 347, Chapter 3.3, except as otherwise noted.

3.08 FIELD QUALITY CONTROL

Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure. Do not reuse split, frayed, delaminated or otherwise damaged formwork.

3.09 FORM REMOVAL

A. The time for removal of forms shall comply with ACI 318. If curing temperatures are below 50°F (15°C), the time for removal shall be increased by fifty percent (50%). In no case shall forms or bracing be removed until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

A. SCOPE:

Under this section of the specifications, the CONTRACTOR shall furnish all labor, material, tools, equipment and related items required to do the concrete reinforcement work as indicated by the Contract Documents.

B. RELATED WORK SPECIFIED ELSEWHERE:

Section 01300: Submittals
Section 03300: Concrete

C. REFERENCES (LATEST VERSION):

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A82	Steel wire, plain, for concrete reinforcement.
A185	Steel wire fabric, plain, for concrete reinforcement.
A615	Deformed and plain billet-steel bars for concrete reinforcement.

1.2 SUBMITTALS:

Submittals shall comply with the requirements of Section 01300, and the following:

A. All detailing and placing drawings shall comply with ACI SP66 "Detailing Manual."

B. Submit mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis.

1.3 DELIVERY AND STORAGE:

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

1.4 MEASUREMENT AND PAYMENT:

No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of this section. The costs for all such items required shall be subsidiary to the various concrete items of work bid for the project.

PART 2 PRODUCTS

2.1 MATERIALS:

A. REINFORCING MATERIALS:

1 Reinforcing Bars (Rebar): ANSI/ASTM A-615, Grade 40 #3 deformed.

2 Welded Wire Fabric (WWF): ANSI/ASTM A-185, welded steel wire fabric.

B. ACCESSORY MATERIALS:

1 Tie Wire: Minimum 18 gauge annealed type, or patented system accepted by the Engineer.

2 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcing during construction conditions. Use of rocks, bricks, wood or any other material not approved by the ENGINEER shall not be permitted.

C. CONCRETE PROTECTION FOR REINFORCEMENT:

Steel reinforcement shall be placed and held in position as shown on the plans. 1" clear cover will be required at bottom for all concrete.

D. STORAGE:

1 Steel reinforcing bars shall be stored in such a manner as to prevent any direct contact with the ground or existing structures.

2 Steel that is stored in a manner not acceptable to the ENGINEER will not be paid for by the OWNER.

END OF SECTION

SECTION 03300
CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

A. SCOPE:

This item shall govern for the material used for concrete pads and incidental structures. Extent of concrete work is shown on the plans. Concrete shall be 4000 psi at 28 days.

B. RELATED WORK SPECIFIED ELSEWHERE:

Section 01300: Submittals
Section 03200: Concrete Reinforcement

C. REFERENCES (LATEST VERSION):

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM): ASTM

C33-86	Concrete Aggregates
ASTM	C94 Ready-Mixed Concrete
ASTM	C150 Portland Cement

1.4 SUBMITTALS:

Submittals shall comply with the requirements of Section 01300 "Submittals," and as specified herein.

A. PRODUCT DATA:

The CONTRACTOR shall submit manufacturer's product data, as requested by the ENGINEER.

1.5 MEASUREMENT AND PAYMENT:

Measurement and payment will be as outlined in Section "Measurement and Payment" of Part 1, General Provisions.

END OF SECTION

SECTION 15430
EMERGENCY EYE/FACE WASH AND SHOWER EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

1. Section Includes: Emergency shower and eyewash.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. Z358.1 - Emergency Eyewash and Shower Equipment.
   2. Z535.1 - Safety Color Code.

B. NIOSH Schedule 13F.

1.03 SUBMITTALS

A. Shop Drawings.

B. Product Data:
   1. Submit manufacturer's product literature information for products specified.
   2. Manufacturer's Installation Instructions.

C. Operation and Maintenance Data.

D. Operating and Maintenance Information for Safety Detectors and Breathing Apparatus: 6 complete sets.

E. Warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Show evidence that the firm has been engaged in producing such materials and products for at least 5 years and that the product submitted has a satisfactory performance record of at least 5 years.

B. Installer Qualifications: Installer shall have 3 years experience in installing these materials for similar projects and shall be approved by the manufacturer prior to bidding of the project.

C. Regulatory Requirements:
   1. As applicable, equipment of this Section shall comply with requirements of public agencies of the state where the project is located including OSHA.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver to the job site in manufacturer's original containers.

B. Delivery: After wet operations in building are completed.

C. Storage and Protection: Store materials in original, unopened containers in compliance with manufacturer's printed instructions.

D. Keep materials dry until ready for use. Keep packages of material off the ground, under cover, and away from sweating walls and other damp surfaces.

E. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

PART 2 PRODUCTS

2.01 EMERGENCY SHOWERS AND EYE/FACE WASHES

A. General Design Requirements:
   1. Combination Unit Emergency Shower with Eye/Face Wash:
      a. Floor mounted fixture consisting of pipe standard, shower head assembly, and eyewash assembly.
      b. Provide stanchion and floor flange, with interconnecting piping.
      c. Provide eyewash with integral flow switch to alarm its use.
   2. Shower Head Flow: 20.0 gpm flow, minimum.
   3. Eye/Face Wash Flow: 3.0 gpm flow, minimum.
   4. Meet or exceed all requirements of ANSI Z358.1.
   5. Provide ANSI compliant identification sign and markings.

B. Combination Unit Emergency Shower and Eye/Face Wash:
   1. Manufacturers: One of the following or equal:
      a. Haws, Model No. 8309.
      b. Guardian Equipment, Model No. G1950HFC.
      c. Bradley, Model No. S19-310AC.
   2. Pipe Standard:
      a. 1-1/4 inch hot-dip galvanized steel pipe, and fittings with interconnecting piping, stanchion, and 9 inch diameter floor flange.
      b. Corrosion Protection: Provide Haws “-CRP” or Guardian Equipment “-EC” epoxy protective coating in corrosive environments.
   3. Shower Head:
      a. Material and Size: ABS plastic, 10 inch diameter.
      b. Valve and Actuator: Stay open chrome plated brass ball valve equipped with stainless steel ball and stem operated by a rigid stainless steel pull rod.
   4. Eye/Face Wash Receptor:

a. Valve and Actuator: Stay open chrome plated brass ball valve with stainless steel ball and stem operated by a stainless steel or epoxy coated aluminum push handle and foot treadle.
b. Spray Heads: Twin ABS plastic or polypropylene eye/face wash type heads, with integral flip top protective dust covers releasing with water pressure.
c. Receptor Bowl: Stainless steel; 11 inches diameter.

5. Supply: 1-1/4 inch IPS.
6. Waste: 1-1/4 inch IPS.

C. Stainless Steel Combination Unit Emergency Shower and Eye/Face Wash:
1. Manufacturers: One of the following or equal:
a. HAWS, Model No. 8335.
b. Guardian Equipment, Model No. G1996.
c. Bradley, Model No. S19-310SSJP.
2. Pipe Standard: 1-1/4 inch stainless steel pipe and fittings, with stainless steel rod providing additional support overhead; 5 inch diameter floor flange.
3. Shower Head:
a. Material and Size: Stainless steel, 10 inch diameter.
b. Valve and Actuator: Stay open Type 316 stainless steel ball valve actuated by rigid stainless steel pull rod.
4. Eye/Face Wash:
a. Valve and Actuator: Stay open Type 316 stainless steel ball valve with stainless steel ball operated by stainless steel push handle and foot treadle.
b. Heads: Twin ABS plastic or polypropylene soft-flow eye/face wash type heads, with integral flip top protective dust covers releasing with water pressure.
5. Receptor Bowl: Stainless steel.

D. Freeze Resistant Combination Unit Emergency Shower and Eye/Face Wash:
1. Manufacturers: One of the following or equal:
a. HAWS, Model No. 8317CTFP.
b. Guardian Equipment, Model No. GFR3100.
c. Bradley, Model No. S19-300T.
2. Pipe Standard: 1-1/4 inch galvanized steel pipe and fittings, wrapped with self-regulating heat cable. Encase piping and fittings in UV resistant ABS plastic jacket with internal foam insulation; 5 inch diameter floor flange.
3. Shower Head:
a. Material and Size: ABS plastic, 10 inch diameter.
b. Valve and Actuator: Chrome plated brass stay open steel ball valve actuated by rigid stainless steel pull rod.
4. Eye/Face Wash:

a. Valve and Actuator: Stay open chrome plated brass ball valve with stainless steel ball and stem operated by a stainless steel or epoxy coated aluminum push handle and foot treadle.

b. Heads: Twin ABS plastic or polypropylene soft-flow eye/face wash type heads, with integral flip top protective dust covers releasing with water pressure.

5. Receptor Bowl: Stainless steel.

E. Deluge Shower - Wall Mounted (where ceiling is 96 inches high or more):
1. Manufacturers: One of the following or equal:
   a. Haws; Model No. 8122H.
   b. Guardian Equipment; Model No. G1643.
   c. Bradley Model No. S19-120.
2. Showerhead: ABS impact resistant plastic, 10 inch diameter.
3. Valve: Chrome plated 1 inch stay open ball valve operated by stainless steel pull rod with triangular handle. Pull open - push close.
4. Supply: Deliver 20 gallons per minute at 45 pounds per square inch inlet pressure, 1 inch IPS.

F. Safety Shower Tester:
1. Manufacturers: One of the following or equal:
   a. Haws, Model No. 9010 with No. 9009.
   b. Guardian Equipment, Model No. AP250-005.
   c. Bradley, Model No. S19-330ST.
2. Kit includes: Minimum 5 gallon plastic bucket, 7 foot long watertight 12 gallon translucent vinyl plastic bag for attaching over drench shower head, and testing record card. Bag shall have drawstring at top and be hemmed at bottom.

G. Safety Shower Tepid Water Mixing Valves:
1. Manufacturers: One of the following or equal:
   a. Haws, Model No. 9201 Series.
   b. Guardian Equipment, Model No. G33800 Series.
2. General Requirements:
   a. Provide one mixing valve for each safety shower unit or group of safety shower units mounted within 100 feet of each other.
3. Tepid water System to provide a minimum of 20 gpm for shower and 3 gpm for eye/face wash of water for a period of at least 15 minutes at a delivery temperature of 80 to 85 degrees Fahrenheit.

H. Portable Sterile Emergency Eyewash Station:
1. Manufactures: One of the following or equal:
   a. Fendall, Model 32-02000-000.
2. General Requirements:

a. Provide complete portable Sterile Emergency Eyewash Station complete with eyewash station, wall mounting brackets, sterile solution cartridge, and installation manual.
b. Eyewash Station shall have an alarm that sounds upon activation and completion.

3. Spare Equipment:
a. Provide one spare cartridge of sterile solution per eyewash.

PART 3 EXECUTION

3.01 ISTALLATION

A. Install products in accordance with manufacturers' recommendations.
B. Install fixed equipment in accordance with manufacturer's instructions.
C. Plumbing and mechanical work shall be in accordance with Section 15050.
D. Electrical connections and distribution shall be in accordance with Section 16050.

3.02 PROTECTION

A. Repair or replace defective equipment with new.

END OF SECTION

SECTION 16010
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Requirements specified within this section apply to all sections in Division 16, ELECTRICAL. Work specified herein shall be performed as if specified in the individual sections. The Contractor shall review installation procedure under other sections and coordinate the installation with all other trades.

1.02 STANDARDS

A. All electrical equipment and controls furnished under the provisions of this Section of the specifications shall conform to the current standards, rules, regulations and specifications of the following authorities:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

AMERICAN WATERWORKS ASSOCIATION (AWWA)

CPS ENERGY ELECTRIC SERVICE STANDARDS

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

INSULATION CABLE ENGINEERS ASSOCIATION (ICEA)

INTERNATIONAL BUILDING CODE (IBC)

INTERNATIONAL FIRE CODE (IFC)

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCATION (NEMA)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

UNDERWRITERS' LABORATORIES, INC. (UL)

B. Reference to standards of any technical society, organization, or both shall be

constructed to mean the latest standard, code, specifications, or tentative specification adopted and published at the date of advertisement.

1.03 DESCRIPTION OF ELECTRICAL WORK

A. General Description:

1. The electrical work to be performed under the provisions of these Contract Documents consists of furnishing all materials, equipment, supplies, permits, fees, utilities, and appurtenances; providing all construction plans, equipment and tools; performing all necessary labor and supervision, transportation, and the construction, complete including all work appurtenant thereto, at the location indicated below. The proposed sites of the work are San Antonio Water System's Proposed Odor Control Facilities: Mission Trails and Northwest Service Center, located in San Antonio, Texas.

B. Electrical Work Provided Within this Contract as applicable per site:

1. CPS service installation and connection will be arranged by Contractor, but payment to CPS will be made by SAWS.
2. Contractor is responsible for providing all required service construction in accordance with the requirements and specifications of CPS Energy as follows per site:
    a. Service Contact Pole, Service Raceway, Service Head, and Service Cable, ready for overhead connection by CPS Energy per plans.
    b. CPS approved meter purchased at a local supply house.
3. Furnish and install safety switch at power pole per SAFETY SWITCHES – HEAVY DUTY section 16410.
4. Furnish and install Service Equipment Rack equipped with:
    a. One (1) panelboard with main breaker, which shall be named "POWER PANEL." Reference BASIC ELECTRICAL MATERIALS AND METHODS section 16050 2.05, 3.07.
    b. One (1) SCADA panel with A/C, which shall be named "SCADA PANEL." Reference SCADA SYSTEM AND LOCAL STATION CONTROL AND MONITORING section 16920 & BASIC ELECTRICAL MATERIALS AND METHODS section 16050 2.09-2.10, 3.09.
    c. One (1) Pump control panel, which shall be named "PUMP CONTROL PANEL." Reference BASIC ELECTRICAL MATERIALS AND METHODS section 16050 2.09, 2.10, 3.09.
    d. One (1) GFCI outdoor rated receptacle. Reference BASIC ELECTICAL MATERIALS AND METHODS section 16050 2.01, 2.03-2.04, 3.02, 3.04-3.05.
    e. One (1) Omni directional antenna. Reference SCADA SYSTEM AND LOCAL STATION CONTROL AND MONITORING section 16920 2.05 G. (Applies to Northwest Side Service Center site only.)
5. Furnish and install antenna mast (height shown on plans). Reference SCADA SYSTEM AND LOCAL STATION CONTROL AND MONITORING section 16920 2.05 D.

6. Furnish and install Yagi antenna. Reference SCADA SYSTEM AND LOCAL STATION CONTROL AND MONITORING section 16920 2.05 C.
7. Furnish and install 600V rated power distribution including ducts and cables. Reference sections 16110 RACEWAYS and 16120 CONDUCTORS.
8. Furnish and install level controller per INSTRUMENTATION section 16930.
9. Provide grounding per GROUND GRID, GROUNDING, AND LIGHTNING PROTECTION section 16451.
10. Furnish and install all interconnect wiring for control. Reference sections 16110 RACEWAYS and 16120 CONDUCTORS.
11. The contractor shall perform electrical testing. Reference section 16950, ELECTRICAL TESTING.
12. The contractor shall provide Arc Flash labeling. Reference section 16412, ARC FLASH LABELING.
13. The work shall include all ductbanks, conduit, cable, wiring, controls, grounding, as specified herein, as indicated on the Contract Drawings, and as necessary to provide a complete, functional, operating electrical system.
14. The Contractor is to provide the conduit layout drawings showing proposed routing of exposed conduits, conduits embedded in structural concrete and conduits directly buried in earth. Drawings shall show locations of pull and junction boxes and all penetrations through slabs.

1.04 SUBMITTALS

A. Shop Drawing Submittals: The submittal of Shop Drawings in accordance with Section 01301, CONTRACTOR SUBMITTALS and the General Conditions of the Contract, Section 5.13, shall include the following:

1. Duct materials including conduit, fittings, and spacers.
2. 600VAC cable specifications.
3. Enclosures.
4. PLC.
5. Level Controller.
6. Duct bank sections.

B. Operation and Maintenance Manuals.

C. Quality Control Submittals:

1. Field Test Results.
2. Factory test certification and reports for all major electrical equipment.

1.05 FINAL DRAWINGS

A. Final drawings shall be submitted in accordance with Division 1, and shall include:

1. Overall Interconnect Wiring Diagram:
    a. The Contractor shall, prior to final acceptance, furnish the Owner with interconnect wiring diagrams of the entire station installation.

b. The diagrams shall be documentation of all field wiring (interconnects) made between all equipment, controllers, panels, instrumentation, etc. by the Contractor.

c. The diagrams shall identify each terminal point, each cable as it was actually labeled and the size and number of cables actually installed by the Contractor.

2. Final “As-Built” Drawings:

a. The Contractor shall, prior to final acceptance, provide the Owner with one copy of the Contract Drawings indicating all deviations made, and additional information provided, during construction and installation. Process and Instrumentation (P&ID) drawings shall also be provided. The drawings shall be documentation of the entire station “as-built” by the Contractor and shall also indicate the following:

i) All fuse sizes.

ii) All current transformer ratios (overall & as-set).

iii) All transformer sizes (kVA) and impedance values (%).

iv) Numbers for all terminal points indicated on the Contract Drawings.

v) Include the actual routing of exposed and concealed conduit runs on Record Drawings as well as a detail of each duct bank section.

vi) Items not furnished under this contract are not applicable.

PART 2 PRODUCTS

2.01 GENERAL

A. All electrical materials used shall conform to the National Electric Code rules and shall be approved by the National Board of Fire Underwriters for the class of service for which they are intended and shall bear the label or approval of the Underwriters Laboratories insofar as such services are available.

B. Permits: Obtain all permits required to commence work and, upon completion of the work obtain and deliver to the Engineer a Certificate of Inspection and Approval from the State Board Fire Underwriters or other authority having jurisdiction.

C. Contractor shall be held responsible to have examined the site and existing facilities prior to bidding in order to compare them with the drawings and specifications with respect to the conditions of the premises, location of and/or connection to existing facilities and any obstructions which may be encountered.

D. The design ambient temperature to be utilized for the electrical facilities is 40° C. Locations will be classified as identified in Section 100-A of the National Electrical Code. All plant areas are classified as "Non-Hazardous".

PART 3 EXECUTION

3.01 GENERAL

A. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

1. Dimensions shown on the Drawings related to equipment are based on one typical manufacturer's equipment. Coordinate the dimensions of the equipment furnished with the space available.

2. Intent: The drawings show the principal elements of the electrical system. They are not intended as detailed working drawings for the electrical work but as a complement to the specifications to clarify the principal features of the electrical systems.

a. It is the intent of this Section that all equipment and devices, furnished and installed under this and other Sections, be properly connected and interconnected with other equipment so as to render the installations complete for successful operation, regardless of whether all the connections and interconnections are specifically mentioned in the specifications or shown on the drawings. Any work that may reasonably be inferred from the specifications or drawings as being required to provide the completed electrical systems shall be supplied whether or not it is specifically called for.

b. Dielectric couplings shall be installed between dissimilar metals in all cases.

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

1. Installation and Operation:

a. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper results. When so specified, or when employees of Contractor or his Subcontractors are not qualified, such personnel shall be field representatives of the manufacturer of the equipment or materials being installed.

3.02 CHECKOUT AND STARTUP

A. All equipment installed under this Contract shall be placed into successful operation according to the written instructions of the manufacturer or the instructions of the manufacturer’s field representative. All required adjustments, tests, operation checks, and other startup activity shall be provided.

B. Voltage Field Test:

1. Check voltage at point of termination of power company supply system to project when installation is essentially complete and is in operation.

2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.

3. Unbalance Corrections:

a. Make written request to power company to correct condition if balance (as defined by NEMA) exceeds 1 percent, or if voltage varies throughout the day and from loaded to unloaded condition more than plus or minus 4 percent of nominal.

b. Obtain a written certification from a responsible power company official that the voltage variations and unbalance are within their normal standards if corrections are not made.

END OF SECTION

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings:
1. Junction and pull boxes used at, or below, grade
2. Device box relocation
3. Terminal junction boxes
4. Panelboards and circuit breaker data
5. Fuses
6. Lighting fixtures and poles
7. Control cabinet enclosures
8. Control cabinet wiring and terminal blocks
9. Control cabinet devices and nameplates

1.02 QUALITY ASSURANCE

A. UL Compliance: Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

1.03 SPARE PARTS

A. Furnish, tag, and box for shipment and storage and deliver prior to 75 percent Project completion the following spare parts:
1. Fuses, 0 to 600 Volts: Six of each type and each current rating installed unless otherwise specified.
2. Lamps for panel lighting: Twelve of each type installed.

PART 2 PRODUCTS

2.01 OUTLET AND DEVICE BOXES

A. Sheet Steel: One-piece drawn type, zinc- or cadmium-plated.

B. Cast Metal:
1. Box: Malleable iron
2. Cover: Gasketed, weatherproof, malleable iron, with stainless steel screws.
3. Hubs: Threaded
4. Lugs: Cast Mounting
5. Finish: Corrosion resistance zinc electroplate coated
6. Manufacturers and Products:
a. Crouse-Hinds; Type FS or FD
b. Appleton; Type FS and FD

2.02 JUNCTION AND PULL BOXES

A. Outlet Boxes Used as Junction or Pull Box: As specified under Article OUTLET AND DEVICE BOXES.

B. All junction and pull boxes shall be oversized to the next standard size.

C. Large Sheet Steel Box: NEMA 250, Type 1
1. Box: Code-gauge, galvanized steel
2. Cover: Full access, screw type
3. Machine Screws: Corrosion-resistant

D. Large Cast Metal Box: NEMA 250, Type 4
1. Box: Cast malleable iron with drilled and tapped conduit entrances.
2. Cover: Hinged with clamps.
3. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.
4. Manufacturers, Surface Mounted Type:
a. Crouse-Hinds; Series W
b. O.Z./Gedney; Series YF
5. Manufacturers, Recessed Type:
a. Crouse-Hinds; Type WJBF
b. O.Z./Gedney; Series YR

E. Large Stainless Steel Box: NEMA 250, Type 4X.
1. Box: 16-gauge, Type 304 stainless steel, with white enamel painted interior mounting panel, and 10 gauge stainless steel flanges.
2. Cover: Hinged with clamps.
3. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.
4. Manufacturers:
a. Hoffman Enclosures Co.

2.03 WIRING DEVICES

A. Switches:
1. NEMA WD1 and FSW-S-896E.
2. Specification grade, totally enclosed, ac type, with quiet tumbler switches and screw terminals.
3. Capable of controlling 100 percent tungsten filament and fluorescent lamp loads.
4. Rating: 20 amps, 120/277 volts
5. Color: Ivory
6. Manufacturers:
a. Bryant
b. Leviton
c. Hubbell
d. Pass and Seymour
e. Arrow Hart

B. Receptacle, Single and Duplex:

1. NEMA WD 1 and FS W-C-596.
2. Specification grade, two-pole, three-wire grounding type with screw type wire terminals suitable for No. 10 AWG.
3. High strength, thermoplastic base color.
4. Color: Ivory.
5. Contact Arrangement: Contact to be made on two sides of each inserted blade without detent.
6. Rating: 125 volts, NEMA WD 1, Configuration 5-20R, 20 amps.
7. Manufacturers:
    a. Bryant
    b. Leviton
    c. Hubbell
    d. Pass and Seymour
    e. Sierra
    f. Arrow Hart

C. Receptacle, Ground Fault Circuit Interrupter: Duplex, specification grade, tripping at 5 mA.

1. Color: Ivory.
2. Rating: 125 volts, NEMA WD 1, Configuration 5-20R, 20 amps, capable of interrupting 5,000 amps without damage.
3. Size: For 2-inch by 4-inch outlet boxes.
4. Feed-Through Model: NEMA WD 1, with No. 12 AWG copper USE/RHH/RHW-XLPE insulated pigtails and provisions for testing.
5. Manufacturers:
    a. Pass and Seymour
    b. Bryant
    c. Leviton
    d. Hubbell
    e. Arrow Hart

2.04 DEVICE PLATES

A. General: Sectional type plates not permitted.

B. Metal:

1. Material: Specification grade, one-piece, 0.040-inch nominal thickness stainless steel.
2. Finish: ASTM A167, Type 302/304, satin
3. Mounting Screw: Oval-head, finish matched to plate

C. Cast Metal:

1. Material: Malleable ferrous metal, with gaskets
2. Screw: Oval-head stainless steel

D. Weatherproof:

1. For Receptacles: Gasketed, cast metal or stainless steel, with individual cap over each receptacle opening.
    a. Mounting Screw: Stainless steel.
    b. Cap Spring: Stainless steel.
    c. Manufacturers:
        i) General Electric
        ii) Bryant
        iii) Hubbell
        iv) Sierra
        v) Pass and Seymour
        vi) Crouse-Hinds; Type WLRD or WLRS
        vii) Bell
        viii) Arrow Hart
        ix) Appleton; FSK-W

2. For Switches: Gasketed, cast metal incorporating external operator for internal switch.
    a. Mounting Screw: Stainless steel
    b. Manufacturers:
        i) Crouse-Hinds; DS-181 or DS-185
        ii) Appleton; FSK-1VTS or FSK-1VS

2.05 LIGHTING AND POWER DISTRIBUTION PANELBOARD, 240 VAC

A. NEMA PB, NFPA 70, and UL 67

B. Panelboards, Circuit Breakers and Terminals: Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.

C. Short-Circuit Current Equipment Rating: Fully rated 10kA.

D. Rating: Applicable to a system with available short-circuit current of 10,000 amperes rms symmetrical.

E. Ground Fault Interrupter: 5-mA trip, 10,000 amps interrupting capacity circuit breakers.

F. Cabinet: NEMA 250, Type 3R, Outdoor; NEMA Type 1 if inside a building.
    1. Material: Code-gauge, hot-dip galvanized sheet steel, with reinforced steel frame.
    2. Front: Fastened with adjustable clamps.
        a. Trim Size:
            i) Surface Mounted: Same as box.
            ii) Flush Mounted: ¾ inch larger than box on all sides.
    3. Exterior:
        a. Finish: Rust inhibitor prime, with manufacturer's standard baked enamel or lacquer unless otherwise specified to be stainless steel. All mounting

hardware shall be corrosion resistant stainless steel.

4. Interior:
   a. Factory assembled, complete with circuit breakers.
   b. Capable of circuit breaker replacement without disturbing adjacent circuit breakers or without removing main bus.
   c. Spaces: Cover openings with easily removable metal cover.
5. Door Hinges: Concealed
6. Locking Device:
   a. Pad lockable, Vandal-Resistant
   b. Doors Over 30 Inches in Height: Multipoint
7. Circuit Directory: Metal frame with transparent plastic face and enclosed card on interior of door.
8. Nameplates: Provide for each cabinet. On outdoor equipment the description nameplate shall be on the outer door.

G. Bus Bar:
1. Material: Tin-plated copper full sized throughout length.
2. Provide for mounting of future circuit breakers along full length of bus regardless of number of units and spaces shown. Machine, drill, and tap as required for current and future positions.
3. Neutral: Insulated, rated same as phase bus bars with at least one terminal screw for each branch circuit.
4. Ground: Copper, installed on panelboard frame, bonded to box, with at least one terminal screw for each circuit.
5. Lugs and Connection Points:
   a. Suitable for either copper or aluminum conductors.
   b. Solderless main lugs for main, neutral, and ground bus bars.
   c. Subfeed or through-feed lugs if shown on plans.
6. Bolt together and rigidly support bus bars and connection straps on molded insulators.

H. Circuit Breakers:
1. NEMA AB 1 and UL 489.
2. Thermal-magnetic, quick-make, quick-break, molded case, of the indicating type showing ON/OFF and TRIPPED positions of operating handle.
3. Noninterchangeable, in accordance with NFPA 70.
4. Type: Bolt-on circuit breakers in all panelboards.
5. Multipole circuit breakers designed to automatically open all poles when an overload occurs on one pole.
6. Do not substitute single-pole circuit breakers with handle ties for multipole breakers.
7. Do not use tandem or dual circuit breakers in normal single-pole spaces.
8. Ground Fault Interrupter:
   a. Equip with conventional thermal-magnetic trip and ground fault sensor rated to trip in 0.025 second for a 5-milliampere ground fault (UL 943, Class A sensitivity).
   b. Sensor with same rating as circuit breaker and a push-to-test button.

9. Means for lock open of the circuit breaker shall be permanently installed.

I. Manufacturers:
1. Cutler-Hammer
2. General Electric
3. Siemens
4. Square D

2.06 TERMINAL JUNCTION BOX

A. Cover: Hinged, unless otherwise shown.

B. Terminal Blocks: Provide separate connection point for each conductor entering or leaving box.
1. Spare Terminal Points: 25 percent.

C. Interior Finish: Paint with white enamel or lacquer.

2.07 TERMINAL BLOCK (0 TO 600 VOLTS)

A. UL 486E and UL 1059.

B. Screw-type for accepting ring-tongue compression lugs.

C. Manufacturers:
1. Buchanan
2. General Electric

2.08 SUPPORT AND FRAMING CHANNELS

A. Material: Rolled, mild strip steel, 10-gauge, ASTM A570, Grade 33.

B. Finish:
1. Dry Areas: Hot-dip galvanize.
2. Corrosive and Wet Areas: ASTM A167, Type 316 stainless steel.

C. Inserts: Continuous

D. Beam Clamps: Gray cast iron

E. Manufacturers:
1. B-Line
2. Unistrut

2.09 CONTROL CABINETS

A. Outdoor control cabinets shall be non-ventilated NEMA Type 4X (316 stainless steel).

B. Outdoor panels containing PLC equipment shall be equipped with a thermostat controlled air conditioner and a thermostat controlled heater. **Refer to specification 16920 for air conditioner information.**

C. Enclosures shall be constructed of 16-gauge 316 stainless steel.

D. Enclosures shall have a single or double swing panel front with continuous hinge, and three point latch which shall have provision for padlocking. Hinge pin and panel clamps shall be stainless steel. Hinged door shall be 16-gauge 316 stainless steel. Door shall be vandal-resistant.

E. Enclosures shall have an interior back panel. No screws shall penetrate the enclosure. The interior surfaces shall be white baked enamel finish. All control panels and devices shall be on a plane surface providing accessibility for maintenance without removing components.

F. Provide an internal, steel, hinged swing-out panel with white baked enamel finish for mounting devices such as pushbuttons, selector switches, control switches, and indicating lights. All devices shall be mounted inside the control cabinets.

G. Devices and nameplates shall be furnished and installed as indicated in the Contract Drawings.

H. Enclosure Manufacturers:
1. Hoffman Enclosure Co.

I. Design and Assembly: Contractor to submit name and qualifications of design and assembly firm for Owner's approval.

2.10 NAMEPLATES

A. Nameplates shall be provided for each enclosure, control and indicating device. On outdoor equipment, the unit description nameplate shall be on the outer door.

B. Exterior nameplates shall be paint-filled, engraved, corrosion-resistant metals of suitable dimensions using ¼ inch high lettering minimum. Exterior switchgear nameplates shall have 3/8" high minimum lettering.

C. Interior nameplates shall be of the size required, made of phenolic material with white core with engraved 3/16" minimum lettering.

D. Permanent nameplates or stenciled painting shall identify each control device and each control wire terminal block connection inside the units to match identifications on the manufacturer's internal wiring diagrams and on the subcontractor's interconnection wiring diagram. Paper labels shall not be acceptable.

E. Nameplates shall be mechanically fastened with rivets or screws.

F. Engraving:
1. Pushbuttons/Selector Switches: Name of drive controlled on one, two, or three lines, as required.
2. Panelboards: Panelboard designation, service voltage, and phases.

2.11 LIGHTING

A. Provide lighting fixtures and poles as shown on the CONTRACT DRAWINGS.

PART 3 EXECUTION

3.01 GENERAL

A. Install equipment in accordance with NECA 5055.

3.02 OUTLET AND DEVICE BOXES

B. Install suitable for conditions encountered at each outlet or device in the wiring or raceway system, sized to meet NFPA 70 requirements.

C. Install plumb and level.

D. Support boxes independently of conduit by attachment to building structure or structural member.

E. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.

F. Open no more knockouts in sheet steel device boxes than are required; seal unused openings.

G. Box Type (Steel Raceway System):
1. Exterior Locations:
a. Exposed Raceways: Cast metal
b. Concealed Raceways: Cast metal
c. Concrete Encased Raceways: Cast metal
2. Interior Dry Locations:
a. Exposed Rigid Conduit or IMC: Cast metal
3. Interior Wet Locations:
a. Exposed Raceways: Cast metal
b. Concealed Raceways: Cast metal
c. Concrete Encased Raceways: Cast metal

H. Box Type (Nonmetallic Raceway System):

1. Exposed Raceways: Cast metal
2. Concealed Raceways: Cast metal

3.03 JUNCTION AND PULL BOXES

A. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.

B. Install pull boxes where necessary in raceway system to facilitate conductor installation.

C. Install in conduit runs at least every 150 feet or after the equivalent of three right angle bends.

D. Use outlet boxes as junction and pull boxes wherever possible and allowed by applicable codes.

E. Installed boxes shall be accessible.

F. Install plumb and level.

G. Support boxes independently of conduit by attachment to building structure or structural member.

H. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.

I. Boxes embedded in concrete or masonry need not be additionally supported.

J. At or Below Grade:
1. Install boxes for below grade conduits flush with finished grade in locations outside of paved areas, roadways, or walkways.
2. If adjacent structure is available, box may be mounted on structure surface just above finished grade in accessible but unobtrusive location.
3. Boxes shall not be installed in paved areas, roadways, or walkways.
4. Use boxes and covers suitable to support anticipated weights.

K. 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.
4. Noncorrosive Areas: Galvanized.

L. Mounting Hardware:
1. Noncorrosive Areas: Galvanized.

M. Location/Type:
1. Finished, Indoor, Dry: NEMA 250, Type 1.

2. Unfinished, Indoor, Dry: NEMA 250, Type 12.
3. Unfinished, Indoor and Outdoor, Wet and Corrosive: NEMA 250, Type 4X.
4. Underground Locations: Concrete.

3.04 WIRING DEVICES

A. Switches:
1. Install with switch operation in vertical position.
2. Install single-pole, switches such that toggle is in up position when switch is on.

B. Receptacles:
1. Install with grounding slot down in vertical mounting, and with neutral slot up in horizontal mounting.
2. Weatherproof Receptacles:
a. Install in cast metal box.
b. Install such that hinge for protective cover is above receptacle opening.
c. Receptacle shall be Ground Fault Circuit Interrupter type.
3. Ground Fault Interrupter: Install feed-through model at locations where ground fault protection is specified for “downstream” conventional receptacles.
4. Special-Purpose Receptacles: Install in accordance with manufacturer's instructions.

3.05 DEVICE PLATES

A. Securely fasten to wiring device; ensure a tight fit to the box.

B. Flush Mounted: Install with all four edges in continuous contact with finished wall surfaces without use of mats or similar materials. Plaster fillings will not be acceptable.

C. Surface Mounted: Plate shall not extend beyond sides of box unless plates have no sharp corners or edges.

D. Install with alignment tolerance to box of 1/16-inch.

E. Types (Unless Otherwise Shown):
1. Exterior: Weatherproof.
2. Interior:
a. Surface Mounted, Cast Metal Boxes: Metal
b. Surface Mounted, Sheet Steel Boxes: Metal

3.06 TERMINAL JUNCTION BOX

A. Label each block and terminal with permanently attached, nondestructible tag.

B. Do not install on finished outdoor surfaces.

C. Location:
1. Unfinished, Indoor and Outdoor, Wet: NEMA 250, Type 4X.

3.07 LIGHTING AND POWER DISTRIBUTION PANELBOARD

A. Install securely, plumb, in-line and square with walls.

B. Install top of cabinet 6 feet above floor unless otherwise shown.

C. Provide typewritten circuit directory for each panelboard.

3.08 SUPPORT AND FRAMING CHANNEL

A. Furnish zinc-rich primer; paint cut ends prior to installation.

B. Install where required for mounting and supporting electrical equipment and raceway systems.

3.09 CONTROL CABINETS

A. Install securely, plumb, in-line and square with walls or structure.

B. Cabinets shall be mounted using manufacturer furnished mounting brackets so that no screws or bolts penetrate the cabinet.

END OF SECTION

THIS SHEET INTENTIONALLY LEFT BLANK.

SECTION 16110
RACEWAYS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings:
1. Manufacturer's Literature:
a. Rigid galvanized steel conduit
b. PVC Schedule 40 conduit
c. PVC Schedule 80 conduit
d. Flexible metal, liquid-tight conduit
e. Flexible, nonmetallic, liquid-tight conduit
f. Aluminum
g. Conduit fittings
h. Wireways.

1.02 UL COMPLIANCE

A. Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

PART 2 PRODUCTS

2.01 CONDUIT AND TUBING

A. Rigid Galvanized Steel Conduit (RGS): (For use only on electric service pole)
1. Meet requirements of ANSI C80.1 and UL6.
2. Material: Hot-dip galvanized, with chromated protective layer.

B. 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.

C. PVC Schedule 80 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 Metal, Liquid-Tight Conduit:
1. UL 360 listed for 105 degrees C insulated conductors.
2. Material: Galvanized steel, with an extruded PVC jacket.

E. 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:
a. Carlon; Carflex or X-Flex
b. T & B; Xtraflex LTC or EFC

F. Rigid Aluminum Conduit: (Sites contain corrosive materials.)
1. Meet requirements of NEMA RN1.
2. Type: Rigid, heavy wall aluminum.

2.02 FITTINGS

A. Rigid Galvanized Steel: (For use only on electric service pole)
1. General:
a. Meet requirements of UL 514B.
b. Type: Threaded, galvanized. Setscrew fittings not permitted.
2. Bushing:
a. Material: Malleable iron with integral insulated throat, rated for 150 degrees C.
b. Manufacturers:
i) Thomas & Betts
ii) O.Z. Gedney
3. Grounding Bushing:
a. Material: Malleable iron with integral insulated throat rated for 150 degrees C, with solderless lugs.
b. Manufacturers:
i) Appleton
ii) O.Z. Gedney
4. Conduit Hub:
a. Material: Malleable iron with insulated throat.
b. Manufacturers:
i) O.Z. Gedney
ii) T & B
5. Conduit Bodies:
a. Material: Cast ferrous, sized as required by NFPA 70.
b. Manufacturers (For Normal Conditions):
i) Appleton; Form 35 threaded Unilets
ii) Crouse-Hinds; Form 7 or 8 threaded condulets
iii) Killark; Series O Electrolets
6. Couplings: As supplied by conduit manufacturer.
7. Drain Seal Manufacturers:
a. Appleton; Type SF
b. Crouse-Hinds; Type EYD or EZD
8. Drain/Breather Fitting Manufacturers:

a. Appleton; Type ECDB
b. Crouse-Hinds; ECD

9. Expansion Fitting Manufacturers:
   a. Deflection/Expansion Movement:
      i) Appleton; Type DF
      ii) Crouse-Hinds; Type XD
   b. Expansion Movement Only:
      i) Appleton; Type XJ
      ii) Crouse-Hinds; Type XJ
10. Cable Sealing Fittings:
   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:
      i) Crouse-Hinds
      ii) Appleton

B. PVC Conduit and Tubing:
   1. Meet requirements of NEMA TC-3
   2. Type: PVC, slip-on

C. Flexible Metal, Liquid-Tight Conduit:
   1. Metal insulated throat connectors with integral nylon or plastic bushing rated for 105 degrees C.
   2. Insulated throat and sealing O-rings.
   3. Long design type extending outside of box or other device at least 2 inches.

D. Flexible, Nonmetallic, Liquid-Tight Conduit: Meet requirements of UL 514B.
   1. Type: One-piece fitting body, complete with lock nut, O-ring, threaded ferrule, sealing ring, and compression nut.
   2. Manufacturers:
      a. Carlon
      b. Kellems
      c. T & B

E. Watertight Entrance Seal Device:
   1. New Construction:
      a. Material: Oversized sleeve, malleable iron body with sealing ring, pressure ring, grommet seal, and pressure clamp.
      b. Manufacturer: O.Z. Gedney; Type FSK or WSK, as required.
   2. Cored-Hole Application:
      a. Material: Assembled dual pressure disks, neoprene sealing ring, and membrane clamp.
      b. Manufacturer: O.Z. Gedney; Series CSM.

F. Aluminum:
   1. For Hazardous Locations: Install sealing fittings on all conduits leaving the

service rack.

a. Cable Sealing Fittings

i) To stop gasses, vapors or flames from migrating from one conduit system to another.

ii) 40 mil PVC exterior coating, 2 mil urethane interior coating

iii) Fittings shall be used with a suitable system of sealing compound.

iv) Manufacturer: Crouse-Hinds Chico A, Chico X or Chico A-P.

2.03 ACCESSORIES

A. Duct Bank Spacers:

1. Type: Nonmetallic, interlocking, for multiple conduit sizes.
2. Suitable for all types of conduit.
3. Manufacturer: Underground Device, Inc.

B. 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
   b. Color: Red
   c. Width: Minimum 6-inch
   d. Designation: Warning on tape that electric circuit is located below tape.
   e. Manufacturers:
      i) Blackburn, Type RT
      ii) Griffolyn Co.

C. Raceway Coating:

1. Material: Bitumastic or plastic tape coating.
2. Manufacturers:
   a. Koppers bitumastic
   b. Scotchwrap

D. Wraparound Duct Band:

1. Material: Heat-shrinkable, cross-linked polyolefin, precoated with hot-melt adhesive.
2. Manufacturer: Raychem

PART 3 EXECUTION

3.01 GENERAL

A. Conduit and Tubing sizes shown are based on the use of copper conductors.

B. All installed Work shall comply with NECA 5055.

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. Do not install raceways within walls.

L. Block Walls: Do not install raceways in same horizontal course with reinforcing steel.

M. Install watertight fittings in outdoor, underground, or wet locations.

N. Paint threads, before assembly of fittings, of galvanized conduit installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound.

O. All metal conduit to 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.

Q. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.

R. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.

3.02 INSTALLATION IN CAST-IN-PLACE STRUCTURAL CONCRETE

A. Minimum cover 3 inches.

B. Provide support during placement of concrete to ensure raceways remain in position.

C. Floor Slabs:

1. Outside diameter of conduit not to exceed one-third of the slab thickness.

2. Separate conduit by minimum six times conduit outside diameter, except at crossings.

3.03 CONDUIT APPLICATION

A. Diameter: Minimum 3/4-inch.

B. Concrete-Encased Raceways: PVC Schedule 40 with rigid aluminum 90 degree bends.

C. Exterior Exposed: Rigid aluminum.

3.04 CONNECTIONS

A. For motors, wall or ceiling mounted fans and unit heaters, dry type transformers, electrically operated valves, instrumentation, and other equipment where flexible connection is required to minimize vibration:

1. Conduit Size 4 Inches or Less: Liquid-tight conduit.

2. Conduit Size Over 4 Inches: Nonflexible.

3. Length: 18-inch minimum, 60-inch maximum, of sufficient length to allow movement or adjustment of equipment.

B. Outdoor Areas, Process Areas Exposed to Moisture, and Areas required to be Oiltight and Dust-Tight: Flexible metal, liquid-tight conduit.

C. Exterior Light Pole Foundations: PVC Schedule 80 conduit.

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. Fire-Rated Walls, Floors, or Ceilings: Fire-stop openings around penetrations to maintain fire-resistance rating.

D. Apply single layer of wraparound duct band to all metallic conduit protruding through concrete floor slabs to a point 2 inches above and 2 inches below concrete surface.

E. Concrete Walls, Floors, or Ceilings (Aboveground): Provide nonshrink grout dry-pack, or use watertight seal device.

F. Entering Structures:

1. General: Seal raceway at the first box or outlet with oakum or expandable

plastic compound to prevent the entrance of gases or liquids from one area to another.

2. Existing or Precast Wall (Underground): Core drill wall and install a watertight entrance seal device.

3. Nonwaterproofed Wall or Floor (Underground, without Concrete Encasement):

a. Provide Schedule 40 galvanized pipe sleeve, or watertight entrance seal device.

b. Sleeve shall be flush with finished surfaces.

c. Fill space between raceway and sleeve with an expandable plastic compound, or oakum and lead joint, on each side.

3.06 SUPPORT

A. Support from structural members only, at intervals not exceeding NFPA 70 requirements, and in any case not exceeding 10 feet. Do not support from piping, pipe supports, or other raceways.

B. Multiple Adjacent Raceways: Provide ceiling trapeze.

C. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:

1. Wood: Wood screws.

2. Hollow Masonry Units: Toggle bolts.

3. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.

4. Steelwork: Machine screws.

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.

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-Degree and Larger: Provide factory-made elbows.
2. 90-Degree Bends: Provide PVC Schedule 80 elbows.
3. 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 EXPANSION/DEFLECTION FITTINGS

A. Provide on all raceways at all structural expansion joints, and in long tangential runs.

B. Provide expansion/deflection joints for 50 degrees F maximum temperature variation.

C. Install in accordance with manufacturer's instructions.

3.09 PVC CONDUIT

A. Solvent Welding:
1. Provide manufacturer recommended solvent; apply to all joints.
2. Install such 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 the unbelled end of the joint prior to joining.

3.10 TERMINATION AT ENCLOSURES

A. Cast Metal Enclosure: Provide manufacturer's pre-molded insulating sleeve inside metallic conduit terminating in threaded hubs.

B. Sheet Metal Boxes, Cabinets, and Enclosures:
1. Rigid Galvanized Conduit:
a. Provide one lock nut each on inside and outside of enclosure.
b. Install grounding bushing.
c. Provide bonding jumper from grounding bushing to equipment ground bus or ground pad; if neither ground bus nor pad exists, connect jumper to lag bolt attached to metal enclosure.
d. Install insulated bushing on ends of conduit where grounding is not required.
e. Provide insulated throat when conduit terminates in sheet metal boxes

having threaded hubs.

2. Flexible, Nonmetallic Conduit: Provide nonmetallic, liquid-tight strain relief connectors.

3. PVC Schedule 40 Conduit: Provide PVC terminal adapter with lock nut.

C. Motor Control Center, Switchboard, Switchgear, and Free-Standing Enclosures: Terminate conduit-entering bottom with grounding bushing; provide a grounding jumper extending to equipment ground bus or grounding pad.

3.11 UNDERGROUND RACEWAYS

A. All underground conduit shall be direct buried a minimum of 2-feet from the top of the conduit.

B. Grade: Maintain minimum grade of 4 inches in 100 feet, either from one pull box to the next, or from a high point between them, depending on surface contour.

C. Cover: Maintain minimum 2-foot cover above top of conduit, unless otherwise shown.

D. Make routing changes as necessary to avoid obstructions or conflicts.

E. Couplings: In multiple conduit runs, stagger so that couplings in adjacent runs are not in same transverse line.

F. Conduits shall have end bells where terminated at walls and adapters for steel conduit continuations.

G. Union type fittings not permitted.

H. Spacers:

1. Provide preformed, nonmetallic spacers, designed for such purpose, to secure and separate parallel conduit runs in 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 5 feet.

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. Metallic Raceway Coating: Along entire length, coat with raceway coating.

K. Backfill:

1. Backfill with sand pneumatically compacted in 6” lifts.

2. Do not backfill until inspected by OWNER.

L. Cutting and Patching of Asphalt Surfaces:

1. In accordance with applicable sections of City of San Antonio Standard Specifications for Public Works Construction, Item No. 511, "CUTTING AND REPLACING PAVEMENTS" and Item No. 205, "HOT MIX ASPHALTIC CONCRETE PAVEMENT."
2. Contractor shall, in all areas to be paved, remove all recent fill or otherwise loose and uncompacted soil. The Contractor shall wet and compact this cut to 90% Texas Department of Transportation (TxDOT) Item 113E density. The Contractor shall place approved earth fill in 8-inch layers and compact soil to 95% modified SDH&PT Item 113 E density. The flexible base shall conform to the TDH&PT Item 248 Type A, Grade 1 and be six inches in thickness. The prime coat shall conform to SDH&PT Specifications Item 300.2 and be applied to the completed base coat at the rate of 0.15 gallons per square yard per Specification Item 340.6. A minimum of 2 inches hot mix asphaltic concrete (HMAC) meeting the requirements of TxDOT Item 340, using Type D mix, shall be placed. A crushed stone aggregate shall be included in the HMAC. The HMAC shall have a field density between 95% and 99% of the laboratory maximum density; the HVEEN stability shall be a 40 minimum. The Contractor shall replace the pavement at the existing grades.

3.12 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.

3.13 IDENTIFICATION DEVICES

A. Raceway Tags:
1. Identify origin and destination.
2. Install at each terminus, near midpoint, and at minimum intervals of every 50 feet of exposed Raceway, whether in ceiling space or surface mounted.
3. Provide noncorrosive wire for attachment.

B. Warning Tape: Install approximately 10 inches above underground raceways. Align parallel to, and above centerline of runs.

C. Buried Raceway Markers:
1. Install at grade to indicate direction of underground raceways.
2. Install at all 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.

3.14 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 all conduit openings during construction.

C. Touch up painted conduit threads after assembly to cover nicks or scars.

END OF SECTION

THIS SHEET INTENTIONALLY LEFT BLANK.

SECTION 16120
CONDUCTORS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings:
1. Wire and cable descriptive product information.
2. Wire and cable accessories descriptive product information.

B. Quality Control Submittals:
1. Factory Test Report for conductors 600 volts and below.
2. Manufacturers data sheets and catalog data.

1.02 UL COMPLIANCE

A. Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

PART 2 PRODUCTS

2.01 CONDUCTORS 600 VOLTS AND BELOW

A. Conform to applicable requirements of NEMA WC 3, WC 5, and WC 7

B. Conductor Type: Stranded Copper

C. Insulation: Type THHN/THWN 90^{o}C. Allowable conductor ampacity shall be as listed for 75^{o}C Temperature rating even for conductor with 90^{o}C rated insulation.

2.02 600-VOLT RATED TC AND INSTRUMENTATION CABLE

A. General:
1. Type: TC, meeting requirements of UL 1277, including Vertical Tray Flame Test at 20,000 Btu/hr, and NFPA 70, Article 340, or UL 13 Listed Power Limited Circuit Cable 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°C dry locations, 75°C wet locations.
5. Overall Outer Jacket: PVC, flame-retardant, sunlight-and oil-resistant.

B. Type 3-No. 16 AWG, Twisted, Shielded Pair, Instrumentation Cable: Single pair, designed for noise rejection for process control, computer, or data log

applications meeting NEMA WC 55 requirements.

1. Outer Jacket: 45-mil nominal thickness.
2. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer overlapped to provide 100 percent coverage.
3. Dimension: 0.31-inch nominal OD.
4. 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 (positive) and white (negative).
5. Manufacturers:
    a. Okonite Co.
    b. Alpha Wire Corp.
    c. Belden

C. Type 8-No. 16 AWG, Twisted, Shielded Triad Instrumentation Cable: Single triad, designed for noise rejection for process control, computer, or data log applications meeting requirements of NEMA WC 55.

1. Outer Jacket: 35-mil nominal thickness.
2. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer, overlapped to provide 100 percent coverage.
3. Dimension: 0.28-inch nominal OD.
4. Conductors:
    a. Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8.
    b. 20 AWG, seven-strand tinned copper drain wire.
    c. Insulation: 15-mil PVC.
    d. Color Code: Triad conductors black, red, and white.
5. Manufacturers:
    a. Okonite Co.
    b. Alpha Wire Corp.
    c. Belden

2.03 GROUNDING CONDUCTORS

A. Equipment:

1. No. 6 AWG and Larger: Stranded Bare Copper, Class B stranding, soft drawn.
2. No. 8 AWG and smaller: Solid Bare Copper, or Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.

B. Direct Buried: Stranded bare copper, class B stranding soft drawn.

2.04 ACCESSORIES FOR CONDUCTORS 600 VOLTS AND BELOW

A. Tape:

1. General Purpose, Flame-Retardant: 7-mil, vinyl plastic, Scotch Brand 33, rated for 90°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:
        i) Scotch; Brand 77, with Scotch Brand 69-glass cloth tape binder.
        ii) Plymouth; Plyarc 30, with Plymouth Plyglas glass cloth tape binder.

B. Identification Devices:
1. Sleeve: Permanent, PVC, yellow or white, with legible machine-printed black markings.
2. Marker Plate: Nylon, with legible designations permanently hot stamped on plate.
3. Grounding Conductor: Permanent green heat-shrink sleeve, 2-inch minimum.
4. Manufacturers:
    a. Brady
    b. Thomas & Betts
    c. 3M
    d. Panduit

C. Connectors and Terminations:
1. Nylon, Self-Insulated Crimp Connectors:
    a. Manufacturers and Products:
        i) Thomas & Betts; Sta-Kon
        ii) Burndy; Insulink
        iii) ILSCO
2. Nylon, Self-Insulated, Crimp Locking-Fork, Torque-Type Terminator:
    a. Manufacturers and Products:
        i) Thomas & Betts; Sta-Kon
        ii) Burndy; Insulink
        iii) ILSCO
3. Self-Insulated, Free spring Wire Connector (Wire Nuts):
    a. Plated steel, square wire springs.
    b. UL Standard 486C.
    c. Manufacturers and Product:
        i) Thomas & Betts
        ii) Ideal; Twister

D. Cable Lugs:
1. In accordance with NEMA CC 1.
2. Rated 600 volts of same material as conductor metal.
3. Insulated, Locking-Fork, Compression Lugs:
    a. Suitable for use with 75°C wire at full NFPA 70, 75°C ampacity.
    b. Manufacturers and Products:

i) Thomas & Betts; Sta-Kon
ii) ILSCO; ILSCONS

4. Uninsulated Crimp Connectors and Terminators:
   a. Suitable for use with 75°C wire at full NFPA 70, 75°C ampacity. Manufacturers and Products:
      i) Square D; Versitide
      ii) Thomas & Betts; Color-Keyed
      iii) ILSCO
5. Uninsulated, Bolted, Two-Way Connectors and Terminators:
   a. Manufacturers and Products:
      i) Thomas & Betts; Locktite
      ii) Burndy; Quiklug
      iii) ILSCO

E. Cable Ties: Nylon, adjustable, self-locking, and reusable.
1. Manufacturer and Product: Thomas & Betts; TY-RAP.

F. Heat Shrinkable Insulation: Thermally stabilized, cross-linked polyolefin.
1. Manufacturer and Product: Thomas & Betts; SHRINK-KON.

2.05 PULLING COMPOUND

A. Nontoxic, noncorrosive, noncombustible, nonflammable, wax-based lubricant; UL listed.

B. Suitable for raceway material and conductor jacket material.

C. Manufacturers and Products:
1. Ideal Co.; Yellow 77
2. Polywater, Inc.
3. Cable Grip Co.

2.06 SOURCE QUALITY CONTROL

A. Conductors 600-Volts and below: Test in accordance with UL 44 and 854 Standards.

B. Medium Voltage Conductors: Test in accordance with NEMA WC 74 and AEIC CS 8.

PART 3 EXECUTION

3.01 GENERAL

A. Conductor installation to be in accordance with NECA 5055.

B. Conductor and cable sizing shown on Contract Drawings is based on copper

conductors, unless noted otherwise.

C. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radius.

D. Tighten screws and terminal bolts in accordance with UL 486A for copper conductors.

E. Cable Lugs: Provide with correct number of holes, bolt size, and center-to-center spacing as required by equipment terminals.

F. Bundling: Where single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations are not wrapped together by some other means, bundle conductors from each conduit throughout their exposed length with cable ties placed at intervals not exceeding 18 inches on center.

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 ¼ inch smaller than raceway inside diameter.

3.02 POWER CONDUCTOR COLOR CODING

A. Conductors 600 Volts and Below:
1. No. 4 AWG and Larger: Apply general purpose, flame retardant tape at each end, and at accessible locations wrapped at least six full overlapping turns, covering an area 1-1/2 to 2 inches wide.
2. No. 6 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
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 or Gray Purple Brown Yellow
NOTE: Phase A, B, C implies direction of positive phase rotation.		

4. Tracer: Outer covering of white with an identifiable colored strip other than green in accordance with NFPA 70.

3.03 CIRCUIT IDENTIFICATION

A. Circuits Appearing in Circuit Schedules: Identify power, instrumentation, and control conductor circuits, using circuit schedule designations, at each termination and in accessible locations such as manholes, handholes, panels, switchboards, motor control centers, pull boxes, and terminal boxes.

B. All wires shall be labeled at both ends to match the engineer point to point wiring diagram. Labels shall be permanently legible, typed or preprinted.

C. Label shall be Brady Permasleeve or as manufactured by Thomas & Betts, 3M or Panduit.

D. Circuits Not Appearing in Circuit Schedules:

E. Assign circuit name based on device or equipment at load end of circuit.

F. 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.

G. Method:
1. Conductors No. 3 AWG and Smaller: Identify with sleeves.
2. Cables, and Conductors No. 2 AWG and Larger:
    a. Identify with marker plates.
    b. Attach marker plates 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 No. 6 AWG and larger unless specifically indicated or approved by OWNER.

C. Connections and Terminations:

1. Install wire nuts only on solid conductors.
2. Install nylon self-insulated crimp connectors and terminators for instrumentation, control, and power circuit conductors No. 6 AWG and smaller.
3. Install uninsulated crimp connectors and terminators for instrumentation, control, and power circuit conductors No. 4 AWG through No. 2/0 AWG.
4. Install uninsulated, bolted, two-way connectors and terminators for power circuit conductors No. 4/0 AWG and larger.
5. Install uninsulated bolted, two-way connectors for motor circuit conductors No. 12 and larger.
6. Tape insulate all uninsulated connections.
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.
    b. Tool shall provide complete, controlled crimp and shall not release until crimp is complete.
    c. Do not use plier type crimpers.

D. Do not use soldered mechanical joints.

E. Splices and Terminations:

1. Indoors: Use general purpose, flame retardant tape.
2. Outdoors: Use flame retardant, cold- and weather-resistant tape.

F. Cap spare conductors and 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.
3. Locate splices in readily accessible cabinets or junction boxes using terminal strips.
4. Cable Protection:
    a. Under Infinite Access Floors: May be installed without bundling.
    b. All Other Areas: Install individual wires, pairs, or triads in flex conduit under the 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 the shield.
e. Instrument shields shall be grounded at only one end.

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 CONDUCTOR ARC AND FIREPROOFING

A. Wrap conductors of same circuit entering from separate conduit together as a single cable.

B. Follow tape manufacturer's installation instructions.

C. Secure tape at intervals of 5 feet with bands of tape binder. Each band to consist of a minimum of two wraps directly over each other.

3.06 FIELD QUALITY CONTROL

A. In accordance with Section 16950, ELECTRICAL TESTING.

END OF SECTION

SECTION 16410
SAFETY SWITCHES – HEAVY DUTY

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install the low-voltage fused and non-fused switches as specified herein and as shown on the contract drawings. Where applicable it shall be suitable for 240V service entrance duty when equipped with a field or factory installed neutral assembly or equipment grounding kit.

1.02 SUBMITTALS

A. Shop Drawings:
   1. Dimensioned outline drawing
   2. Conduit entry/exit locations
   3. Switch ratings including:
      a. Short-circuit rating
      b. Voltage
      c. Continuous current
   4. Fuse ratings and type
   5. Cable terminal sizes

B. Product Information:
   1. Descriptive bulletins
   2. Product sheets

1.03 QUALITY ASSURANCE

A. UL Compliance: Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

1.04 SPARE PARTS

A. Furnish, tag, and box for storage three (3) spare fuses of each type and current rating installed.

PART 2 PRODUCTS

2.01 HEAVY-DUTY SAFETY SWITCHES

A. Construction:
   1. Switchblades and jaws shall be plated copper.
   2. Switches shall have copper current carrying parts.
   3. Switches shall have a handle that is easily padlockable in the OFF position.

4. Switches shall have defeatable door interlocks that prevent the door from opening when the handle is in the ON position.
5. Switch assembly and operating handle shall be an integral part of the enclosure base.
6. Switches rated 60A to 600A shall have reinforced fuse clips.
7. Switchblades shall be readily visible in the OFF position.
8. Switch operating mechanism shall be non-teasible, positive quick-make/ quick-break type (except 30A plug fuse-type).
9. Fusible switches shall be suitable for service entrance equipment.
10. Switches shall have line terminal shields.

B. Manufacturers:
1. Square D, Class 3110, 240-volt, Model H22_DS, or equal from the other listed manufacturers.
2. Siemens
3. General Electric
4. Cutler-Hammer

C. Enclosures:
1. The enclosure shall be NEMA 4X – 316 stainless steel.
2. The enclosure shall have ON and OFF markings stamped into the cover.
3. The operating handle shall be provided with a dual colored, red/black position indication.

D. Switch Ratings:
1. The UL Listed short circuit current rating of the switch shall be 10,000 rms, symmetrical amperes when used with or protected by Class H or K fuses (30-600 amperes) and 200,000 rms, symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 amperes switches employing appropriate fuse rejection schemes).

2.02 NAMEPLATES

A. Nameplates shall be front cover mounted, contain a permanent record of switch type, ampere rating, and maximum voltage rating.

PART 3 EXECUTION

3.01 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.

3.02 INSTALLATION

A. The equipment shall be installed per the manufacturer's recommendations and the contract drawings.

B. Contractor is responsible for providing all mounting brackets and structure to provide proper support and working clearances.

END OF SECTION

THIS SHEET INTENTIONALLY LEFT BLANK.

SECTION 16412
ARC FLASH LABELING

PART 1 GENERAL

1.01 DESCRIPTION

A. General: This section specifies that the CONTRACTOR provide an arc flash hazard label on selected equipment per IEEE 1584.

B. Scope:
Labels shall be provided for each covered piece of equipment for installation on the equipment. These labels will provide all necessary information for personnel to select the proper Personnel Protective Equipment (PPE).

1.02 REFERENCES

A. This Section contains references to the following documents. They are part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

Reference	Title
IEEE 1584-02	IEEE Guide For Performing Arc Flash Hazard Calculations

PART 2 PRODUCTS –NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. Provide arc flash hazard labels on the electrical power distribution system, as specified.

3.02 ARC FLASH HAZARD LABELS

A. Colored labels shall be provided that contain:
1. Flash Hazard Boundary
2. Limited Approach Boundary
3. Restricted Boundary
4. Prohibited Boundary
5. Incident Energy Level
6. Required Personnel Protective Equipment Class
7. Type of Fire Rated Clothing

END OF SECTION

THIS SHEET INTENTIONALLY LEFT BLANK.

SECTION 16451
GROUND GRID, GROUNDING AND LIGHTNING PROTECTION

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings:
   1. Product Data:
      a. Exothermic weld connectors
      b. Mechanical connectors
      c. Compression connectors
      d. Ground Rods
      e. Surge Arresters
      f. Conductors

1.02 UL COMPLIANCE

A. Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

1.03 GROUNDING SYSTEM

A. The grounding system is a solidly grounded neutral system that is multigrounded. The grounding electrode is the grounding rings formed by the conductors encircling the medium voltage switchgear and motor areas.

PART 2 PRODUCTS

2.01 GROUND RODS

A. Located as shown on the grounding site plan.

B. Material: Copper Bonded.

C. Size: 5/8” x 8’ or as indicated on the drawing.

D. Ground Enhancement Material (GEM) backfill, if required.

E. Manufacturers: Erico, Inc.; ground rods and GEM backfill.

2.02 GROUND CONDUCTORS

A. Conductor size as shown on the grounding site plan.

B. As specified in Section 16120, CONDUCTORS.

2.03 CONNECTORS

A. Exothermic Weld Type:
   1. Outdoor Weld: Suitable for exposure to elements or direct burial.
   2. Indoor Weld: Utilize low-smoke, low-emission process.
   3. Manufacturers:
      a. Erico Products, Inc.; Cadweld and Cadweld Exolon
      b. Thermoweld

B. Below Grade Compression Type:
   1. Irreversible high strength compression.
   2. Pure wrought copper extrusion.
   3. Barrels prefilled with oxide-inhibiting and antiseizing compound and sealed.
   4. Manufacturers:
      a. Burndy Corp, hyground compression system

C. Above Grade Compression Type for Equipment Ground Connection:
   1. Single indentation for conductors 6 AWG and smaller.
   2. Double indentation with extended barrel for conductors 4 AWG and larger.
   3. Barrels prefilled with oxide-inhibiting and antiseizing compound and sealed.
   4. Specifically listed four ground connections
   5. All mechanical hardware, nuts, bolts and washers shall be high strength copper alloy.
   6. Manufacturers:
      a. Burndy Corp

PART 3 EXECUTION

3.01 GENERAL

A. Grounding shall be in compliance with NEC Article 250, NFPA 70 and ANSI C2.

B. Ground each separately derived system neutral in accordance with NEC 250-30. All connections will be connected to the grounding grid.

C. Ground the reservoir tank as shown on Contract Drawings for dissipation of lightning energy into the earth.

D. 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.

E. Arresters shall be installed in locations as shown on the Contract Drawings.

F. Shielded Instrumentation Cables:
   1. Expose shield minimum 1 inch at termination to field instrument and apply heat shrink tube.
   2. Do not ground instrumentation cable shield at more than one point.

G. Ground grid conductors to be installed not less than 30 inches deep.

3.02 WIRE CONNECTIONS

A. Ground Conductors: Install in conduit containing low voltage power conductors and control circuits above 50 volts.

B. Nonmetallic Raceways and Flexible Tubing: Install an 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.

3.03 MOTOR GROUNDING

A. Motor frame shall be connected to the ground grid as indicated on the grounding site plan.

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: Furnish compression, spade-type terminal connected to conduit box mounting screw.

D. 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 ground rod full length with conductor connection at upper end. The ground rod shall be driven into undisturbed earth.

B. If soil conditions prevent driving the ground rod to full length, installation shall by accomplished by augering a 3” diameter or larger hole and backfilling with compacted ground enhancement material.

C. Install top of rod 6 inches below finished grade, unless otherwise shown.

3.05 CONNECTIONS

A. General:
   1. Above Grade Connections: Use either exothermic weld, mechanical, or compression-type connectors.
   2. Below Grade Connections: Install exothermic weld or compression type connectors.
      a. Remove paint, dirt, or other surface coverings at connection points to allow good metal-to-metal contact.
      b. Notify OWNER prior to backfilling ground connections.

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. Do not use 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.

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.

3.06 METAL STRUCTURE GROUNDING

A. Ground 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.

END OF SECTION

THIS SHEET INTENTIONALLY LEFT BLANK.

SECTION 16920
SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM
AND LOCAL STATION CONTROL AND MONITORING

PART 1 GENERAL

1.01 SCOPE

A. Contractor shall furnish all labor, materials, and components, and shall provide all design, assembly, programming, software, licensing and start-up services to provide a complete and operational SCADA system including local station control and monitoring, as specified herein and as shown on the Contract Drawings. Contractor will not be responsible for SCADA operations, programming, or components at the Owner's Production Control Center (PCC) or other off-site locations.

B. Contractor General Qualifications
   1. Have a local office within one hundred (100) miles of the City of San Antonio.
   2. Be able to provide resumes, project experience history and references for all employees that will be qualified to work on the SCADA system.
   3. Have a local full time staff of employees that have developed and commissioned a minimum of three new Modicon based systems within the past twelve months. Must have a minimum five years experience designing, installing and commissioning SCADA systems.
   4. Have a minimum of three local full time employees qualified to perform the SCADA system configuration work.
   5. All proposals submitted to the San Antonio Water System must be accompanied by documentation supporting the qualifications of the contractor as detailed above. The San Antonio Water System reserves the right to reject any proposal if the above qualifications are not met.

C. The control, monitoring and SCADA system shall include, but is not limited to, the following component equipment:
   1. PLC Processor
   2. PLC modules, chassis, and power supplies
   3. 24Vdc power supply
   4. Supervisory Control Panel (SCP) to include the PLC, serial communication devices, radio transceivers, interposing relays, interface wiring terminals, and all local indication and local control devices specified herein or indicated on the Contract Drawings.

D. The SCADA system shall be furnished in accordance with the requirements stated herein to assure compatibility with Owner's existing facilities and systems. No deviation from specified equipment will be allowed.

1.02 SUBMITTALS

A. Shop Drawings:
   1. Bill of Materials
   2. Catalog Cuts
   3. Component Data Sheets
   4. Panel Construction Drawings, including wiring and component layout
   5. List of Labels and Tags

B. Submit control loop drawings complete with rack, card slot and point configuration.

1.03 OPERATION AND MAINTENANCE MANUAL

A. The final O & M manual shall contain a complete set of as-built control loop and wiring drawings in "11x17" format.

1.04 PLC INPUT/OUTPUT POINT LIST

A. The Input/Output (I/O) Point List is attached to this specification as Appendix "A" and indicates nomenclature, and signal functions, and defines the scope of interface requirements for this project. All analog I/O shall be 4-20ma.

B. The quantity of Input/Output modules furnished shall not be less than shown in the PLC I/O capacity summary in Appendix "A".

C. Field wiring to complete all interconnections listed in the I/O are included in the Contractor's scope of work whether or not shown on the Contract Drawings.

1.05 PLC SYSTEM PROGRAMMING

A. Owner will provide for programming of the PLC CPU.
B. Contractor shall provide the PLC with all functionality and capability required for Owner programming, and shall document all I/O terminations for Owner programming. Contractor will provide field tracing for any programmed loop that does not function in accordance with Owner programming.

PART 2 PRODUCTS

2.01 SUPERVISORY CONTROL PANEL

A. General:
   1. Install PLC, one radio transceiver, 24Vdc power supply, interposing relays, power supplies, interface wiring terminals, and local front panel mounted control and indication devices.

2. Provide mounting hardware, terminal blocks, circuit breakers, electrical wiring, communications wiring, and all other items required for a complete operational system.
3. Panel layout and fabrication shall allow for convenient maintenance and removal of all equipment after installation.
4. Provide switched fluorescent interior panel light, and an interior mounted 15 amp, 120 Vac GFI duplex receptacle.
5. Provide thermostat controlled space heater sized and rated at 120Vac. Shall be low density type for long life.
6. Provide thermostat controlled air conditioner. **Air conditioner shall re-circulate air inside the panel (closed-loop cooling) and shall not bring in outside air.** Air conditioner shall be NEMA 4X stainless steel. Manufacturer: McLean Cooling Technology model #T20-0216-G100.

B. Wiring:
1. Internal wiring for control and low voltage power circuits shall be flame retardant NFPA 70, Type SIS, single conductor, Class B, stranded copper, rated 600 volts. Minimum wire size shall be #14 AWG.
2. Analog signal wiring shall be #16 AWG twisted shielded pairs with drain wire and outer jacket.
3. Segregate signal wiring from control wiring, group functionally and arrange to facilitate tracing of circuits.
4. Arrange wiring on terminal blocks to segregate field incoming conductors on a common side separate from internal wiring.
5. Wire routing and bundling shall utilize wiring duct and plastic wire wrap, secured to the structure and with spare space.
6. Color code wiring as follows:
   a. Line and load circuits, AC or DC power. Black
   b. AC control circuits. Red
   c. DC control circuits. Blue
   d. Equipment ground conductors. Green
   e. Current carrying grounded conductor (neutral). White

C. Terminal Blocks:
1. Provide screw type 600 volt terminal blocks with pressure plate and marking strip. Do not use miniature terminal blocks.
2. Provide a minimum of 25 percent spare terminals.
3. Group interface terminals together.

D. Grounding:

1. Provide a ground bus connected to building ground for grounding shields, cabinet, and components.
2. DC signal common shall be ungrounded.

E. Enclosure:
   1. Enclosure shall be a NEMA 4X 316 stainless steel cabinet with full height, gasketed door.
   2. Doors shall have three-point latch with key lock, and shall have full length hinges with stainless steel pins. Lock to be keyed for Owner's key.
   3. Fabricate using 316 stainless steel. Grind and sand welds to a smooth finish. Surfaces shall be free of ridges, nuts, and boltheads.
   4. Internal structural framing to provide enclosure bracing and equipment support.
   5. Provide removable lifting lugs, with plugs for use after installation is complete.
   6. Enclosure shall be complete with interior back panels, side panels and swing out panel, as required for component mounting.
   7. Provide a print pocket on inside of each door.

F. Devices:
   1. Reference is made to Section 16010, BASIC ELECTRICAL REQUIREMENTS, for devices not specified in this Section or on the Contract Drawings.
   2. Interposing relays, auxiliary relays, and selector switches shall be as indicated on Contract Drawings.
   3. Combination lightning protection and TVSS for power main shall be Phoenix contact COMBOTRAB mounted using DIN-rail assembly in the SCP, P/N 5603030.
   4. Temperature sensor shall be Weed Instrument model # 753-TM.

G. Nameplates, Labels and Tags:
   1. Furnish face-of-panel mounted nameplates to identify systems and equipment. Use plastic laminate nameplates having white letters on red background for 120V system equipment, and white letter on blue background for 24V system equipment. Center lettering on each line.
   2. Use plastic tags with letters on a red (120V) and blue (24V) background in the panel interior to identify each device mounted on the panel exterior and interior. Place the tags adjacent to, but not on, the device. Do not obstruct visibility by wire bundles or other equipment.

2.02 PROGRAMMABLE LOGIC CONTROLLER (PLC) SYSTEM

A. The PLC shall be a complete system that includes but is not limited to the following:
   1. PLC processor
   2. PLC modules, chassis, and power supply
   3. All connection cables
   4. Program software deliverable to Owner

B. Approved Products – NO SUBSTITUTIONS

DESCRIPTIONS	MANUFACTURER	PART NUMBER
6 Slot Backplane	Modicon	BMXXBP0600
Power Supply Module	Modicon	BMXCPS3500
CPU	Modicon	BMXP342020
16 Channel Digital Input Module	Modicon	BMXDDI1602
8 Channel Analog Input Module	Modicon	BMXAMI0810
4 Channel Analog Output Module	Modicon	BMXAMO0410
Analog Input Telefast base	Modicon	ABE-7CPA02
Analog Output Telefast base	Modicon	ABE-7CPA21
Analog Telefast Connection Cable	Modicon	BMXFCA300
Analog Telefast Connection Cable	Modicon	BMXFTA300

C. Communications:
1. Modbus RS 232 communication ports shall be provided using the PLC CPU serial ports.

D. Programming:
1. The PLC shall use the latest version of Unity Pro, for the programming of the CPU. Contractor to provide software and deliver to Owner.
2. All the programs and licenses shall become the property of the Owner.
3. Contractor to coordinate with the SCADA division of the SAWS Production Department.

2.03 120 VAC UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Provide power conditioning during normal power operation.
1. Lightning and surge protection: Tested to ANSI/IEEE C62.41 Category A.
2. RF noise isolation: EMI/RFI suppression.
3. On-Line input range: 100-142 Vac, output 112-128 Vac.

B. Upon loss of feeder power to UPS, maintain power to the load for a minimum of 2 hrs with 4 msec transfer time.

C. Ratings:
1. Volt – Ampere Capacity: Shall be sized to run all devices in SCADA panel including the SCADA radio for 2 hours.
2. Nominal Input Voltage: 120 Vac.
3. On-Battery Output Voltage: 120 Vac +/- 10%.
4. On-Battery Frequency: 60 Hz. Stepped sine wave.
5. Ambient Operating Temperature: 0-40 degrees C.

D. Battery shall be a sealed maintenance-free lead acid type with 3-year minimum life.

E. UL Compliance: UPS shall conform to UL Standards and have an applied UL listing.

F. Manufacturer: Powerware 5115 750 USB or larger based on VA calculation as specified above.

2.04 DC POWER SUPPLY

A. 24 Vdc Control Power shall be provided by a single-output DC Power Supply.

B. Ratings:
   1. Input Voltage: 120 Vac, + 10%, -13%, 47-63 Hz.
   2. Output Voltage: 24 Vdc single output.
   3. Output Current: 3.6 amperes, overload protected.
   4. Ambient Operating Temperature: 0-40 degrees C.

C. UL Compliance: Power Supply shall conform to UL Standards and have an applied UL listing.

D. Manufacturer: POWER-ONE, Model HN24-3.6-A.

2.05 RADIO TRANSCEIVER SYSTEM

(APPLICABLE TO MISSION TRAILS SITE ONLY)

A. Contractor shall furnish and install a complete and operational radio transceiver system.
   1. A 900 MHz licensed fixed frequency microwave radio transceiver to be mounted inside the SCADA panel.
      a. Provide Microwave Data Systems package P70 NEMA 4X MDS 9710 B transceiver with power supply and interface/utility board.
         1) Primary power to the power supply shall be 120 Vac.
         2) The power supply shall contain a standard configuration 4.5 amp-hour backup battery and charger.
         3) Interface shall facilitate direct connection of the PLC.
   2. Manufacturer:
      a. Microwave Data Systems, 175 Science Parkway, Rochester, NY 14620. Phone (716) 242-9600, Fax (716) 242-9620.

B. Surge Protection
   1. Radio antenna cable connection shall have 50kA surge protector, Poly Phaser Part No. IS-50NX-C2.

C. Antenna

1. Contractor shall furnish and install a 900 MHz directional antenna to be installed on the mast as shown on the Contract Drawings. Contractor to use cable clamps and hangers by Andrew or equal suitable for use for hanging RG-8 or Heliax cable. Hose clamps and wire ties are not allowed.

2. Directional
   a. Type: 900 MHz nominal, 10dBd gain, 50 ohm, directional Yagi.
   b. Manufacturer: Kathrein Inc., Scala Division, Model TY-900.
3. Feedline:
   a. 50 feet or less: RG-8A/U Coaxial Cable.
   b. Over 50 feet: ½ inch HELIAX.

D. Antenna Mast
   1. Contractor shall furnish and install a 20 ft. high antenna mast. SEE CONTRACT DRAWING FOR DETAILS.

(APPLICABLE TO NORTHWEST SIDE CENTER SITE ONLY)

E. Contractor shall furnish and install a complete and operational radio transceiver system.
   1. A 900 MHz unlicensed frequency microwave radio transceiver is to be mounted inside the SCADA Panel.
      a. Provide Microwave Data Systems package P70 NEMA 4X TransNet 900 transceiver with power supply and interface/utility board.
         1) Primary power to the power supply shall be 120 Vac.
         2) The power supply shall contain a standard configuration 4.5 amp-hour backup battery and charger.
         3) Radio shall interface with the local TransNet telemetry at existing pump station located adjacent to the odor control station.
   2. Manufacturer:
      a. Microwave Data Systems, 175 Science Parkway, Rochester, NY 14620. Phone (716) 242-9600, Fax (716) 242-9620.

F. Surge Protection
   1. Radio antenna cable connection shall have 50kA surge protector, Poly Phaser Part No. IS-50NX-C2.
   2. Surge Protection to be mounted in SCADA panel.

G. Antenna
   1. Contractor shall furnish and install Kathrein Scala Division K7515641 Omni directional antenna.
   2. Using stainless steel mounting accessories, mount antenna to unistrut.
   3. Use flexible conduit for feedline from antenna to bottom of SCADA panel.
   4. Feedline:
      a. 50 feet or less: RG-8A/U Coaxial Cable.
      b. Over 50 feet: ½ inch HELIAX.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
   1. Supervisory Control Panel is to be secured to rack with anchor bolts of sufficient size and number for load conditions.
   2. Contractor shall install all interconnect wiring from the Supervisory Control Panel to field equipment and devices, except where the field device is future and has no provision for wiring termination.

B. Follow procedures, instructions, and check sheets provided by the manufacturers for proper installation of their equipment.

3.02 FIELD QUALITY CONTROL

A. In accordance with Section 16950, ELECTRICAL TESTING.

END OF SECTION

PLC I/O LIST - SAWS ODOR CONTROL PROJECT - PHASE II						
Parameter	**Digital Input**	**Analog Input**	**Analog Output**	**Rack**	**Slot**	**PCC Telemetry**
Odor Control Tank Level						
Tank Level				1	1	A-out
Injection Pump Monitoring and Control						
Pump No. 1 Speed Indication				1	1	A-out
Pump No. 2 Speed Indication				1	1	A-out
Standby Pump Speed Indication				1	1	A-out
Pump No. 1 Speed Set				1	3	A-in
Pump No. 2 Speed Set				1	3	A-in
Standby Pump Speed Set				1	3	A-in
Pump No. 1 Run Status				1	2	out
Pump No. 2 Run Status				1	2	out
Standby Pump Run Status				1	2	out
General						
PLC Alarm (Internal)						out
Loss of 120V source from UPS				1	2	out
Communication Failure Alarm (Internal)						out
SCADA Panel Temperature				1	1	A-out

THIS SHEET INTENTIONALLY LEFT BLANK.

GRUBB ENGINEERING, INC.

ELECTRICAL POWER SYSTEMS
DESIGN AND TESTING

Radio Path Survey Report
REVISED AS OF 07-07-09
Mission Odor Control
SCADA Link

Grubb Engineering INC.
7901 Challenger Dr
San Antonio, Tx 78235
(210) 658-7250
www.grubbengineering.com
July 7, 2009

A radio path survey report is vital when constructing a wireless telecommunication system. A clear line of sight does not guarantee a dependable communication link. Radio attenuation can result from a variety of issues such as, free-space loss, refraction, reflection, diffraction, and absorption. Radio path survey reports ensure that a communication link can be established over a given area. There are two procedures for generating a radio path survey report. The first method involves using software to predict path attenuation with the use of a topographical map. The results of the software-based study do not reflect signal attenuation caused by clutter, absorption and atmospheric loss. This is why a second method is required. The second method involves physically measuring signal strength between the two designated points. A physical study entails implementing a MDS 9710 radio with a Yagi antenna to establish a link with the base or repeater site. Values are then documented at different heights to confirm the results of the computer-based study.

Because of the scope of this project, only the software-based study has been performed. The physical study is to be done at a later date by SAWS.

The results of the radio path survey for Mission are as follows:

Hildebrand Station with Coordinates [29º 28' 0.60" N, 98º 28' 50.70" W]

(Hildebrand has an elevation of 806ft and an antenna height of 125ft)

Mission Odor Control with Coordinates [29º 22' 49.67" N, 98º 29' 23.70" W]

(Mission has an elevation of 580ft)

The table below illustrates the results of the Mission to Hildebrand link

Software-based study Elevation	587ft
At a mast height of 5 ft	-67 dB
At a mast height of 10 ft	-71 dB
At a mast height of 20 ft	-64 dB

Appendix A shows the path profile and result of the software-based study.

It is shown on the path profile that a link from Mission Odor Control site to the Hildebrand site has a clear line of sight. The fluctuation from that of a mast at 5ft versus a mast at 10ft can be attributed from deflection caused by the ridge located about a mile away from Mission Odor Control site. Grubb Engineering recommends a minimum antenna height of 20ft to avoid any unforeseen signal attenuation that may be encountered from buildings, foliage and any other obstructions.

Appendix A

Note: Profile generated does not account for clutter and atmospheric absorption loss.

Mission to Hildebrand Worksheet
With a Mission antenna height of 5ft:

	Mission OC	Hildebrand
Elevation (ft)	587.27	800.52
Latitude	29 22 49.67 N	29 28 00.60 N
Longitude	098 29 23.70 W	098 28 51.70 W
True azimuth (°)	5.15	185.15
Vertical angle (°)	0.57	-0.64
Antenna model	Yagi TY-900	Omni
Antenna height (ft)	5.00	125.00
Antenna gain (dBi)	10.00	9.15
(dBd)	7.85	7.00
TX line type	5/8 Heliax	5/8 Heliax
TX line length (ft)	75.00	200.00
TX line unit loss (dB /100 ft)	3.38	3.38
TX line loss (dB)	2.54	6.76
Frequency (MHz)	915.00	
Polarization	Vertical	
Path length (mi)	5.97	
Free space loss (dB)	111.35	
Diffraction loss (dB)	2.05	
Net path loss (dB)	103.55	103.55
Radio model	MDS 9710B	MDS 9710B
TX power (watts)	5.00	5.00
(dBm)	36.99	36.99
Effective Radiated Power (Watts)	17.00	5.28
(dBm)	42.30	37.23
RX Sensitivity Criteria	-110	-110
RX Sensitivity (µv)	0.71	0.71
(dBm)	-110.00	-110.00
RX Signal (µv)	105.08	105.08
(dBm)	-66.56	-66.56
RX Field Strength (µv/m)	1324.71	2376.14
Fade Margin (dB)	43.44	43.44
Rayleigh Fade Probability (%)	4.53E-03	4.53E-03
Log Normal Fade Probability (%)	0.01	0.01

Figure A-1

Path Profile from Mission to Hildebrand
With a Mission antenna height of 5ft:

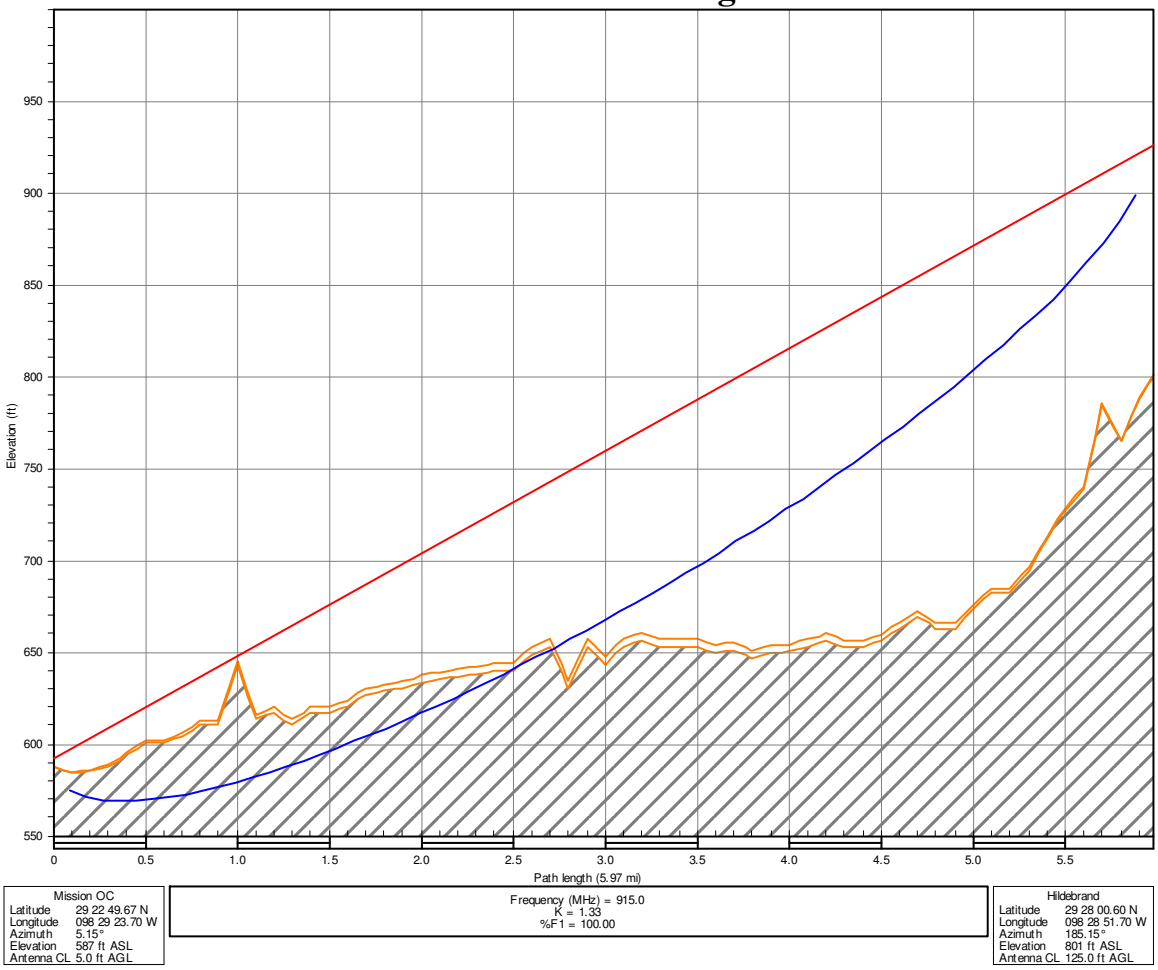


Figure A-2
Red line indicates the direct line of sight
Blue line indicates the 1st Fresnel zone at 100% effect

Note: Profile generated does not account for clutter and atmospheric absorption loss.

Mission to Hildebrand Worksheet
With a Mission antenna height of 10ft:

	Mission OC	Hildebrand
Elevation (ft)	587.27	800.52
Latitude	29 22 49.67 N	29 28 00.60 N
Longitude	098 29 23.70 W	098 28 51.70 W
True azimuth (°)	5.15	185.15
Vertical angle (°)	0.56	-0.63
Antenna model	Yagi TY-900	Omni
Antenna height (ft)	10.00	125.00
Antenna gain (dBi)	10.00	9.15
(dBd)	7.85	7.00
TX line type	5/8 Heliax	5/8 Heliax
TX line length (ft)	75.00	200.00
TX line unit loss (dB /100 ft)	3.38	3.38
TX line loss (dB)	2.54	6.76
Frequency (MHz)	915.00	
Polarization	Vertical	
Path length (mi)	5.97	
Free space loss (dB)	111.35	
Diffraction loss (dB)	6.84	
Net path loss (dB)	108.34	108.34
Radio model	MDS 9710B	MDS 9710B
TX power (watts)	5.00	5.00
(dBm)	36.99	36.99
Effective Radiated Power (Watts)	17.00	5.28
(dBm)	42.30	37.23
RX Sensitivity Criteria	-110	-110
RX Sensitivity (µv)	0.71	0.71
(dBm)	-110.00	-110.00
RX Signal (µv)	60.52	60.52
(dBm)	-71.35	-71.35
RX Field Strength (µv/m)	763.03	1368.65
Fade Margin (dB)	38.65	38.65
Rayleigh Fade Probability (%)	0.01	0.01
Log Normal Fade Probability (%)	0.06	0.06

Figure A-3

Path Profile from Mission to Hildebrand
With a Mission antenna height of 10ft:

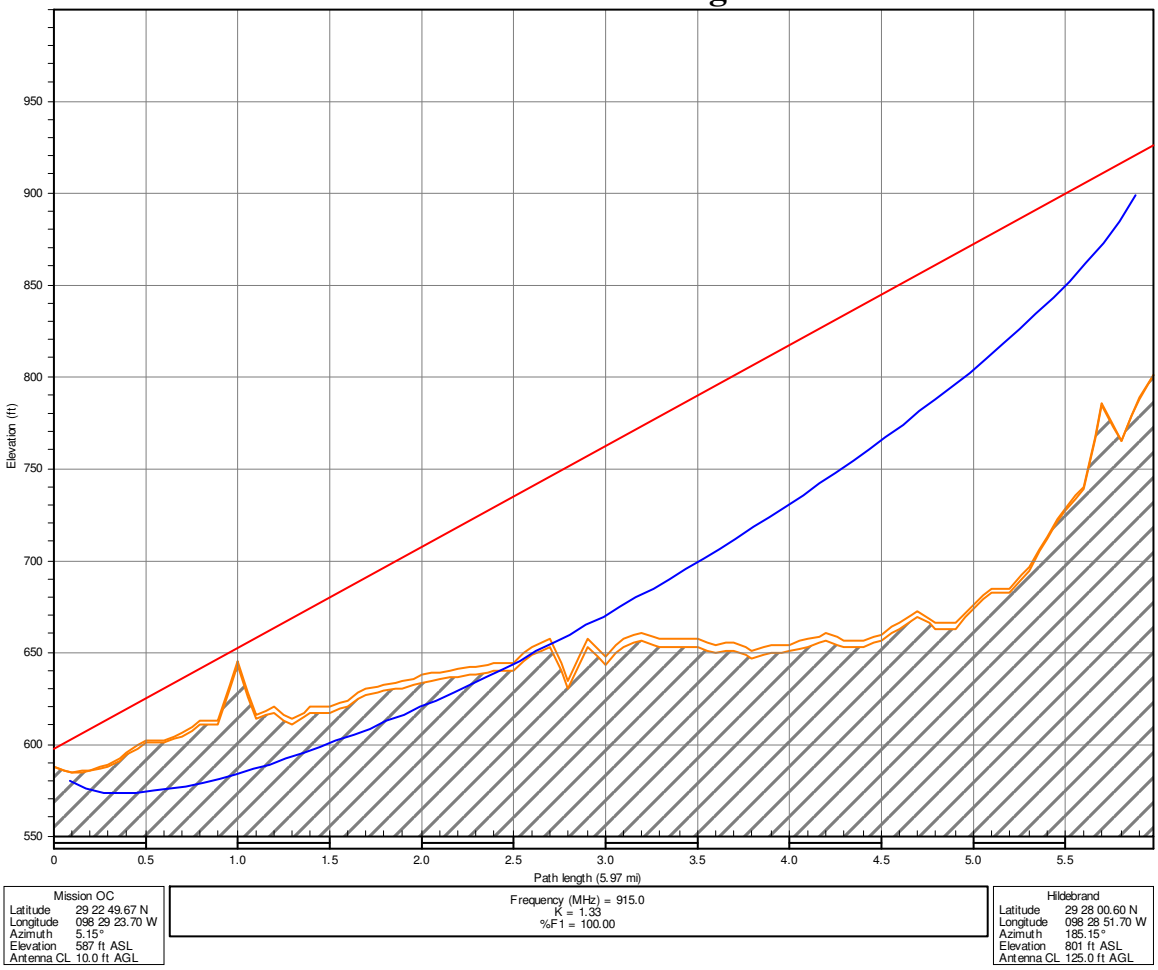


Figure A-4
Red line indicates the direct line of sight
Blue line indicates the 1st Fresnel zone at 100% effect

Note: Profile generated does not account for clutter and atmospheric absorption loss.

Mission to Hildebrand Worksheet
With a Mission antenna height of 20ft:

	Mission OC	Hildebrand
Elevation (ft)	587.27	800.52
Latitude	29 22 49.67 N	29 28 00.60 N
Longitude	098 29 23.70 W	098 28 51.70 W
True azimuth (°)	5.15	185.15
Vertical angle (°)	0.55	-0.61
Antenna model	Yagi TY-900	Omni
Antenna height (ft)	20.00	125.00
Antenna gain (dBi)	10.00	9.15
(dBd)	7.85	7.00
TX line type	5/8 Heliax	5/8 Heliax
TX line length (ft)	75.00	200.00
TX line unit loss (dB /100 ft)	3.38	3.38
TX line loss (dB)	2.54	6.76
Frequency (MHz)	915.00	
Polarization	Vertical	
Path length (mi)	5.97	
Free space loss (dB)	111.35	
Net path loss (dB)	101.50	101.50
Radio model	MDS 9710B	MDS 9710B
TX power (watts)	5.00	5.00
(dBm)	36.99	36.99
Effective Radiated Power (Watts)	17.00	5.28
(dBm)	42.30	37.23
RX Sensitivity Criteria	-110	-110
RX Sensitivity (µv)	0.71	0.71
(dBm)	-110.00	-110.00
RX Signal (µv)	133.08	133.08
(dBm)	-64.51	-64.51
RX Field Strength (µv/m)	1677.75	3009.38
Fade Margin (dB)	45.49	45.49
Rayleigh Fade Probability (%)	2.82E-03	2.82E-03
Log Normal Fade Probability (%)	7.50E-03	7.50E-03

Figure A-5

Path Profile from Mission to Hildebrand
With a Mission antenna height of 20ft:

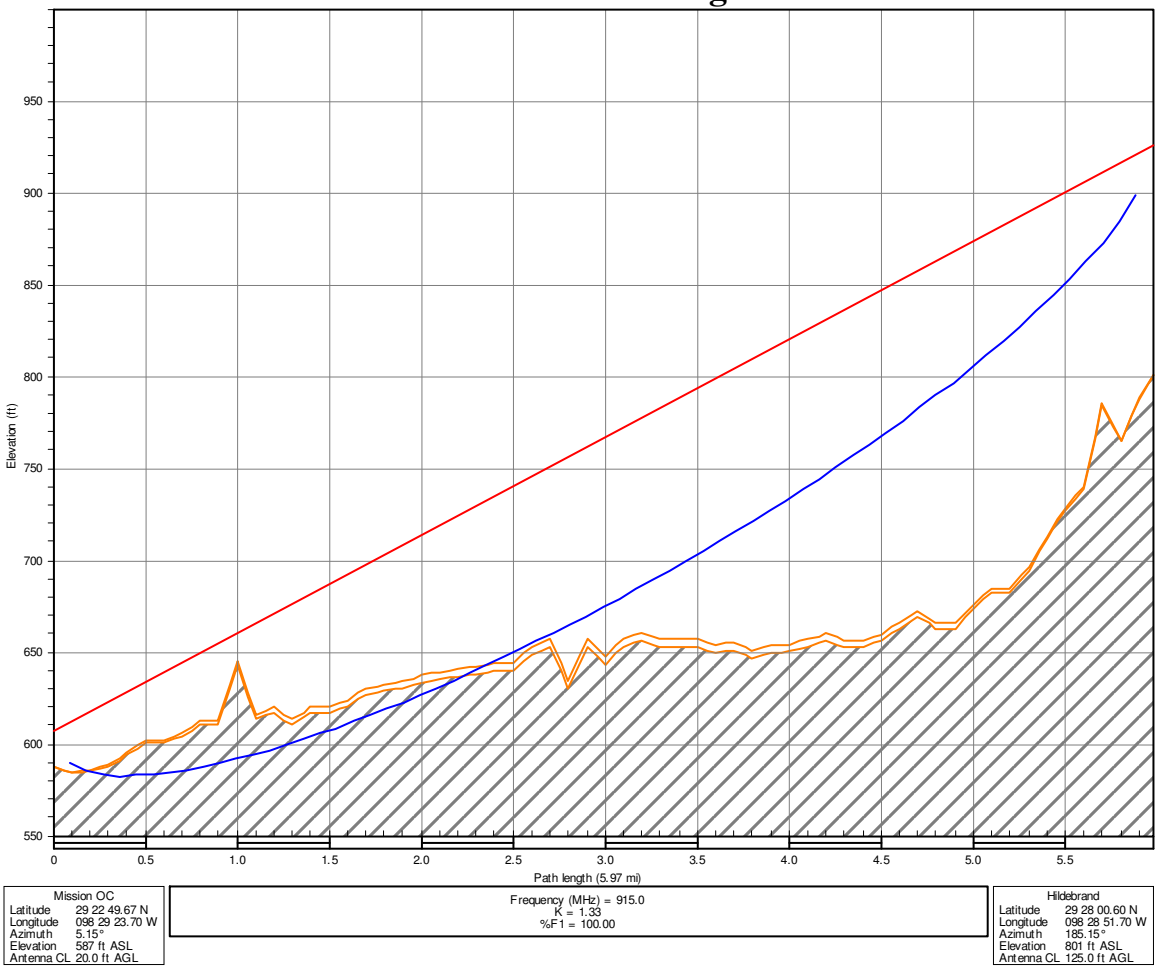


Figure A-6
Red line indicates the direct line of sight
Blue line indicates the 1st Fresnel zone at 100% effect

SECTION 16930
INSTRUMENTATION

PART 1 GENERAL

1.01 SCOPE

A. Contractor shall furnish, install, calibrate and test instrumentation for monitoring and control, for the following lift station process functions:
   1. Level Controller

1.02 SUBMITTALS

A. Shop Drawings:
   1. Bill of Materials
   2. Catalog Cuts
   3. Component Data Sheets
   4. Panel Construction Drawings, including wiring and component layout
   5. List of Labels and Tags

PART 2 PRODUCTS

2.01 GENERAL

A. All devices shall be Factory Mutual (FM) approved.
   1. Explosion Proof for Class I division 1 group B, C, and D..
   2. Dust-Ignition Proof for Class II and Class III, division 1, group E, F and G.
   3. Suitable for Indoor and Outdoor Hazardous locations.
   4. Factory Sealed.

B. Hardware:
   1. All hardware used for outdoor instrument mounting shall be 316 Stainless Steel.

2.02 LEVEL CONTROLLER

A. Level monitoring controller:
   1. Local and remote indication
   2. Non-contacting level instrument
   3. Outdoor application
      a. NEMA 4X enclosed (Level controller shall be housed in SCADA panel.)

B. Ratings:
   1. Relays: 4 Form A, 5 Amp, 250 Vac and 2 Form C, 5 Amp, 250 Vac
   2. Power Supply: 110-120 Vac
   3. Ambient Temperature: -5 to 122° F
   4. Outputs: (2) 4-20 mA

5. Inputs: (1) analog, (2) digital
6. Transducer: Ultrasonic Type, Echomax XPS-15F
    a. Range: 1-50ft.
    b. Frequency: 44kHz
    c. Beam angle: 6°
    d. Mounting: 304 stainless steel
        1) Blind flange on 8” pipe size tank nozzle. Contractor is responsible for all aspects of coordination with tank fabricator.

C. Manufacturer:
1. Siemens Milltronics HydroRanger 200

PART 3 EXECUTION

3.01 LEVEL CONTROLLER AND TRANSDUCER

A. Transducer must be mounted so that the axis of transmission is perpendicular to the liquid surface, and free of obstructions. Contractor to coordinate location with manufacturer.

B. Location to be approved by Owner.

C. Install transducer in accordance with manufacturer’s instructions and recommendations.

D. Controller shall be installed in a control panel as shown on Contract Drawings and in accordance with Section 16050, Paragraph 2.09.

E. Programming and set up of the controller shall be done following manufacturer’s recommendation and instruction.
1. The Owner will determine the elevations that will activate the relays.
2. If tank height exceeds the capability of the transducer, the controller shall be programmed to avoid misoperation beyond transducer range.

3.02 CONDUIT AND IDENTIFICATION

A. When the use of flexible conduit is required, a minimum of 18” shall be provided but the flexible conduit shall not exceed 36”.

B. All Instrumentation runs shall be the full length of the conduit. No splices will be allowed.

C. The following nomenclature shall be used for identification:
1. tag # (0-10) for instrumentation info: tags, devices type and termination point
2. jb# (0-10) for junction box, power panel lighting panel and termination point
3. r# (0-10) for rack location and termination point
4. s# (0-10) for slot location and termination point

5. p# (0-10) for point location and termination point

3.03 TESTING

A. Full testing (loop check) shall be done on all instrumentation and all SCADA I/O points and will be witnessed by the Owner.

B. A calibration sheet shall be supplied for all the instruments and at the time of any instrument test.
   1. Analog device calibration sheet shall include the following:
      a. Time of calibration
      b. Date of calibration
      c. Name of the person performing the calibration
      d. Name of the witness, Owner
      e. Test equipment used and their calibration dates
      f. Device identification S/N, device name and tag number
      g. As found voltage reading
      h. As left voltage reading
      i. As found milliamp reading @ 0%, 50% and 100%
      j. As left milliamp reading @ 0%, 50% and 100%
      k. Calibration ranges
      l. I/O points
   2. I/O point data sheet for each I/O analog and discrete through SCADA
      a. Field point location
      b. Analog or Discrete
      c. Software point location
      d. Point function
      e. Time of verification
      f. Date of verification
      g. Name of the person verifying the point
      h. Name of the witness, Owner

END OF SECTION

THIS SHEET INTENTIONALLY LEFT BLANK.

SECTION 16950
ELECTRICAL TESTING

PART 1 GENERAL

1.01 SCOPE

A. Contractor will provide, and pay the cost of, electrical testing by an independent testing firm. This cost shall be included in the Contract Bid.

B. The Contractor shall immediately correct all deficiencies discovered during testing by the independent firm.

1.02 REFERENCES

A. International Electrical Testing Association – Acceptance Testing Specifications (NETA-ATS), current version.

B. Related equipment specifications in all sections of Division 16.

1.03 SUBMITTALS

A. Administrative Submittals: Submit 30 days prior to performing inspections or tests:
   1. Schedule for performing inspection and tests.
   2. List references to be used for each test.
   3. Sample copy of equipment and materials inspection form(s).
   4. Sample copy of individual device test form.
   5. Sample copy of individual system test form.

B. Quality Control Submittals: Submit within 15 days after completion of test:
   1. Test or inspection reports and certificates for each electrical item tested.

C. Contract Closeout Submittals:
   1. Operation and Maintenance Data:
      a. After test or inspection reports and certificates have been reviewed by OWNER and returned, insert a copy of each in operation and maintenance manual.

1.04 QUALITY ASSURANCE

A. Testing Firm Qualifications:
   1. Corporately and financially independent organization functioning as an unbiased authority, for a minimum of 5 years.
   2. Professionally independent of manufacturers, suppliers, and installers of electrical equipment and systems being tested.
   3. Employer of engineers and technicians regularly engaged in testing and

inspecting electrical equipment, installations, and systems.

4. Supervising technician having a minimum of 5 years testing experience on similar projects.
5. Full-time employed Registered Professional Engineer to provide comprehensive project report outlining services performed, results of such services, recommendations, actions taken, and opinions.

B. Test equipment shall have an operating accuracy equal to, or greater than, requirements established at NETA-ATS.

C. Test instrument calibration shall be in accordance with NETA-ATS.

1.05 SEQUENCE AND SCHEDULING

A. Perform inspection and electrical tests after equipment has been installed.

B. Perform tests with apparatus de-energized whenever feasible.

C. Inspection and electrical tests on energized equipment are to be:
   1. Scheduled with OWNER prior to de-energization.
   2. Minimized to avoid extended period of interruption to the operating plant equipment.

D. Notify OWNER at least 24 hours prior to performing tests on energized electrical equipment.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. Tests specified in this section are to be performed in accordance with the requirements of Section 01651, FACILITY STARTUP.

B. Tests and inspection shall establish that:

   1. Electrical equipment is operational within industry and manufacturer's tolerances.
   2. Installation operates properly.
   3. Equipment is suitable for energization.
   4. Installation conforms to requirements of Contract Documents and NFPA 70, NFPA 70E, and ANSI C2.

C. Perform inspection and testing in accordance with NETA-ATS, industry standards, and manufacturer's recommendations.

D. Set, test, and calibrate protective relays, circuit breakers, and other applicable devices in accordance with standard values established by a short circuit and coordination study provided by CONTRACTOR.

E. Adjust mechanisms and moving parts for free mechanical movement.

F. Adjust adjustable relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

G. Verify nameplate data for conformance to Contract Documents.

H. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench to manufacturer's recommendations, or as otherwise specified.

I. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.

J. Provide proper lubrication of applicable moving parts.

K. Inform OWNER of working clearances not in accordance with NFPA 70.

3.02 LOW VOLTAGE CABLES, 600 VOLTS MAXIMUM

A. Visual and Mechanical Inspection:
   1. Inspect Each Individual Exposed Power Cable No. 4 and Larger for:
      a. Physical damage.
      b. Proper connections in accordance with single-line diagram.
      c. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.
      d. Color-coding conformance with specifications.
      e. Proper circuit identification.
   2. Mechanical Connections For:
      a. Proper lug type for conductor material.
      b. Proper lug installation.
      c. Bolt torque level in accordance with NETA-ATS, Table 100.12, unless otherwise specified by manufacturer.
   3. Shielded Instrumentation Cables For:
      a. Proper shield grounding.
      b. Proper terminations.
      c. Proper circuit identification.
   4. Control Cables For:
      a. Proper termination.
      b. Proper circuit identification.
   5. Cables Terminated Through Window Type CTs: Verify that neutrals and grounds are terminated for correct operation of protective devices.

3.03 SAFETY SWITCHES, 600 VOLTS MAXIMUM

A. Visual and Mechanical Inspection:
   1. Proper blade pressure and alignment.
   2. Proper operation of switch operating handle.
   3. Adequate mechanical support for each fuse.
   4. Proper contact-to-contact tightness between fuse clip and fuse.
   5. Cable connection bolt torque level in accordance with NETA-ATS, Table 100.12.
   6. Proper phase barrier material and installation.
   7. Verify that fuse sizes and types correspond to one-line diagram.
   8. Perform mechanical operational test and verify mechanical interlocking system operation and sequencing.

B. Electrical Tests:
   1. Insulation Resistance Tests:
      a. Applied megohmmeter dc voltage in accordance with NETA-ATS, Table 100.1.
      b. Phase-to-phase and phase-to-ground for 1 minute on each pole.
      c. Insulation resistance values equal to, or greater than, ohmic values established by manufacturer.
   2. Contact Resistance Tests:
      a. Contact resistance in microhms across each switch blade and fuse holder.
      b. Investigate deviation of 50 percent or more from adjacent poles or similar switches.

3.04 GROUNDING SYSTEMS

A. Visual and Mechanical Inspection:
   1. Accessible connections to grounding electrodes for proper fit and tightness.
   2. Accessible exothermic-weld grounding connections to verify that molds were fully filled and proper bonding was obtained.

B. Electrical Tests:
   1. Fall-Of-Potential Test:
      a. In accordance with IEEE 81, Section 8.2.1.5 for measurement of main ground system’s resistance.
      b. Main ground electrode system resistance to ground to be no greater than 5 ohms when disconnected from the utility company ground system.

END OF SECTION

SHEET INDEX

PART I - LIFT STATIONS REHABILITATION DESIGN - PHASE 3

PART II - ODOR CONTROL SYSTEMS IMPROVEMENTS PHASE II

San Antonio Water System

LIFT STATIONS REHABILITATION DESIGN-PHASE 3

SAWS JOB NO. 08-2504
SOLICITATION NO. B-12-015-MF

OWNER:
SAN ANTONIO WATER SYSTEM
2800 U.S. HWY 281 NORTH
SAN ANTONIO, TX 78212

MAILING ADDRESS:
P.O. BOX 2449
SAN ANTONIO, TX 78298

CONTACT:
JEFF A. RAY, GRADUATE ENGINEER II
TREATMENT AND RECYCLE ENGINEERING
SAN ANTONIO WATER SYSTEM (SAWS)
2800 U.S. HWY 281 NORTH
TOWER 2, 457A
P.O. BOX 2449
SAN ANTONIO, TX 78212
PHONE (210) 233-3088
FAX: (210) 233-4108

SUBMITTAL PREPARED BY:

WESTON SOLUTIONS®
TEXAS REGISTERED ENGINEERING FIRM F-3123

70 N.E. LOOP 410, SUITE 600
SAN ANTONIO, TX 78216-5842

CONTACT:
ABDEL - QADER HAMED, P.E.
PHONE: (210) 308-4300
FAX: (210) 308-4329
abdel.hamed@westonsolutions.com

STATE OF TEXAS
ABDEL-QADER J. HAMED
94279
LICENSED PROFESSIONAL ENGINEER

05/17/2012

ENGINEER OF RECORD ABDEL - QADER HAMED, P.E. (TX PE # 94279)
PART I - LIFT STATIONS REHABILITATION DESIGN - PHASE 3

SHEET NUMBER G-1

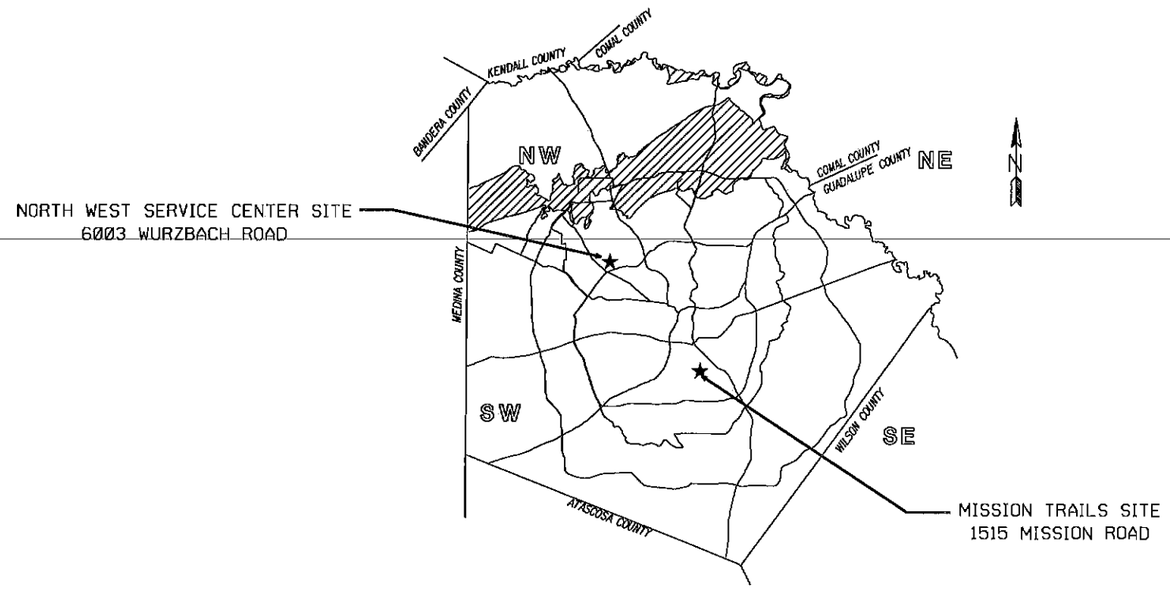
PLANS FOR
WATER WORKS CONSTRUCTION

JOB NO.**08-2504**

SOLICITATION No: **B-12-015-MF**

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II



SITE DIAGRAM

STATE OF TEXAS
ILKNUR E. DRZYMALA
95657
LICENSED
PROFESSIONAL ENGINEER
05/14/2012

GENERAL NOTES:

1. THE LOCATION AND DEPTHS OF EXISTING UTILITIES, INCLUDING SERVICE LATERALS, SHOWN ON THE PLANS ARE APPROXIMATE ONLY. ACTUAL LOCATIONS AND DEPTHS MUST BE FIELD VERIFIED BY THE CONTRACTOR 48 HOURS PRIOR TO CONSTRUCTION, AND IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO LOCATE UTILITY SERVICE LINES REQUIRED FOR CONSTRUCTION AND TO PROTECT THEM DURING CONSTRUCTION.

SAN ANTONIO WATER SYSTEM (SAWS)	233-2010
COSA DRAINAGE	207-2800
CITY SIDEWALK AND TRENCHING DIVISION	821-3240
COSA TRAFFIC SIGNAL OPERATIONS	207-7765
TEXAS STATE WIDE ONE CALL LOCATOR	1-800-545-6005
CITY PUBLIC SERVICE	"
SOUTHWESTERN BELL	"
TIME WARNER	"
VALERO ENERGY CO.	"
BEXAR METROPOLITAN WATER DISTRICT	354-6536

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING TO ITS ORIGINAL OR BETTER CONDITION FROM DAMAGES DONE TO EXISTING FENCES, CURBS, STREETS, DRIVEWAYS, SIDEWALKS, LANDSCAPING AND STRUCTURES.

3. THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAN ONE INCH IN DIAMETER WHEN EXCAVATING NEAR EXISTING TREES. EXCAVATION IN VICINITY OF TREES SHALL PROCEED WITH CAUTION. THE CONTRACTOR SHALL CONTACT THE CITY ARBORIST AT 207-8053 FOR GUIDELINES. SAWS CONSTRUCTION INSPECTOR SHOULD ALSO BE NOTIFIED.

4. THE CONTRACTOR SHALL NOT PLACE ANY WASTE MATERIALS IN THE 100 YEAR FLOOD PLAIN WITHOUT FIRST OBTAINING AN APPROVED FLOOD PLAIN PERMIT.

5. NO EXTRA-PAYMENT SHALL BE ALLOWED FOR WORK CALLED FOR ON THE PLANS AND SPECS. BUT NOT INCLUDED ON THE BID SCHEDULE. THIS INCIDENTAL WORK WILL BE REQUIRED, AND SHALL BE INCLUDED UNDER THE PAY ITEM TO WHICH IT RELATES.

6. CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITE WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES. THE CONTRACTOR'S IMPLEMENTATION OF THE SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLIES WITH AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATION, SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATIONS.

7. WORK COMPLETED BY THE CONTRACTOR WHICH HAS NOT RECEIVED A WORK ORDER OR THE NOTICE TO PROCEED FROM THE SAWS CONSTRUCTION INSPECTION DIVISION WILL BE SUBJECT TO REMOVAL AND REPLACEMENT BY, AND AT THE EXPENSE OF THE CONTRACTOR.

8. THE CONTRACTOR WILL KEEP THE AREA ON TOP OF AND AROUND THE WATER METER BOX FREE OF ALL OBJECTS AND DEBRIS.

9. ALL TRENCHING AND BACKFILLING SHOULD BE DONE IN ACCORDANCE WITH SAWS SPECIFICATION NO. 804 "EXCAVATION, TRENCHING AND BACKFILLING," AND PAVED STREETS SHOULD BE COVERED WITH A TEMPORARY ALL WEATHER SURFACE AT THE END OF EACH WORK DAY.

10. NORMAL OPERATIONS OF ODOR CONTROL SITES CANNOT BE INTERRUPTED DURING CONSTRUCTION.

11. ADEQUATE DRAINAGE SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION AND ANY DRAINAGE DITCH OR STRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THE SATISFACTION OF THE OWNING AUTHORITY. ALL CONSTRUCTION STORM RUNOFF SHALL COMPLY WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) REQUIREMENTS.

12. IF EXISTING FIBER OPTIC CONDUIT SYSTEMS ARE LOCATED DURING EXCAVATION, A FIBER OPTIC COMPANY REPRESENTATIVE IS REQUIRED TO BE ON SITE. THE CONTRACTOR MUST PROVIDE SUITABLE SUPPORT AND/ OR PROTECTION FOR THE CONDUIT AT ALL TIMES. DURING BACKFILLING, THE FIBER OPTIC REPRESENTATIVE MAY PLACE UNDERGROUND MARKING DEVICES AS REQUIRED. REPAIR OF ANY DAMAGES TO THE CONDUIT SYSTEM AND ASSOCIATED FACILITIES SHALL BE MADE BY THE FIBER OPTIC COMPANY PERSONNEL AND THE CONTRACTOR SHALL REIMBURSE THEM FOR ALL COSTS OF SUCH REPAIRS, IF REQUIRED. THE CONTRACTOR SHALL CONTACT THE FIBER OPTIC COMPANY 48 HOURS PRIOR TO THE START OF EXCAVATION. LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE AND NOT GUARANTEED TO BE ACCURATE.

13. CONTRACTOR SHALL ASSURE THAT ALL CONSTRUCTION PERMITS HAVE BEEN OBTAINED PRIOR TO COMMENCEMENT OF WORK. REQUIRED PERMITS THAT CAN BE ISSUED TO CONTRACTOR WILL BE OBTAINED BY SAWS. NO SEPARATE PAY ITEM.

14. CONTRACTOR SHALL PROVIDE ELECTRICAL POWER FOR PROPOSED WORK. SAWS ON-SITE POWER SHALL NOT BE USED BY THE CONTRACTOR.

15. CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING PUBLIC OR PRIVATE UTILITY LINES TO REMAIN, INCLUDING BUT NOT LIMITED TO WATER LINES, WASTEWATER COLLECTION SYSTEMS AND STORM SEWERS. DURING CONSTRUCTION, ALL DAMAGES SHALL BE REPAIRED IN ACCORDANCE WITH THE OWNING AUTHORITIES' STANDARDS. NO SEPARATE PAY ITEM. ALTERNATE ALIGNMENTS CAN BE PROPOSED TO THE SAWS ENGINEER.

16. TEXAS LAW SECTION 752, HEALTH & SAFETY CODE, FORBIDS ALL ACTIVITIES IN WHICH PERSONS OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES. FEDERAL REGULATION, TITLE 29 PART 1910.180 (I) AND PART 1926.440 (A) (15) REQUIRE A MINIMUM CLEARANCE OF 10 FEET FROM THESE FACILITIES. PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THESE LAWS. THESE LAWS CARRY BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE DE-ENERGIZED OR MOVED, CALL (713) 223-4567. NO SEPARATE PAY ITEM.

17. CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING STREETS ADJACENT TO THE PROJECT FREE OF MUD AND DEBRIS FROM CONSTRUCTION AT ALL TIMES.

18. ALL MATERIAL AND CONSTRUCTION PROCEDURES WITHIN THE SCOPE OF THIS CONTRACT SHALL BE APPROVED BY SAWS AND COMPLY WITH THE FOLLOWING, AS APPLICABLE:

A. CURRENT TEXAS COMMISSION ON ENVIRONMENTAL QUALITY DESIGN CRITERIA FOR PUBLIC DRINKING WATER (30 TAC, CHAPTER 290.44 & 30 TAC 290.46).
B. CURRENT TEXAS COMMISSION ON ENVIRONMENTAL QUALITY DESIGN CRITERIA OUALITY DESIGN CRITERIA FOR SEWERAGE SYSTEMS (31 TAC 217.1, 31 TAC 217.2, 31 TAC 217.3 AND 31 TAC 217.13 AND 213).
C. CURRENT TXDOT "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS STREETS, AND DRAINAGE."
D. CURRENT SAWS "STANDARD SPECIFICATIONS FOR CONSTRUCTION."
E. CURRENT COSA "STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION."
F. THE LAWS OF THE STATE OF TEXAS, AND OSHA STANDARDS.

19. CONTRACTOR TO CONTACT 48 HOURS PRIOR TO STARTING CONSTRUCTION, SAWS CONSTRUCTION INSPECTOR FOR THE PROJECT.

20. CONTRACTOR TO CONTACT 48 HOURS PRIOR TO STARTING CONSTUCTION, PRODUCTION MAINTENANCE DIVISION, DAVID DAVILA, (210) 233-3358.

21. LOCATIONS OF PROPOSED EYEWASH STATIONS AT EACH SITE ARE FOR ILLUSTRATION ONLY. THE ACTUAL LOCATIONS TO BE DETERMINED AFTER INSTALLATION OF THE CHEMICAL TANK PIPING PUMP STAND AND PUMPS. CONTRACTOR WILL COORDINATE WITH PENCCO, INC. ON SITE AND MAKE NECESSARY CHANGES IN COORDINATION WITH THE SAWS CONSTRUCTION INSPECTOR.

22. CONTRACTOR TO PROVIDE A GUARD FROM U.S. SECURITY ASSOCIATION TO BE ON-SITE WHILE HE IS WORKING AT NORTH WEST SERVICE CENTER SITE.

23. CONTRACTOR TO INCLUDE NORTH WEST SERVICE CENTER ODOR CONTROL SITE IN THE FIRST LIFT STATION GROUP. MISSION TRAILS ODOR CONTROL SITE SHALL BE INCLUDED IN THE SECOND GROUP.

24. PART II PLANS AND SPECIFICATIONS WILL APPLY TO ODOR CONTROL STATION SITES ONLY.

STREET OVERLAY NOTES

1. PRIOR TO THE APPLICATION OF OVERLAY, ALL MANHOLES SHALL BE ADJUSTED SO THAT THE RING AND COVERS ARE FLUSH WITH THE FINISHED GRADE OF THE NEW PAVEMENT. DUE TO OCCASIONAL VARYING DEPTHS OF NEW PAVEMENT PLACEMENT, REPEATED ADJUSTMENTS MAY BECOME NECESSARY TO MATCH THE FINISHED GRADE. N. S. P. I.

2. WHERE THE STREET IS CURBED, CONTRACTOR SHALL RESURFACE ENTIRE REACH IN LENGTH, FOR THE FULL WIDTH OF ROADWAY, FROM CURB TO CURB, WITH HOT MIX HOT LAID, ASPHALTIC CONCRETE, TYPE "D". WEDGE MILL GUTTER LANES ONLY. 1 1/2" TO 0"; STANDARD WIDTH OF A COLD PLANE MILLING MACHINE MINIMUM, 7 WIDE. APPLY A MINIMUM OF 1 1/2" THICKNESS OF HOT MIX HOT LAID ASPHALTIC CONCRETE, BY MEANS OF HEATED SCREED PAVER ONLY. DRAG BOX OR NON-HEATED SCREED PAVER(S) SHALL NOT BE USED AND OF HEATED SCREED PAVER ONLY. DRAG BOX OR NON-HEATED SCREED PAVER(S) SHALL NOT BE USED.

3. WHERE CURBS ARE NOT PRESENT, CONTRACTOR SHALL RESURFACE ENTIRE REACH IN LENGTH, ENTIRE WIDTH OF ROAD WAY, FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT, WITH HOT MIX HOT LAID, ALAID ASPHALTIC CONCRETE, BY MEANS OF HEATED SCREED PAVER ONLY. DRAG BOX OR NON-HEATED SCREED PAVER(S) SHALL NOT BE USED.

4. RING RISERS SHALL NOT BE USED FOR VALVE BOX ADJUSTMENT.

5. ADJUST EXISTING VALVE BOXES TO NEW PAVING GRADE. REPLACE MISSING OR DAMAGED VALVE BOXES AND COVERS. N. S. P. I.

6. EXISTING APPROACHES AND GRATE INLETS WILL BE MILLED.

7. MEET EXISTING CURB AND GUTTER FOR GRADE AND ALIGNMENT.

B. CONTRACTOR IS RESPONSIBLE TO POT HOLE ALL EXISTING UTILITIES PRIOR TO ANY EXCAVATION TO AVOID CONFLICTS AND DELAYS DURING CONSTRUCTION. N. S. P. I.

9. FOR UTILITY ADJUSTMENTS WHICH ARE TO BE PERFORMED BY OTHERS, MINIMUM OF 7 DAYS NOTICE SHALL BE GIVEN BY THE CONTRACTOR TO THE CONCERNED UTILITIES PRIOR TO ASPHALT OVERLAY FOR NECESSARY ADJUSTMENTS TO BE MADE.

10. IT IS THE INTENT THAT HOT ASPHALTIC PAVEMENT, TYPE "D" SHALL BE APPLIED AT A RATE OF 220 LBS./SY FOR OVERLAYING PURPOSES.

11. OVERLAYING OF STREET SURFACES MAY COMMENCE THE FOLLOWING DAY AFTER WHICH AN ACCEPTABLE APPLICATION OF SEAL COAT HAS BEEN APPLIED AS DETERMINED BY THE ENGINEER AND APPROVED BY PUBLIC WORKS INSPECTOR.

INDEX OF DRAWINGS

STATE OF TEXAS
ILKNUR E. DRZYMALA
95657
LICENSED
PROFESSIONAL ENGINEER
05/14/2012

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN PHASE 3

INFORMATION

Date:
Drawn by: Cris Martinez
Designed by:
Checked by:
Scale:
Aprroved by:
Map No:

San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

GENERAL NOTES, INDEX OF DRAWINGS
STREET OVERLAY NOTES

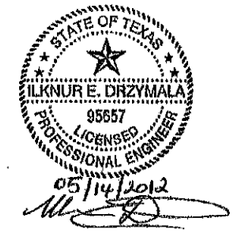
DRAWING NO.

ABBREVIATIONS

@	AT
BF	BLIND FLANGE,
BV	BUTTERFLY VALVE
BLDG	BUILDING
BLK	BLOCK
BM	BENCHMARK
BOT	BOTTOM
BS	BOTH SIDES
C TO C	CENTER TO CENTER
CFM	CUBIC FEET PER MINUTE
CHKD	CHECKERED
CI	CAST IRON
CO	CLEAN OUT, COMPANY
CONC	CONCRETE
CP	CHEMICAL PUMP
CRS	COURSES, (ING)
CV	CHECK VALVE
CW	COLD WATER
D	DOOR
DET	DETAIL
DH	DOOR HEIGHT
DIA	DIAMETER
DIM	DIMENSION
DMJ	DOUBLE MECHANICAL JOINT
DN	DOWN
EA	EACH
ECC	ECCENTRIC
ECC RED	ECCENTRIC REDUCER
EF	EACH FACE
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC, (AL)
EQ	EQUAL
EXP JT	EXPANSION JOINT
FCA	FLANGED COUPLING ADAPTER
FD	FLOOR DRAIN
FE	FIRE EXTINGUISHER
FE	FLOW ELEMENT
FI	FLOW INDICATOR FIN
GR	FINISH GRADE
FLG	FLANGE, FLASHING
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
HF	HOSE FAUCET
HMD	HOLLOW METAL DOOR
HMC	HARNESSED MECHANICAL COUPLING
HMJ	HARNESSED MECHANICAL JOINT
HORIZ	HORIZONTAL
HV	HOSE VALVE
ID	INSIDE DIAMETER
INV	INVERT
IPS	IRON PIPE SIZE
JT	JOINT
L	LOUVER
MAX	MAXIMUM
MC	MECHANICAL COUPLING
MCC	MOTOR CONTROL CENTER
MIN	MINIMUM, MINUTE
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MJTR	MECHANICAL JOINT WITH TIE ROD
N	NORTH
NC	NORMALLY CLOSED
NO	NORMALLY OPEN or NUMBER
NPW	NONPOTABLE WATER
NTS	NOT TO SCALE
OC	ON CENTER, ODOR CONTROL
PI	PRESSURE INDICATOR
PL	PLATE
PRV	POWER ROOF VENTILATOR, PRESSURE
RV	REDUCING VALVE
PS	PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
PV	PLUG VALVE
PW	POTABLE WATER
R	RADIUS, RISER
RD	ROOF DRAIN, ROAD
RDL	ROOF DRAIN LEADER
REINF	REINFORCING
REQD	REQUIRED
SCHED	SCHEDULE
SS	STAINLESS STEEL
SVW	SERVICE WATER
T&B	TOP AND BOTTOM
TYP	TYPICAL
VERT	VERTICAL
WL	WATER LEVEL
W/O	WITHOUT
WP	WATER PUMP

PIPING LEGEND

BLIND FLANGE	
ELBOW	PROP. WATER MAIN
ELBOW DOWN	
LINE TURNING UP	EXIST. WATER MAIN
REDUCER	SANITARY SEWER
TEE	STORM SEWER
TEE LINE DOWN	UTILITY POLE LINE
TEE LINE UP	LIGHT POLE
UNION	TELEPHONE BOX
WALL SLEEVE	GAS MAIN
PLUG VALVE, ECCENTRIC	ELECTRIC CABLE
CAP OR PLUG	TELEPHONE CABLE
CLEANOUT	NEW ¾" SERVICE
CROSS	NEW 1 " SERV. OR LARG.
	BOLLARD
BUTTERFLY VALVE	SIGN
BALL VALVE	MAIL BOX
CHECK VALVE	FILLING LINE BALL VALVE QUICK COUPLING
3 WAY VALVE	
ANGLE VALVE	DRAIN VALVE
GLOBE VALVE	
THERMAL SHUTOFF VALVE	EMERGENCY EYEWASH & SHOWER STATION
HOSE FAUCET OR WALL HYDRANT	
BACKFLOW PREVENTER	
PRESSURE RELIEF VALVE	
BACK PRESSURE VALVE	



JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

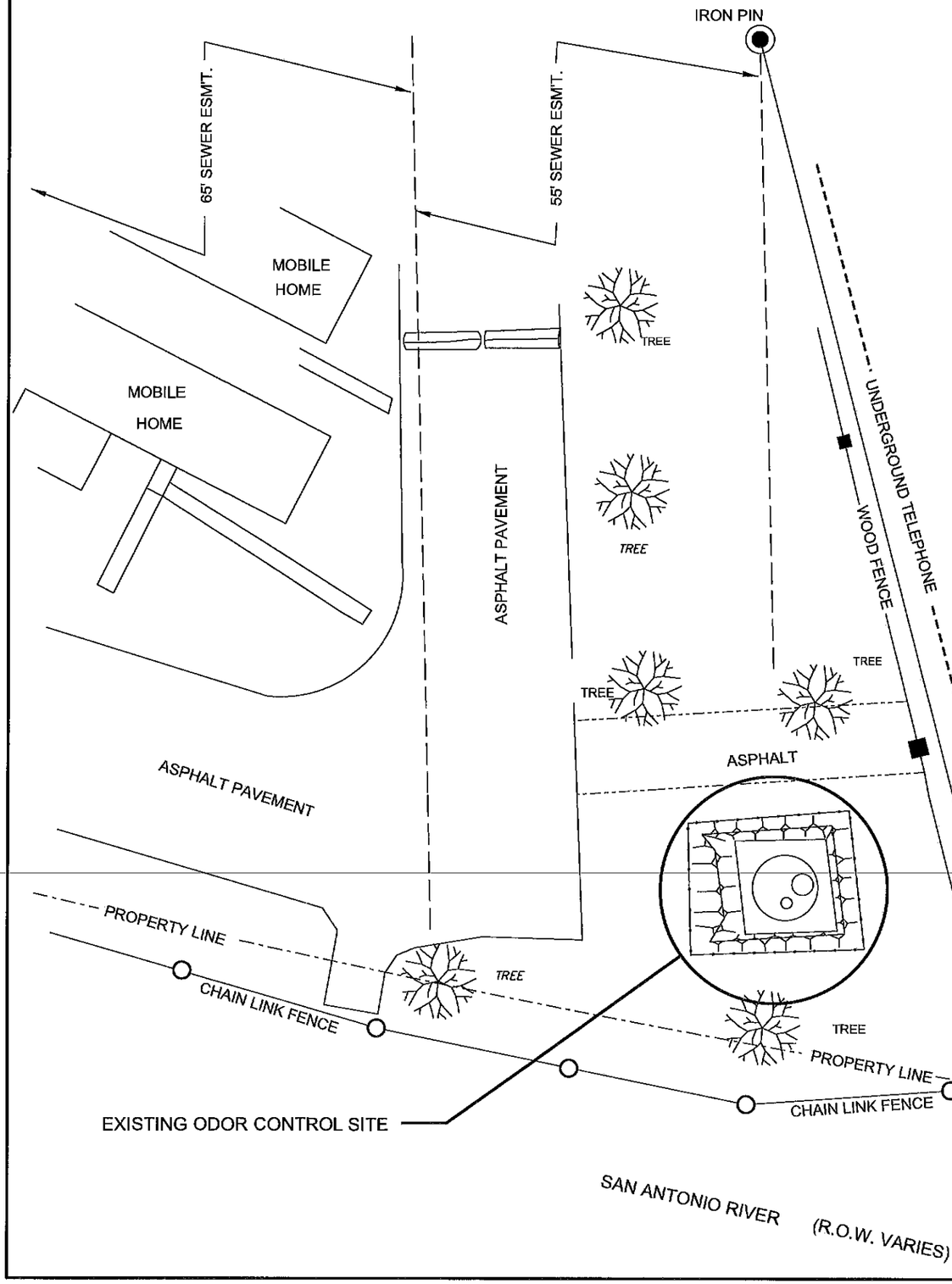
Date:
Drawn by: CCM
Designed by:
Checked by:
Scale:
Approved by:
Map No:

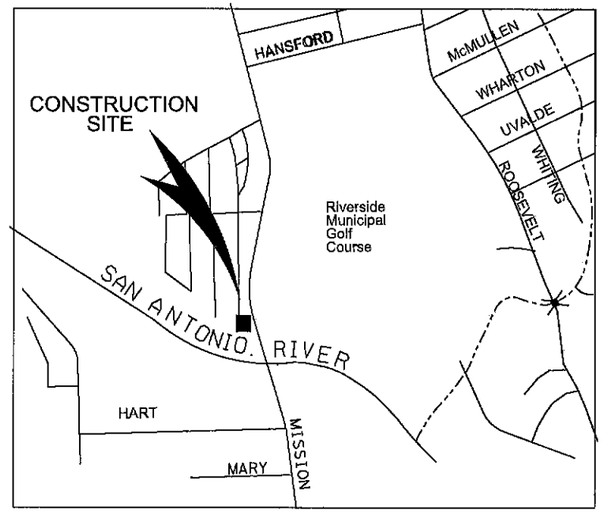
San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

ABBREVIATIONS AND LEGEND

DRAWING NO.
3 OF 21





SCALE 1"=20'

GENERAL NOTES

1. CONTRACTOR TO REMOVE EXISTING TANK AND RELOCATE IT TO THE PROPOSED SITE.
2. CONTRACTOR TO REMOVE EXISTING FENCE AND RESTORE GRADE TO ITS ORIGINAL STATE OR BETTER.
3. SEE SHEET 2 OF 21, GENERAL NOTES 23 FOR CONSTRUCTION SEQUENCE.

ILKNUR E. DRZYMALA
95657
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
05/14/2012

JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN – PHASE 3

INFORMATION

Date:
Drawn by: CCM
Designed by: CCM
Checked by:
Scale:
Aproved by:
Map No:

San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

MISSION TRAILS
EXISTING SITE PLAN

DRAWING NO.
4 OF 21

65' SEWER ESM'T.

55' SEWER ESM'T.

ASPHALT PAVEMENT

WOOD FENCE

UNDERGROUND TELEPHONE

TREE

MOBILE HOME

QUICK COUPLER W/STAND

VENT PIPE

TREE

POUR NEW SLAB W/CONTAINMENT WALLS (SEE DETAIL SHEET 11 FOR SAWS TEMPLATE LAYOUT. REUSE EXISTING FIBERGLASS TANK)

PROPOSED 8' SECURITY FENCE W/3 STRANDS OF BARBWIRE

30'

TREE

TREE

16.5'

TANK

CONTRACTOR MAY PRUNE THE TREE UPON CONFIRMING WITH SAWS INSPECTOR.

CUT OFF VALVE

1- 1½" x ¾" ANGLE STOP

1-¾" METER W/BOX ± 30 L. F. ¾" IPS

TIE PROPOSED DRAIN TO EXISTING SANITARY SEWER LINE

1- 1½" ⅛BEND

PROPOSED PRECAST STAIRS

PROPOSED 8' SECURITY GATE

12.5'

36'

PROPOSED SILT CONTROL FENCE

ASPHALT PAVEMENT

PROPOSED ELECTRICAL PANEL (W/120V OUTLET & SCADA SEE SHEET 19 FOR DETAILS)

PROPOSED EYE WASH STATION AND HOSE BIBB

CHAIN LINK FENCE

TREE

PROPERTY LINE

TREE

PROPERTY LINE

CHAIN LINK FENCE

CHAIN LINK FENCE

POC

115 L.F. 1½" IPS

MISSION RD (60' R.O.W.)

SAN ANTONIO RIVER (R.O.W. VARIES)

PROPOSED SILT CONTROL FENCE

1- 12" x 1½" SERVICE SADDLE TO FIT 12" STEEL PIPE

1-1½" CORPORATION (SEE SAWS STD. DD-824-01)

± 70 L.F. OF ENCASED IPS WITH PIPE INSULATION

± 70 L.F. 6" SCH 40 PVC PIPE (SEE DETAIL ON THIS SHEET)

2-1½" ⅛BEND

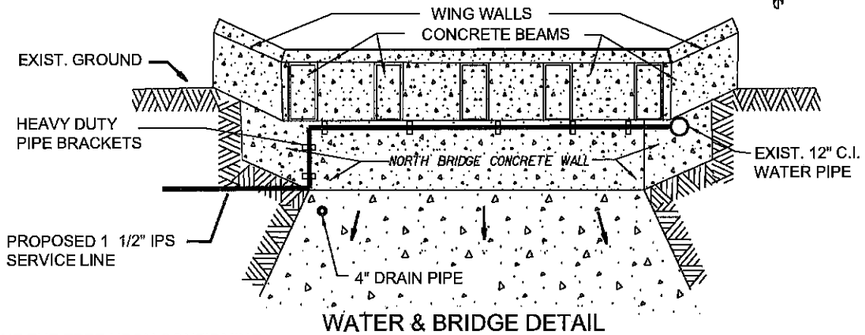
2-1½" ⅛SCH 40 PVC BEND

± 22 L.F. 1½" IPS

1 1/2" 1/4 BEND

SEE WATER DETAILS FOR PLACEMENT OF WATER LINE (SEE WATER & BRIDGE DETAIL ON THIS SHEET)

SCALE: 1" = 20'



WATER & BRIDGE DETAIL

GENERAL NOTES

1. CONTRACTOR TO INSTALL EYE WASH & HOSE BIBB AND MAKE ALL CONNECTIONS TO WATER SOURCE.
2. CONTRACTOR TO INSTALL SCADA PANEL & 120V OUTLET.
3. CONTRACTOR TO REUSE EXISTING EQUIPMENT.
4. CONTRACTOR TO CLEAN 4" DRAIN TO SANITARY SEWER MAIN & TIE NEW PROPOSED 4" DRAIN TO EXISTING SANITARY SEWER.
5. ALL WATER PIPE FITTINGS SHALL BE SUBSIDIARY TO THE PIPING. NO SEPARATE PAY ITEM.
6. PROPOSED WATER PIPE TO BE TIED INSIDE WATER METER.
7. EXTEND IPS TO NEW EYE WASH LOCATION.
8. NEW WATER TO BE EXTENDED OVER WALL TO ALL WATER PIPE ABOVE GROUND FITTINGS AS REQUIRED.
9. ALL ABOVE GROUND WATER PIPING INCLUDING HOSE BIBB AND EMERGENCY SHOWER/EYEWASH SHALL BE HEAT TRACE WIRED AND INSULATED.
10. SEE SHEET 2 OF 21, GENERAL NOTES 21 FOR EYEWASH STATION LOCATION.

ILKNUR E. DRZYMALA
95657
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
05/14/2012

JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN– PHASE 3

INFORMATION

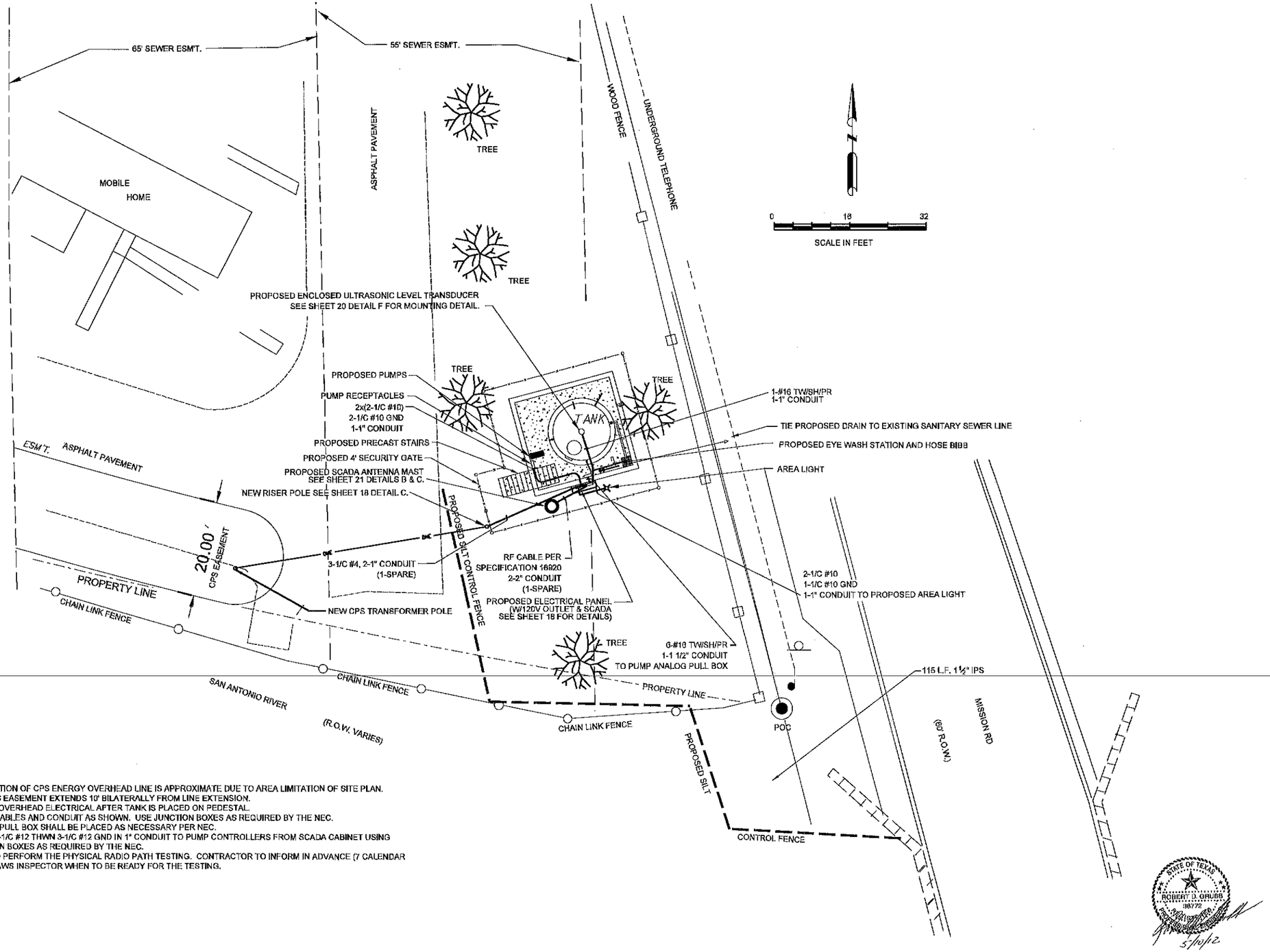
Date: 2-25-11
Drawn by: CCM
Designed by:
Checked by:
Scale: 1" = 20'
Aproved by:
Map No:

San Antonio Water System

PART II : ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

MISSION TRAILS
PROPOSED SITE PLAN

DRAWING NO.
5 OF 21



NOTES:
1. ORIENTATION OF CPS ENERGY OVERHEAD LINE IS APPROXIMATE DUE TO AREA LIMITATION OF SITE PLAN.
2. NEW CPS EASEMENT EXTENDS 10' BILATERALLY FROM LINE EXTENSION.
3. INSTALL OVERHEAD ELECTRICAL AFTER TANK IS PLACED ON PEDESTAL.
4. ROUTE CABLES AND CONDUIT AS SHOWN. USE JUNCTION BOXES AS REQUIRED BY THE NEC.
5. ANALOG PULL BOX SHALL BE PLACED AS NECESSARY PER NEC.
6. ROUTE 6-1/C #12 THWN 3-1/C #12 GND IN 1" CONDUIT TO PUMP CONTROLLERS FROM SCADA CABINET USING JUNCTION BOXES AS REQUIRED BY THE NEC.
7. SAWS TO PERFORM THE PHYSICAL RADIO PATH TESTING. CONTRACTOR TO INFORM IN ADVANCE (7 CALENDAR DAYS) SAWS INSPECTOR WHEN TO BE READY FOR THE TESTING.

STATE OF TEXAS
ROBERT D GRUBB
68779
LICENSED PROFESSIONAL ENGINEER
5/10/12

JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN -
PHASE 3

INFORMATION

GRUBB ENGINEERING, INC.
TBPE FIRM REGISTRATION #3064

Date: 5-10-12
Drawn by: SG
Designed by: BD
Checked by: SM
Scale: AS NOTED
Aproved by: RDG
Map No:

San Antonio Water System

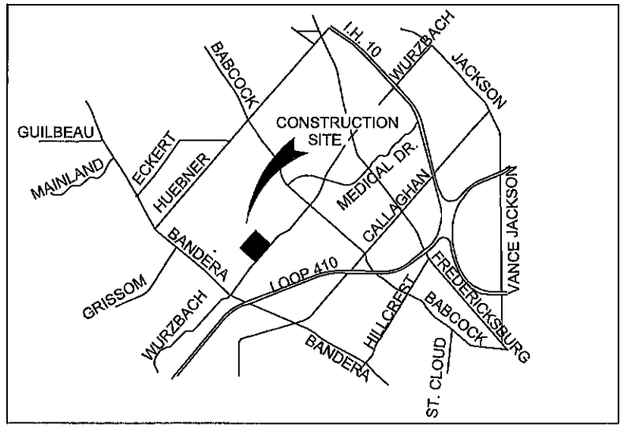
PART II: ODOR CONTROL
SYSTEM IMPROVEMENTS
PHASE II

MISSION TRAILS

PROPOSED ELECTRICAL SITE PLAN

DRAWING NO.

6 OF 21



GENERAL NOTES

1. CONTRACTOR TO INSTALL EYEWASH & HOSE BIBB AND MAKE ALL CONNECTIONS TO WATER SOURCE.
2. CONTRACTOR TO INSTALL SCADA PANEL & 120V OUTLET.
3. CONTRACTOR TO CLEAN 4" DRAIN TO SANITARY SEWER MAIN & TIE NEW PROPOSED 4" DRAIN TO EXISTING 8" S.A.
4. CONTRACTOR TO PICK-UP AND PAY FOR THE STREET-CUT PERMIT FROM COSA.
5. ALL WATER PIPE FITTINGS SHALL BE SUBSIDIARY TO THE PIPING. NO SEPARATE PAY ITEM.
6. PROPOSED WATER PIPE TO BE TIED INSIDE WATER METER.
7. EXTEND IPS TO NEW EYEWASH LOCATION.
8. NEW WATER TO BE EXTENDED OVER WALL TO ALL WATER PIPE ABOVE GROUND FITTIHGS AS REQUIRED.
9. ALL ABOVE GROUND WATER PIPING INCLUDING HOSE BIBB AND EMERGENCY SHOWER/EYEWASH SHALL BE HEAT TRACE WIRED AND INSULATED.
10. SEE SHEET 2 OF 21, GENERAL NOTES 21 FOR EYEWASH STATION LOCATION.
11. SEE SHEET 2 OF 21, GENERAL NOTES 23 FOR CONSTRUCTION SEQUENCE.

STATE OF TEXAS
ILKNUR E. DRZYMALA
95657
LICENSED
PROFESSIONAL ENGINEER
05/14/2012

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN – PHASE 3

INFORMATION

Date:
Drawn by:
Designed by:
Checked by:
Scale: AS NOTED ABOVE
Aproved by:
Map No:

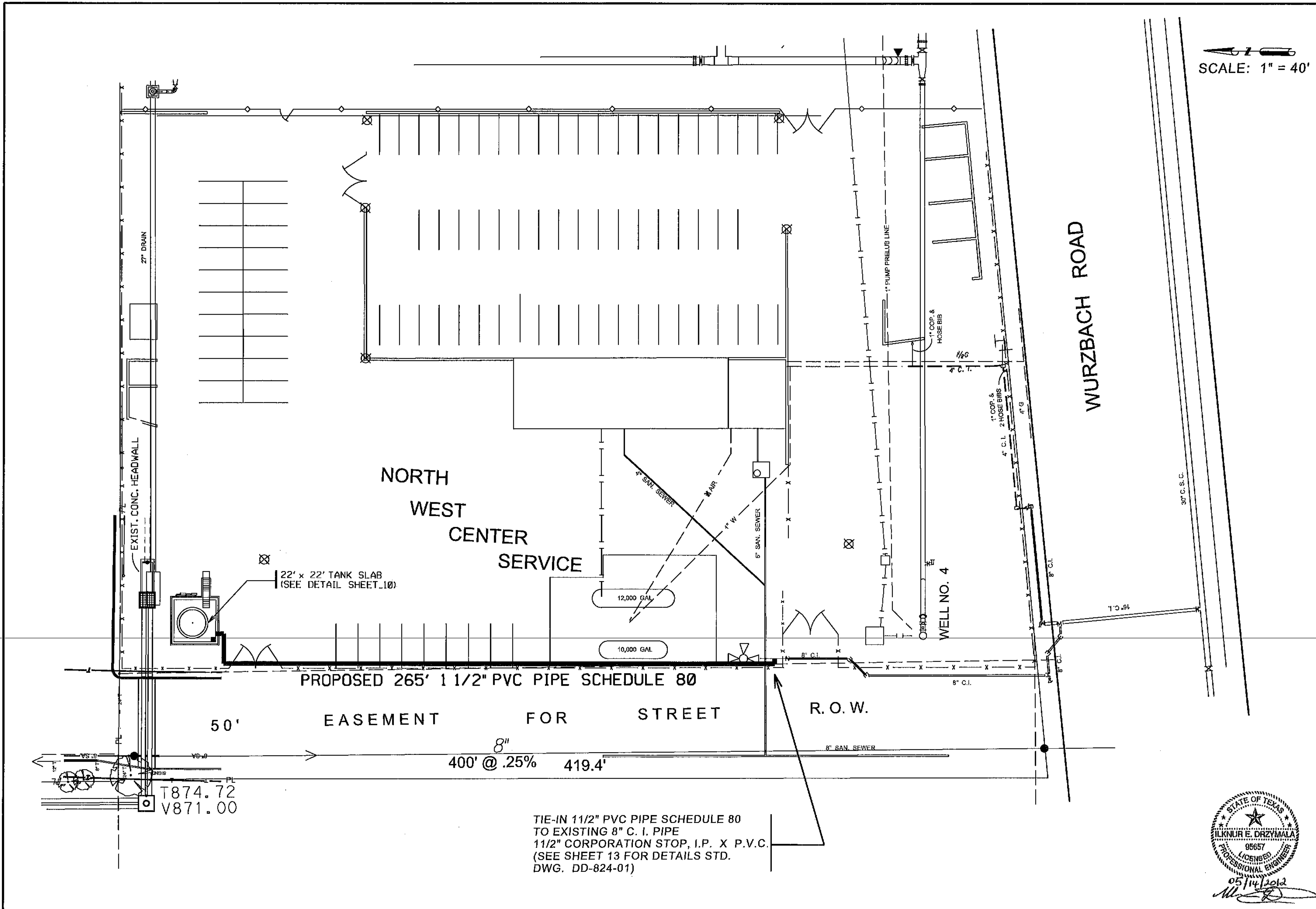
San Antonio Water System

PART II : ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

NORTH WEST SERVICE CENTER

PROPOSED SITE PLAN

DRAWING NO. 7 OF 21



JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN – PHASE 3

INFORMATION

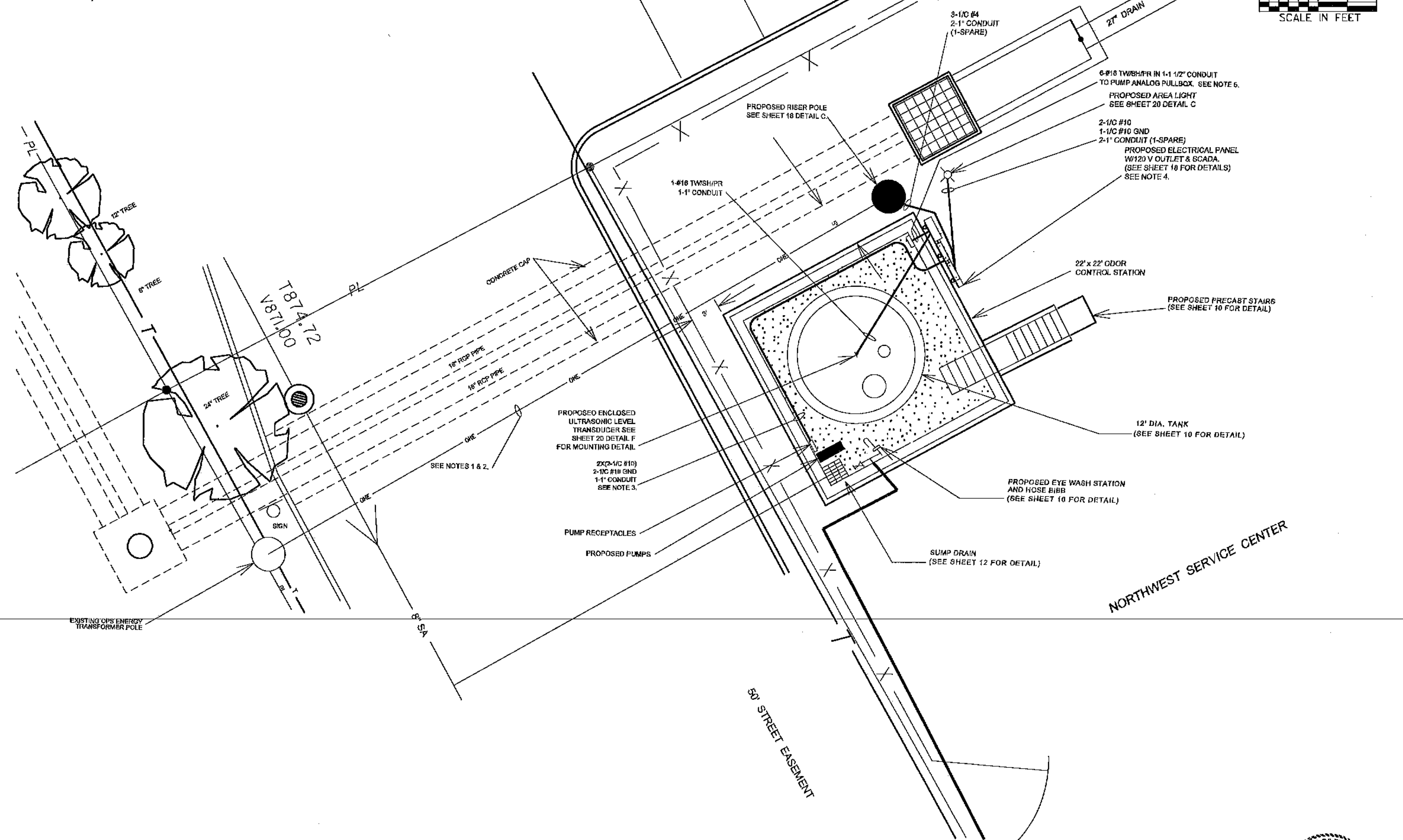
Date:
Drawn by: CHRIS MARTINEZ
Designed by:
Checked by:
Scale: AS NOTED ABOVE
Approved by:
Map No.:

San Antonio Water System

PART II : ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II
NORTH WEST SERVICE CENTER WATER MAIN CONNECTION DETAIL

DRAWING NO.
8 OF 21

NOTES:
1. PROPOSED CPS ENERGY OVERHEAD ELECTRIC. CONTRACTOR SHALL COORDINATE WITH CPS ENERGY.
2. INSTALL OVERHEAD ELECTRICAL AFTER TANK IS PLACED ON PEDESTAL.
3. ROUTE CABLES AND CONDUIT AS SHOWN USING JUNCTION BOXES AS REQUIRED BY THE NEC.
4. ROUTE 6-1/C #12 THWN WITH 3-1/C #12 GND IN 1" CONDUIT TO PUMP CONTROLLERS FROM SCADA CABINET USING JUNCTION BOXES AS REQUIRED BY THE NEC.
5. ANALOG PULLBOX SHALL BE LOCATED AS NECESSARY PER THE NEC.
6. SAWS TO PERFORM THE PHYSICAL RADIO PATH TESTING. CONTRACTOR TO INFORM IN ADVANCE (7 CALENDAR DAYS) SAWS INSPECTOR WHEN TO BE READY FOR THE TESTING.



JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

GRUBB ENGINEERING, INC.
ELECTRICAL POWER SYSTEMS DESIGN AND TESTING
3128 SIDNEY BROOKS, SAN ANTONIO, TEXAS 78235
BUS: (210) 658-7250 FAX: (210) 658-9805
TBPE FIRM REGISTRATION #3904

Date: 5-10-12
Drawn by: SG
Designed by: BD
Checked by: SM
Scale: AS NOTED
Aproved by: RDG
Map No:

San Antonio Water System

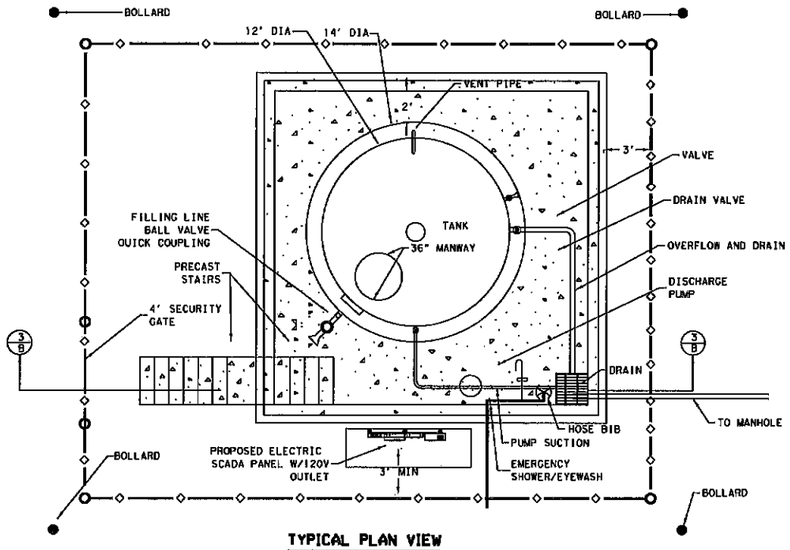
PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

NORTH WEST SERVICE CENTER

PROPOSED ELECTRICAL SITE PLAN

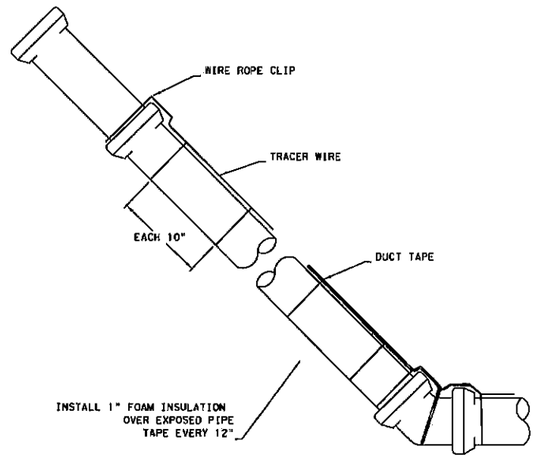
STATE OF TEXAS
ROBERT D. GRUBB
38772
5/10/12

DRAWING NO.
9 OF 21



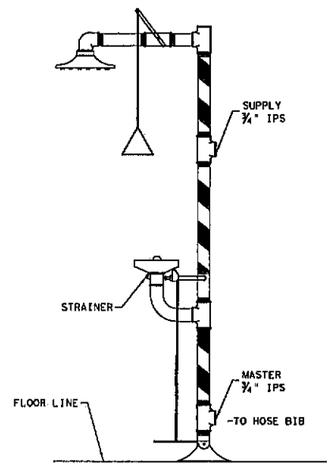
TYPICAL PLAN VIEW

SCALE: 1"=10'



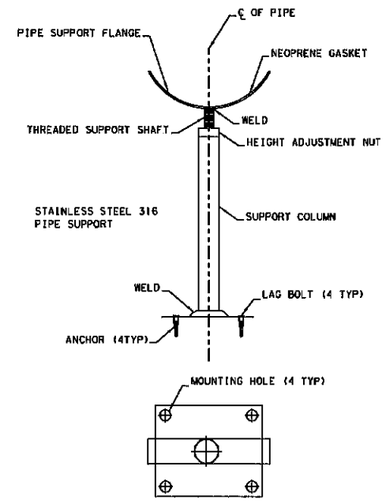
TYPICAL TRACER WIRE DETAIL

NOT TO SCALE



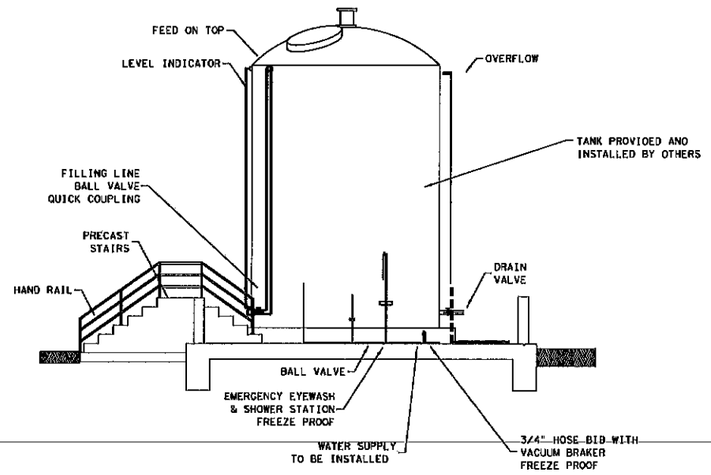
TYPICAL EMERGENCY SHOWER AND EYE WASH

NOT TO SCALE



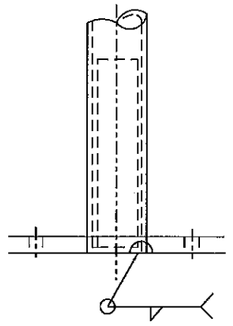
TYPICAL PIPE SUPPORT DETAIL

NOT TO SCALE



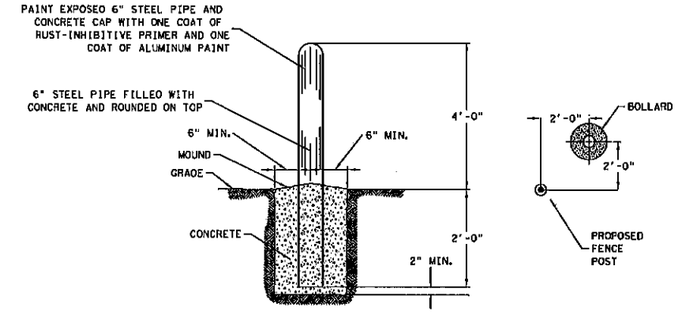
(3/8) SECTION DETAIL

SCALE: 1"=10'



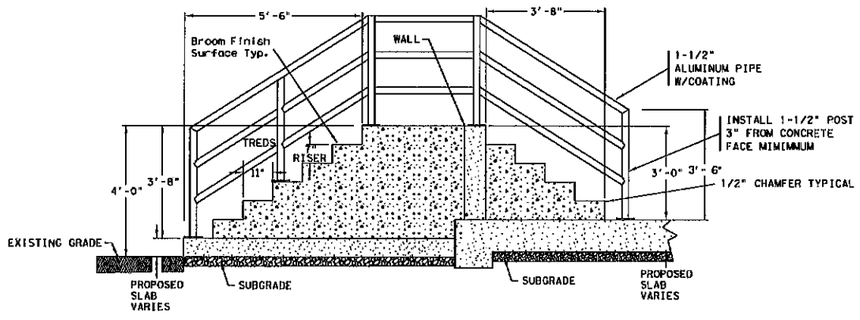
TYPICAL HAND RAIL DETAIL

NOT TO SCALE



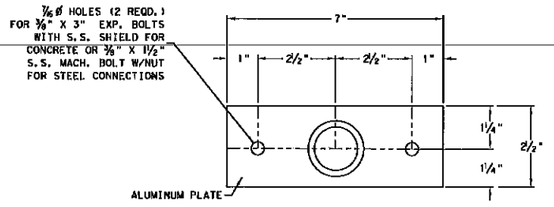
TYPICAL BOLLARD DETAIL

NOT TO SCALE



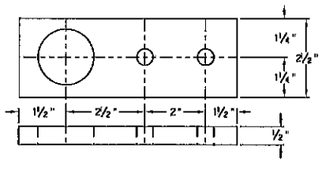
TYPICAL STAIRS DETAIL

SCALE: 1"=5'



BASE MOUNT FOR RAIL

NOT TO SCALE

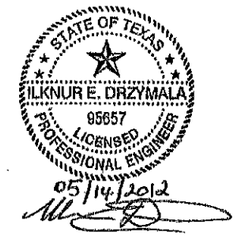


MODIFIED BASE MOUNT

NOT TO SCALE

HAND RAIL GENERAL NOTES:

1. ALL ALUMINUM POSTS & RAILINGS WILL BE 1½" O SCHEDULE 40, ALLOY 6063-T6 WITH 215 CLEAR SATIN ANODIZED FINISH.
2. ALL OTHER ALUMINUM COMPONENTS WILL BE 6063-T6 OR 6061-T6 WITH A 204 CLEAR SATIN ANODIZED FINISH.
3. ALL ALUMINUM THAT COMES IN CONTACT WITH CONCRETE OR DISSIMILAR METALS WILL BE COATED WITH ZINC CHROMATE #P759-66.
4. ALL FASTENERS (MACHINE BOLTS, EXPANSION BOLTS, SELF TAPPING SCREWS & BLIND RIVETS) WILL BE A-304 OR A-305 STAINLESS STEEL.
5. INSTALLER WILL PROVIDE EXPANSION JOINTS IN RAILING WHERE STRUCTURES REQUIRE EXPANSION JOINTS.
6. INSTALLER TO DRILL WEEP HOLES, IF NOT PROVIDED, IN ALL POSTS & AT ALL LOW POINTS OF SYSTEM. (7/32" O WEEP HOLES).



JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN- PHASE 3

INFORMATION

Date:
Drawn by: ccm
Designed by:
Checked by:
Scale:
Aproved by:
Map No:

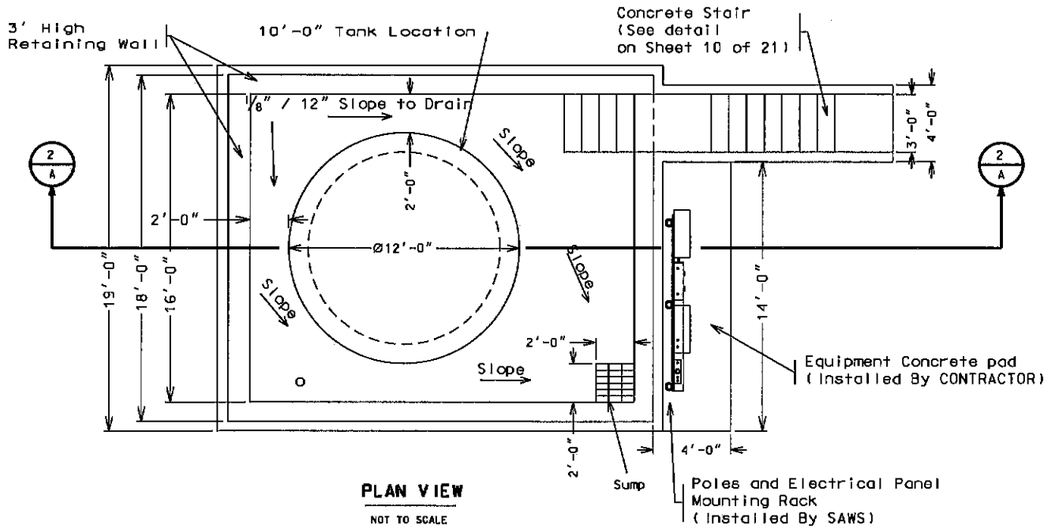
San Antonio Water System

PART II : ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

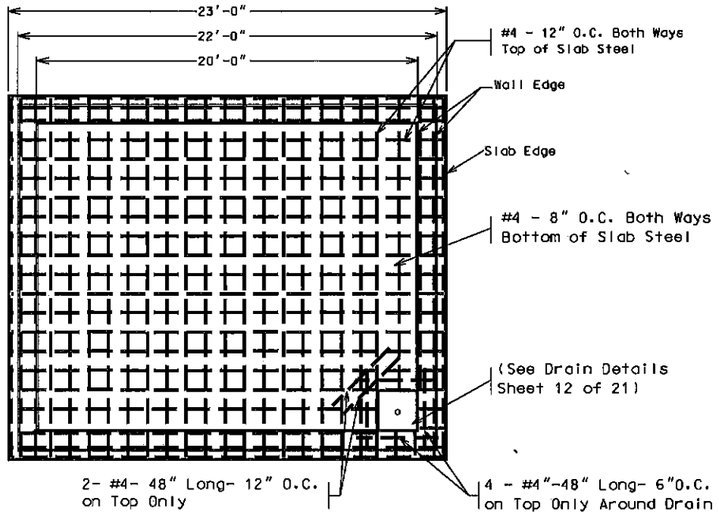
TANK, STAIR AND EYE WASH DETAILS

DRAWING NO.

10 OF 23



PLAN VIEW
NOT TO SCALE



SLAB DETAIL, PLAN VIEW
Not to Scale

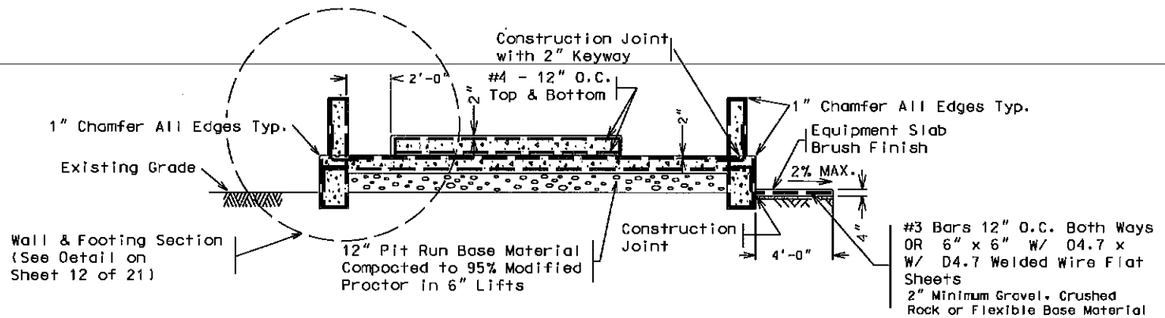
Foundation Notes

A. All steel to be 60,000 psi

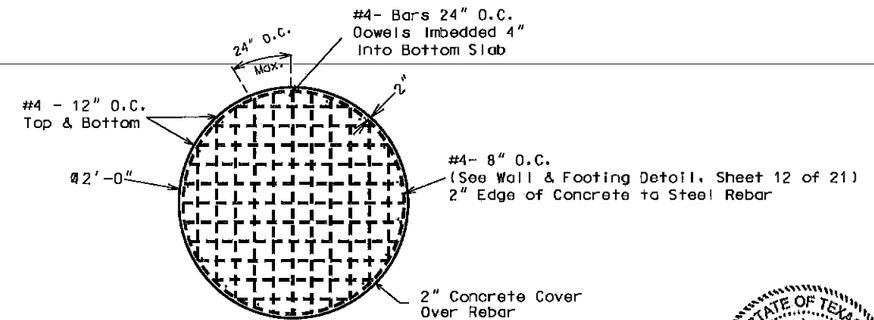
B. Steel to be lapped 30"

C. All concrete to be 4,000 psi

D. Aggregate 1" + or - well graded. Air Intrainment 5%



SLAB DETAIL (2/A)
Not to Scale



TANK SLAB DETAIL PLAN VIEW
Not to Scale

STATE OF TEXAS
ILKNUR E. DRZYMALA
95657
LICENSED PROFESSIONAL ENGINEER
05/14/2012

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

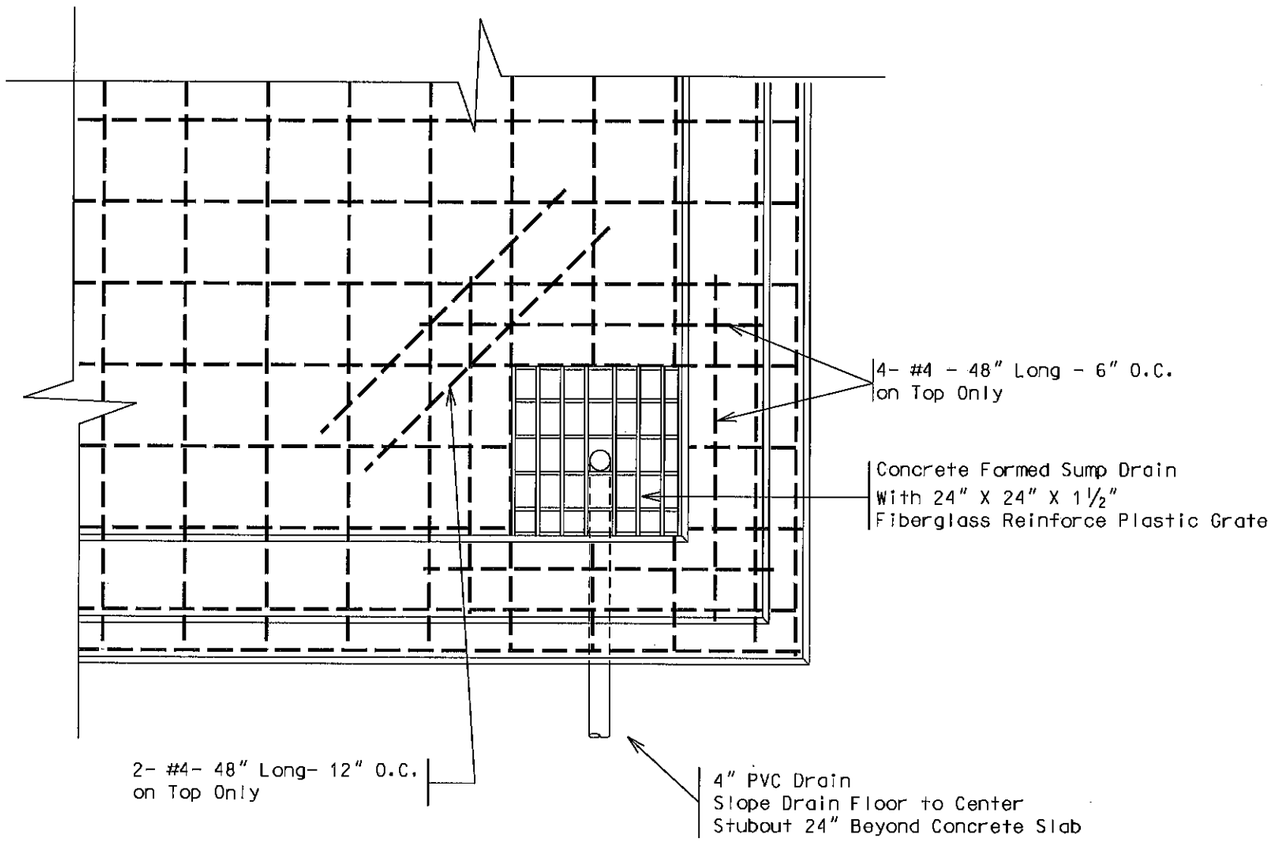
Date:
Drawn by:
Designed by:
Checked by:
Scale:
Aprroved by:
Map No:

San Antonio Water System

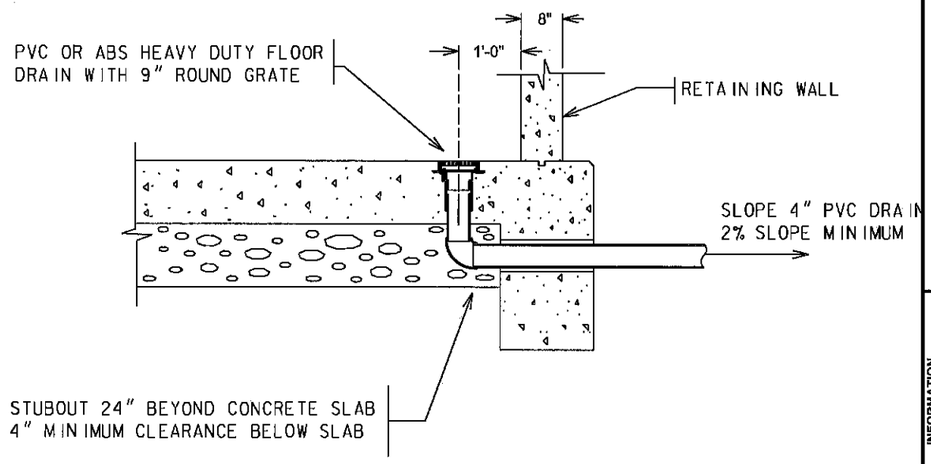
PART II : ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

TYPICAL TANK SLAB DETAILS

DRAWING NO. 11 OF 21



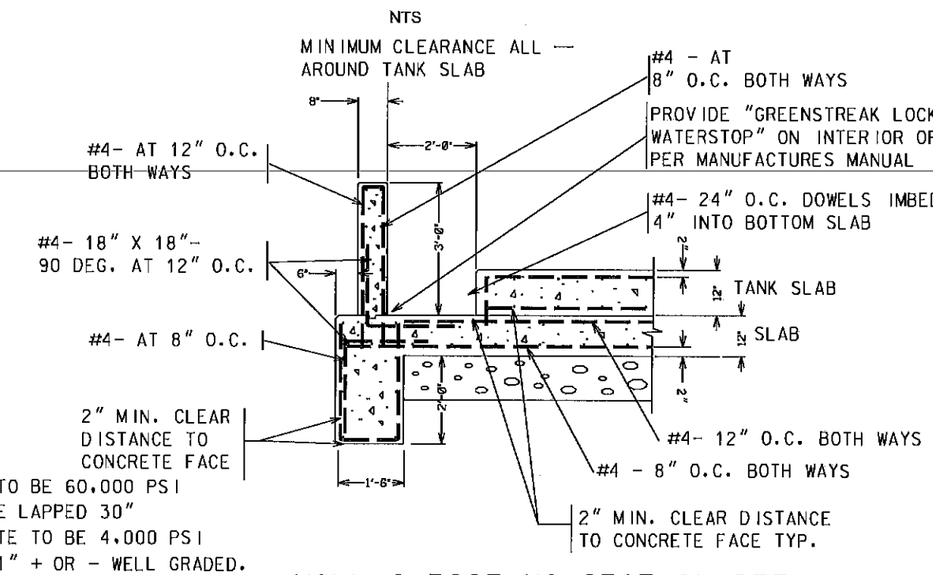
TYPICAL CORNER DRAIN SECTION DETAILS



CORNER DRAIN SECTION DETAIL

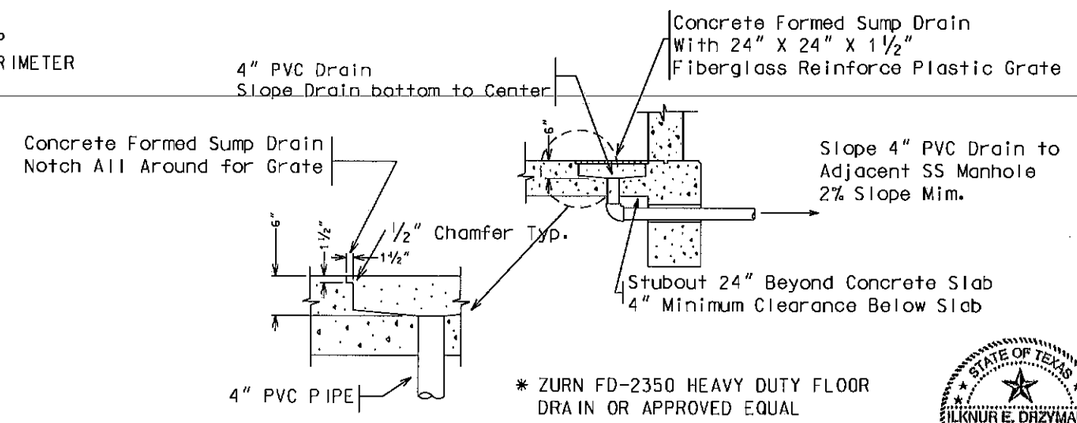
Not to Scale

NTS



A. ALL STEEL TO BE 60,000 PSI
B. STELL TO BE LAPPED 30"
C. ALL CONCRETE TO BE 4,000 PSI
D. AGGREGATE 1" + OR - WELL GRADED.
AIR INTRAIMENT 5%

WALL & FOOTING SECTION DETAIL



* ZURN FD-2350 HEAVY DUTY FLOOR DRAIN OR APPROVED EQUAL

STATE OF TEXAS
ILKNUR E. DRZYMALA
95657
LICENSED
PROFESSIONAL ENGINEER
05/14/2012

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN- PHASE 3

INFORMATION

Date:
Drawn by:
Designed by:
Checked by:
Scale:
Aproved by:
Map No:

San Antonio Water System

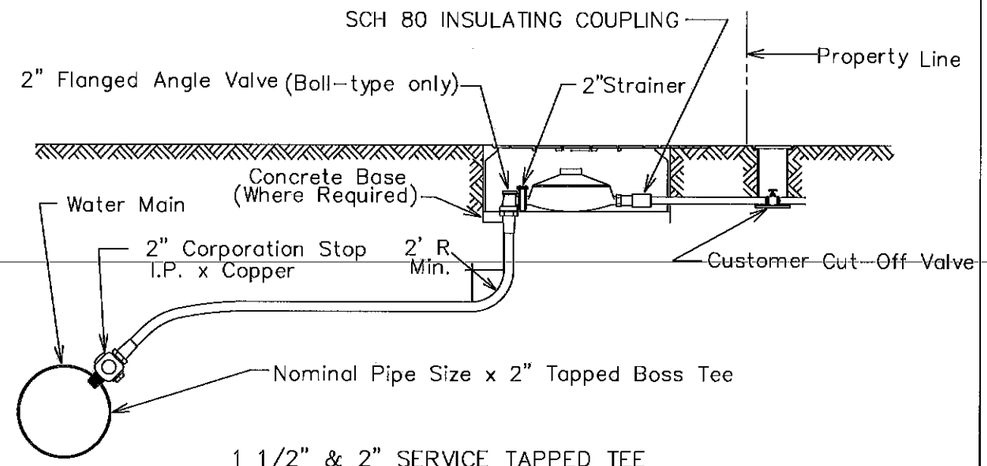
PART II : ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

TYPICAL CORNER AND FOOTING DRAIN DETAILS

DRAWING NO.

12 OF 21

PIPE TAPPING SCHEDULE				
PIPE DIAMETER	SERVICE SIZE			
	3/4"	1"	1 1/2"	2"
6" A.C.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
6" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
8" A.C.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
8" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
8" PVC	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
10" A.C.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
10" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
10" PVC	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
12" A.C.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
12" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
12" PVC	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
16" A.C.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
16" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle

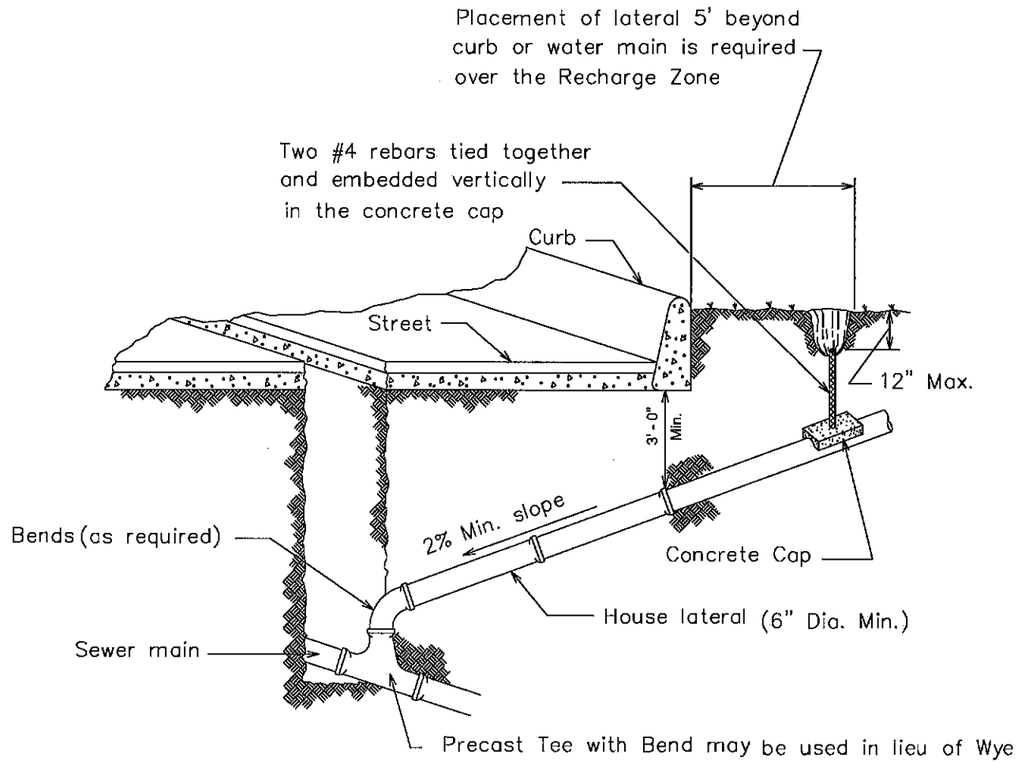


1 1/2" & 2" SERVICE TAPPED TEE

Note:
For direct tap to main, see Tapping Schedule

PROPERTY OF SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS	COPPER SERVICE INSTALLATION TAPPING SCHEDULE	APPROVED AUGUST 1998	REVISED	SHEET 1 OF 1
		DD-824-01		

Depth and grade of service laterals as shown, ore typicol only. Actual depth, alignment and grade of service laterals shall be determined by the Engineer based on the elevations of the sewer main, street, natural ground and building to be serviced.



HOUSE LATERAL DETAIL

Note:
A minimum of 3' of cover to subgrade is necessary, otherwise concrete encasement will be required.

PROPERTY OF SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS	HOUSE LATERAL DETAIL	APPROVED AUGUST 1998	REVISED	SHEET 1 OF 1
		DD-854-Ø1		

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

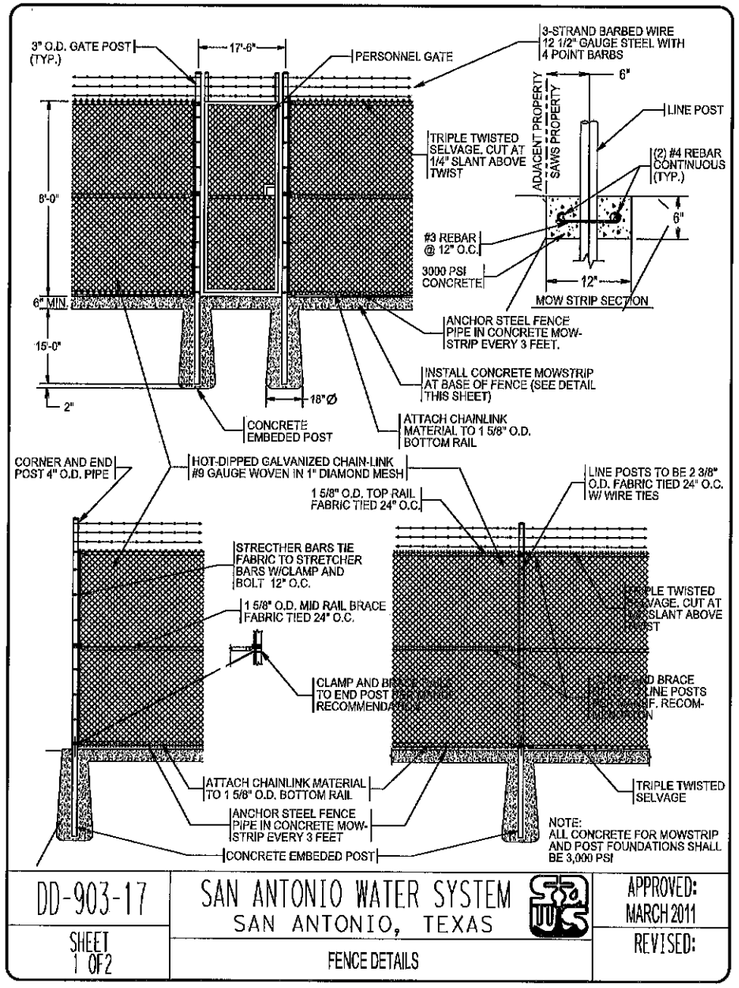
Date:
Drawn by:
Designed by:
Checked by:
Scale:
Aproved by:
Map No:

San Antonio Water System

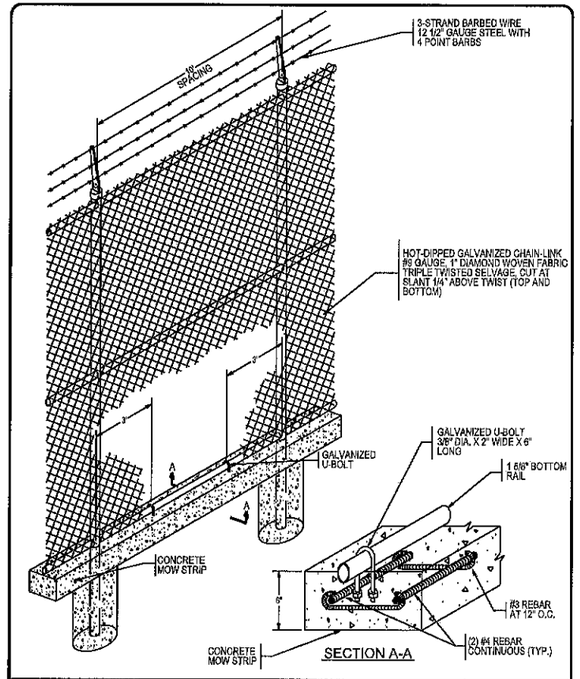
PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

SERVICE INSTALLATION AND LATERAL DETAIL

DRAWING NO. 13 OF 21

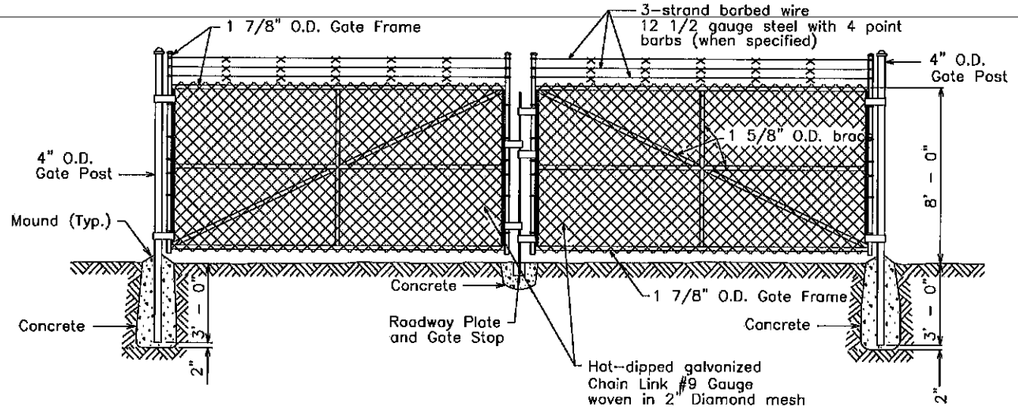


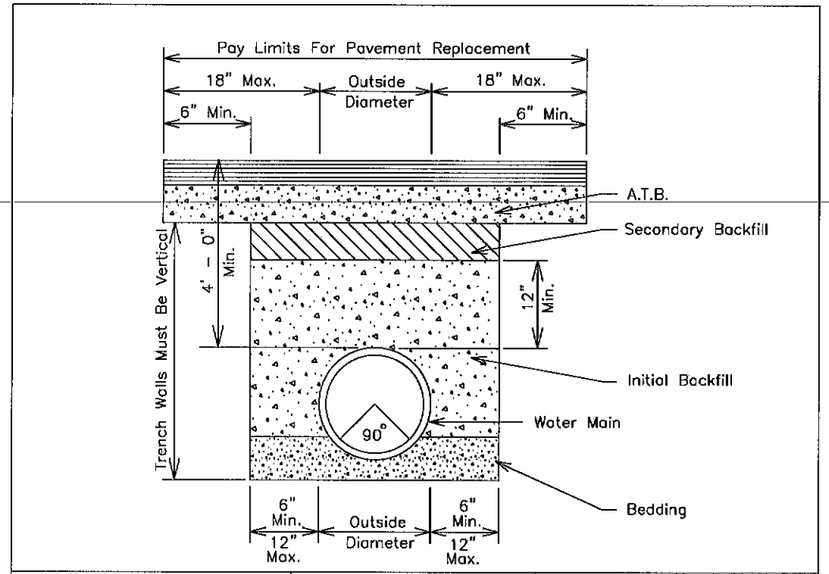
DD-903-17	SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS	APPROVED: MARCH 2011
SHEET 1 OF 2	FENCE DETAILS	REVISED:



DD-903-17	SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS	APPROVED: MARCH 2011
SHEET 2 OF 2	FENCE DETAILS	REVISED:

1. 8' GALVANIZED CHAIN LINK FENCE SHALL HAVE 1" MESH PATTERN W / SALVAGE UP, 3 STRAND BARB WIRE, MIDSPAN SUPPORT, AND CONCRETE MOW BAND WITH GALVANIZED ROD ANCHORED TO FENCE.
2. ALL METAL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION. TOP OF MESH MUST BE TWISTED.
3. FENCES AND GATES SHALL BE FURNISHED COMPLETE WITH ALL NECESSARY FITTINGS AND HARDWARE.
4. GATES, SIZES OF PIPE, SAG RODS AND TURNBUCKLES SHALL BE MANUFACTURER'S STANDARD WHICH ALSO MEET THE REQUIREMENTS OF THIS DRAWINGS.
5. POSTS SHALL BE ROLLED OR EXTRUDED SECTIONS OR TUBING OF STEEL CAPABLE OF WITH STANDING A LATERAL FORCE OF 100 POUNDS APPLIED AT THE TOP. ALL HOLLOW POSTS SHALL BE CAPPED.
6. STANDRAD PIPE SIZES INDICATED ARE NOMINAL DIAMETER SCHEDULE 40, PER AMERICAN STANDARDS ASSOCIATION (ASA) B36.10.
7. PROVIDE PLUNGE ROD AND CATCHES FOR ALL GATES IN OPEN CLOSED POSITION.
8. VERIFY SIZE AND LAYOUT OF LOCK ASSEMBLY PRIOR TO FABRICATION.
9. EXISTING PROPERTY FENCE SHALL REMAIN. FENCE MAY BE REMOVED AND RESET TO ALLOW CONSTRUCTION OF NEW FENCE. NO SEPERATE PAY ITEM.
10. AT NO TIME SHALL THE SITE BE LEFT UNATTENDED BY THE CONTRACTOR WITHOUT EXISTING, TEMPORARY OR PERMANENT FENCING AND GATES IN PLACE. ALL TEMPORARY AND PERMANENT FENCING SHALL MEET T.C.E.Q. REGULATIONS.





PROPERTY OF SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS	POTABLE AND RECYCLED WATER MAIN DETAIL	APPROVED AUGUST 1998	REVISED
		DD-812-01	SHEET 1 OF 1

JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

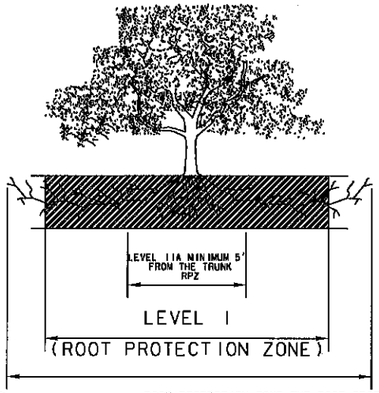
Date: 3/12/2012
Drawn by: ccm
Designed by: ccm
Checked by:
Scale:
Aproved by:
Map No:

San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENT PHASE II

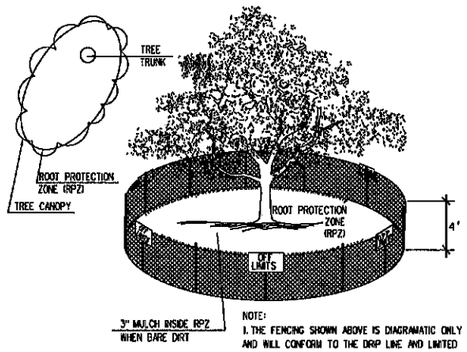
WATER MAIN AND FENCE DETAILS

DRAWING NO.
14 OF 21

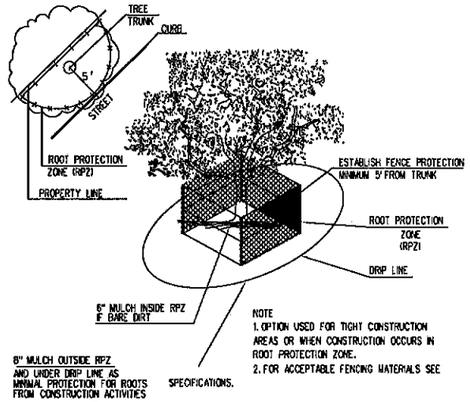


1.1.1 ELEVATION
N. T. S.

ROOT PROTECTION ZONE-THE ROOT PROTECTION ZONE IS A CIRCULAR AREA AROUND A TREE THAT IS BASED ON THE DIAMETER OF THE TREE. EACH 1 INCH DIAMETER OF THE TREE EQUALS 1 FOOT RADIUS FOR ROOT PROTECTION ZONE.



1.1.2 LEVEL I & FENCE PROTECTION
N. T. S.



1.1.3 LEVEL II A FENCE PROTECTION
N. T. S.

GENERAL NOTES

1. ALL THE TREES WITH A DIAMETER GREATER THAN 3 INCHES AFFECTED BY CONSTRUCTION SHALL HAVE THE LIMBS AND ROOTS TRIMMED AND PRUNED ACCORDING TO ITEM No. 802. TREE PRUNING, SOIL AMENDING AND FERTILIZATION, UNLESS SPECIFIED TREES SHALL RECEIVE LEVEL 2 PROTECTION AS PER ITEM No. 802. TREES TO RECEIVE LEVEL 1 PRDTECTION AS PER ITEM No. 802 ARE SHOWN ON TREE PROTECTION TABLE ON THIS SHEET.

2. ALL TREES SHALL REMAIN UNLESS NOTED ON THE PLANS.

3. NO SITE PREPARATION WORK SHALL BEGIN IN AREAS WHERE TREE PRESERVATION AND TREATMENT MEASURES HAVE NOT BEEN COMPLETEO AND APPROVED.

4. TREE PROTECTION FENCING SHALL BE REQUIRED. TREE PROTECTION FENCING SHALL BE INSTALLED, MAINTAINED AND REPAIRED BY THE CONTRACTOR DURING SITE CONSTRUCTION.

5. THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAN THREE INCHES IN DIAMETER WHEN EXCAVATING NEAR EXISTING TREES. EXCAVATION IN THE VICINITY OF TREES SHALL PROCEED WITH CAUTION. THE CONTRACTOR SHALL CONTACT THE CITY INSPECTOR.

6. THE ROOT PROTECTION ZONE IS THAT AREA SURROUNDING A TREE, AS MEASURED BY A RADIUS FROM THE TREE TRUNK, IN WHICH NO EQUIPMENT, VEHICLES OR MATERIALS MAY OPERATE OR BE STORED. THE REQUIRED RADIUS LENGTH IS 1 FOOT PER DIAMETER INCH OF THE TREE. FOR EXAMPLE, A 10-INCH DIAMETER TREE WOULD HAVE A 5-FOOT RADIUS ROOT PROTECTION ZONE AROUND THE TREE. ROOTS OR BRANCHES THAT ARE IN CONFLICT WITH THE CONSTRUCTION SHALL BE CUT CLEANLY ACCORDING TO PROPER PRUNING METHODS. LIVE OAK WOUNDS SHALL BE PAINTED OVER, WITHIN 20 MINUTES TO PREVENT OAK WILT.

7. ACCESS TO FENCED AREAS WILL BE PERMITTED ONLY WITH THE APPROVAL OF THE ENGINEER OR CITY INSPECTOR.

8. GRADING, IF REQUIRED, SHALL BE LIMITED TO A 3 INCH CUT OR FILL WITHIN THE FENCEO ROOT ZONE AREAS.

9. TREES, SHRUBS OR BUSHES TO BE CLEARED FROM PROTECTED ROOT ZONE AREAS SHALL BE REMOVED BY HAND AS DIRECTED BY THE PROJECT MANAGER OR CITY INSPECTOR.

10. TREES DAMAGED OR LOST DUE TO CONTRACTOR'S NEGLIGENCE DURING CONSTRUCTION SHALL BE MITIGATED TO THE ENGINEER'S SATISFACTION.

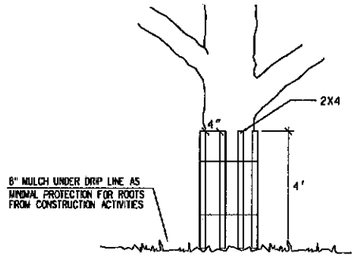
11. EXPOSED ROOTS SHALL BE COVERED AT THE END OF EACH DAY USING TECHNIQUES SUCH AS COVERING WITH SOIL, MULCH OR WET BURLAP.

12. ANY TREE REMOVAL SHALL BE APPROVED BY THE CITY ARBORIST PRIOR TO ITS REMOVAL.

1.3 GENERAL NOTES

TREE PROTECTION TABLE

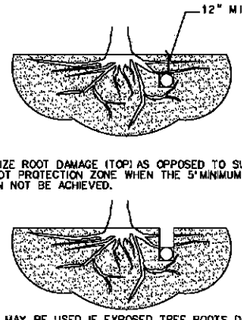
PROTECTION MEASURE						
TREE SHEET #	TREE/CALIPER SHEET #	STATION OR NUMBER	LOCATION	ITEM 801	ITEM 802 MAINTENCE/ TREATMENTS/ PROTECTION	REMOVAL SEE GENERAL NOTE No. 2
ASH	13"	FROM SE CORNER WEST 50'			TREE REMOVAL	
	9					
ASH	20"	SOUTHEAST CORNER			LEVEL IIA	
	9					
ASH	34"	FROM SE CORNER NORTH 85'			LEVEL IIB	



1.1.4 LEVEL IIB FENCE PROTECTION
N. T. S.

TREES THAT ARE MARKED TO BE PRESERVED ON A SITE PLAN AND FOR WHICH UTILITIES MUST PASS TROUGH THEIR ROOT PROTECTION ZONES MAY REQUIRE TUNNELING AS OPPOSED TO OPEN TRENCHES. THE DECISION TO TUNNEL WILL BE DETERMINED ON A CASE BY CASE BASIS BY THE ENGINEER.

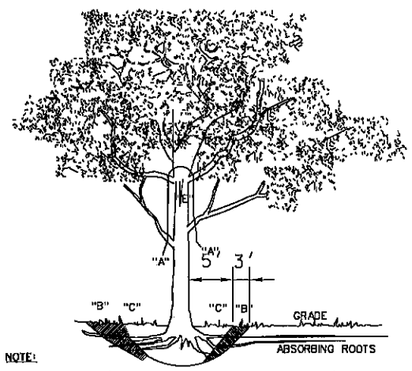
TUNNELS SHALL BE DUG THROUGH THE ROOT PROTECTION ZONE IN ORDER TO MINIMIZE ROOT DAMAGE.



TUNNEL TO MINIMIZE ROOT DAMAGE (TOP) AS OPPOSED TO SURFACE-DUG TRENCHES IN ROOT PROTECTION ZONE WHEN THE 5' MINIMUM DISTANCE FROM TRUNK CAN NOT BE ACHIEVED.

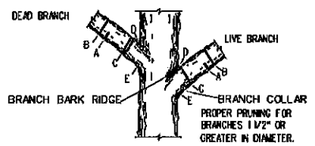
OPEN TRENCHING MAY BE USED IF EXPOSED TREE ROOTS DO NOT EXCEED 3" OR ROOTS CAN BE BENT BACK.

1.2 BORING THRU TREE ROOT ZONE
N. T. S.



NOTE:
"A" REMOVE BULKY TREE PARTS "SHRED" AND/OR HAUL SEPARATELY.
"B" BEGIN EXCAVATION APPROX. 6' FROM THE TRUNK - CUT THRU ANCHOR ROOTS AT AN ANGLE - 3' TO 4' DEEP
"C" USING TREE TRUNK AS A LEVER PUSH AT POINT "E" TO REMOVE TREE BOLE AND LARGE FEEDER ROOTS (4" TO 10" IN DIAM.)
"D" BACKFILL HOLE AND CLEAN UP.

1.3 TREE REMOVAL DIAGRAM
N. T. S.



NOTE: DO NOT CUT FROM D to E.

A. FIRST CUT - TO PREVENT THE BARK FROM BEING PEELED WHEN THE BRANCH FALLS.
B. SECOND CUT - TO REDUCE THE WEIGHT OF BRANCH.
C. FINAL CUT - ALLOW FOR HEALING COLLAR BUT NO STUBS
D. BRANCH RIDGES - INDENT PROPERLY BRANCH RIDGES WHICH ARE SITE FOR DECAY.

FOR OAKS ONLY: PAINT ALL WOUNDS OR CUTS WITH PRUNING PAINT WITHIN 20 MIN TO PREVENT THE SPREAD OF OAK WILT.

1.4 BRANCH PRUNING DETAIL
N. T. S.

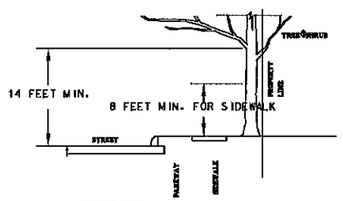
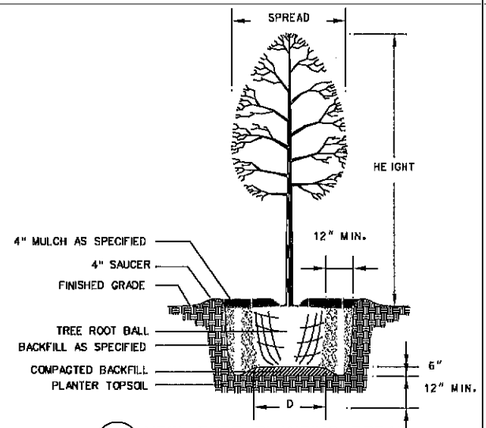


FIGURE No.2:

A MINIMUM BRANCH CLEARANCE OF 14 FEET ABOVE STREET ELEVATION MUST BE MAINTAINED FROM THE PROPERTY LINE TO THE CURB LINE AS PRESCRIBED BY PROJECT MANAGER.

1.5 BRANCH CLEARANCE DETAIL
N. T. S.



1.6 NEW TREE PLANTING DETAIL
N. T. S.

1.3 TREE PROTECTION TABLE

TREE INVENTORY SUMMARY
(8" DIAMETER AND LARGER)

TOTAL DIAMETER INCHES, R.O.W _____
TOTAL DIAMETER INCHES REMOVED _____
TOTAL DIAMETER INCHES PRESERVED _____
TOTAL PERCENTAGE INCHES PRESERVED _____
TOTAL INCHES TO BE MITIGATED _____

1.3 TREE INVENTORY SUMMARY

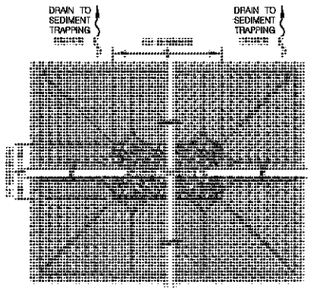
PREPARED BY: FERNANDEZ FRAZER WHITE & ASSOC. INC. & C.F. ZAVALA GROUP

CITY OF SAN ANTONIO

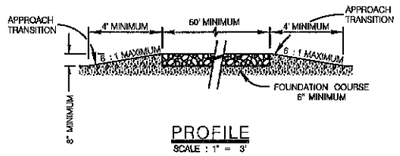
DEPARTMENT OF PUBLIC WORKS

CITY OF SAN ANTONIO
TREE PROTECTION DETAILS
TREE PRESERVATION

DESIGNED:	FED. RD. DIV. NO.	STATE			SHT. NO.
CHECKED:		TEXAS			1 OF 4
DRAWN:	STATE DIST. NO.	COUNTY	CONTROL NO.	SECT. NO.	JOB NO.	HIGHWAY NO.
CHECKED:		BEXAR				



PLAN
SCALE : 1" = 3'

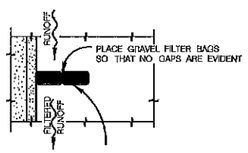


PROFILE
SCALE : 1" = 3'

GENERAL NOTES

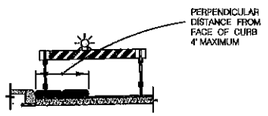
1. THE LENGTH OF THE TYPE 1 CONSTRUCTION EXIT SHALL BE AS INDICATED ON THE PLANS, BUT NOT LESS THAN 50'.
2. THE COARSE AGGREGATE SHOULD BE OPEN GRADED WITH A SIZE OF 4" TO 8".
3. THE APPROACH TRANSITIONS SHOULD BE NO STEEPER THAN 8 : 1 AND CONSTRUCTED AS DIRECTED BY THE ENGINEER.
4. THE CONSTRUCTION EXIT FOUNDATION COURSE SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL AS APPROVED BY THE ENGINEER.
5. THE CONSTRUCTION EXIT SHALL BE GRADED TO ALLOW DRAINAGE TO A SEDIMENT TRAPPING DEVICE.
6. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

CONSTRUCTION EXIT – TYPE 1



3 /4" GRAVEL CONTAINED IN PERVIOUS BURLAP BAGS OR SYNTHETIC NET BAGS (1 /8" MESH) APPROX. 24" LONG, 12" WIDE AND 6" HIGH

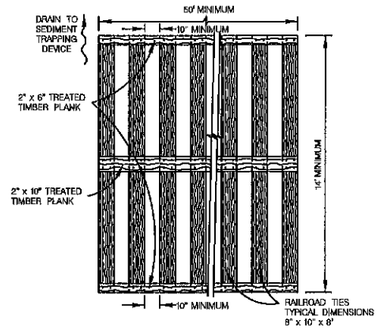
PLAN
SCALE : 1" = 5'



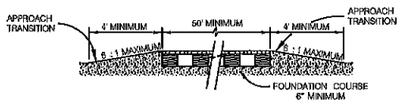
ELEVATION
SCALE : 1" = 5'

NOTE:
STRADDLE GRAVEL FILTER BAGS WITH TYPE I BARRICADES MOUNTED WITH TYPE "A" FLASHING WARNING LIGHT. SEE BARRICADE CONSTRUCTION SIGN DETAILS. PLACE FLASHING LIGHTS AWAY FROM GUTTER, FLUSH WITH OUTSIDE EDGE OF BAG CONFIGURATION.

GRAVEL FILTER BAGS



PLAN
SCALE : 1" = 3'

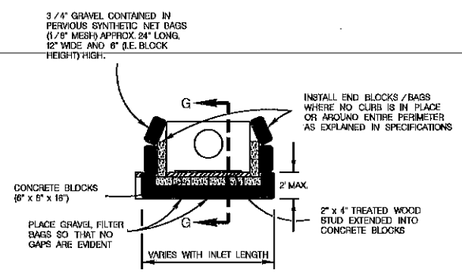


PROFILE
SCALE : 1" = 3'

GENERAL NOTES

1. THE LENGTH OF THE TYPE 2 CONSTRUCTION EXIT SHALL BE AS INDICATED ON THE PLANS, BUT NOT LESS THAN 50'.
2. THE TREATED TIMBER PLANKS SHALL BE ATTACHED TO THE RAILROAD TIES WITH 1/2" x 6" MIN LAG BOLTS. OTHER FASTENERS MAY BE USED AS APPROVED BY THE ENGINEER.
3. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MIN., AND SHOULD BE FREE FROM LARGE AND LOOSE KNOTS.
4. THE APPROACH TRANSITIONS SHOULD BE NO STEEPER THAN 8 : 1 AND CONSTRUCTED AS DIRECTED BY THE ENGINEER.
5. THE CONSTRUCTION EXIT FOUNDATION COURSE SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL AS APPROVED BY THE ENGINEER.
6. THE CONSTRUCTION EXIT SHOULD BE GRADED TO ALLOW DRAINAGE TO A SEDIMENT TRAPPING DEVICE.
7. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

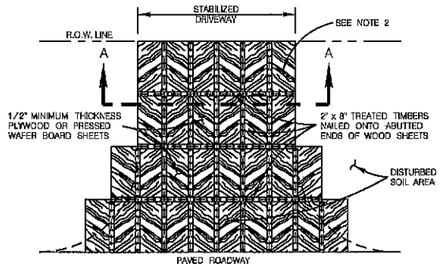
CONSTRUCTION EXIT – TYPE 2



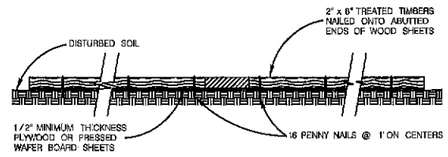
PLAN
SCALE : 1" = 5'

NOTE:
GRAVEL FILTERS CAN BE USED ON PAVEMENT OR BARE GROUND.

CURB INLET GRAVEL FILTER



PLAN
SCALE : 1" = 10'

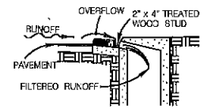


SECTION A–A
SCALE : 1" = 1'

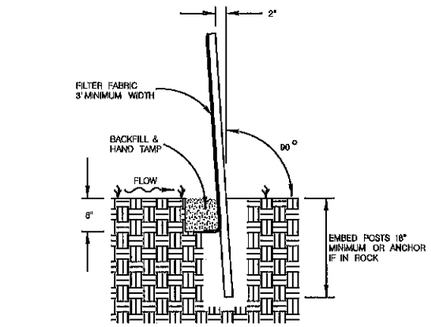
GENERAL NOTES

1. THE LENGTH OF THE TYPE 3 CONSTRUCTION EXIT SHALL BE AS INDICATED ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.
2. THE TYPE 3 CONSTRUCTION EXIT MAY BE CONSTRUCTED FROM OPEN GRADED CRUSHED STONE WITH A SIZE OF 2 TO 4 INCHES SPREAD A MINIMUM OF 4 INCHES THICK TO THE LIMITS SHOWN ON THE PLANS.
3. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MIN., AND SHOULD BE FREE FROM LARGE AND LOOSE KNOTS.
4. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

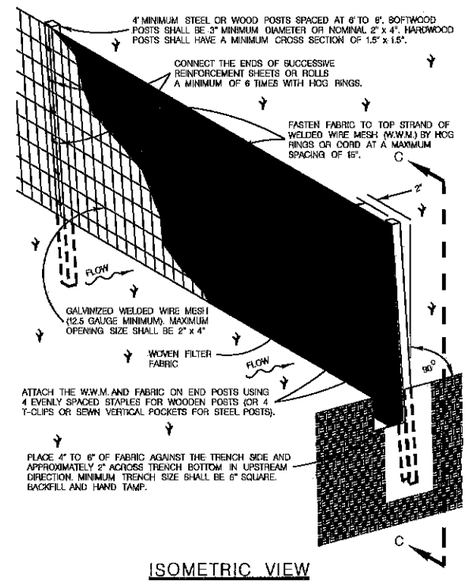
CONSTRUCTION EXIT – TYPE 3



SECTION G–G
SCALE : 1" = 5'



SECTION C–C
SCALE : 1" = 1'



ISOMETRIC VIEW
SCALE : 1" = 1'

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A SEDIMENT CONTROL FENCE MAY BE CONSTRUCTED NEAR THE DOWNSTREAM PERIMETER OF A DISTURBED AREA ALONG A CONTOUR TO INTERCEPT SEDIMENT FROM OVERLAND RUN-OFF. A 2 YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE TO BE FILTERED.

SEDIMENT CONTROL FENCE SHOULD BE SIZED TO FILTER A MAXIMUM FLOW THRU RATE OF 100 GPM /FT SQUARED. SEDIMENT CONTROL FENCE IS NOT RECOMMENDED TO CONTROL EROSION FROM A DRAINAGE AREA LARGER THAN 2 ACRES.

GENERAL NOTES

1. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

TEMPORARY SEDIMENT CONTROL FENCE

JANUARY 2005

STANDARD PLANS
CITY OF SAN ANTONIO, TEXAS
DEPARTMENT OF PUBLIC WORKS

TEMPORARY EROSION, SEDIMENT & WATER POLLUTION CONTROL MEASURES STANDARDS 1

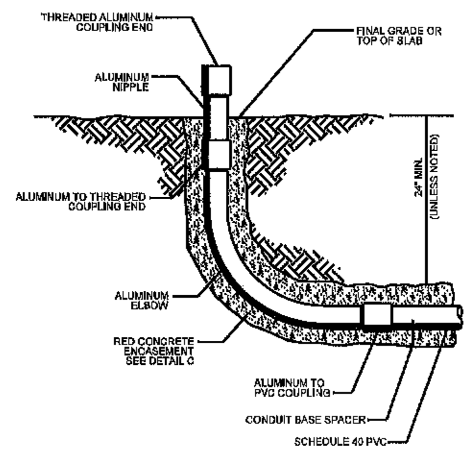
DRAWN BY: V. VASQUEZ	DATE	REVISIONS	SCALE: SEE ABOVE
CHECKED BY: NAT HARDY, P.E.			DATE:

ELECTRICAL SYMBOLS

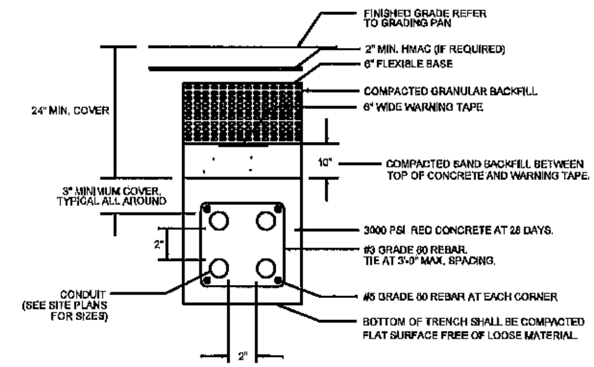
SYMBOL	DESCRIPTION
	GROUND TEST WELL, REFER TO STANDARD DETAIL
	COPPERCLAD GROUND ROD
	CONTACT - NORMALLY OPEN
	CONTACT - NORMALLY CLOSED
	CIRCUIT BREAKER - THERMAL MAGNETIC 3 POLE UNLESS INDICATED OTHERWISE CONTINUOUS AMP TRIP SETTING INDICATED
160A	FUSED SWITCH - SWITCH AND FUSE CURRENT RATING INDICATED.
	SURGE ARRESTOR
	FUSE
	UNDERGROUND CONDUIT
	CONDUIT ABOVE GROUND
	CONDUIT - UP
	CONDUIT - DOWN
	CONDUIT - STUBBED AND CAPPED AS SHOWN
OHE	OVERHEAD ELECTRIC LINES
	LUMINAIRE AND POLE, TYPE AS NOTED
	CONVENIENCE RECEPTACLE-DUPLEX UNLESS SPECIFIED OTHERWISE
	GROUND
2000KVA 4160/480V	POWER DISTRIBUTION TRANSFORMER VOLTAGES AND RATING INDICATED AS APPLICABLE.
	GROUNDING CONNECTION EXOTHERMIC OR COMPRESSION
	ABOVE GRADE TAIL FOR EQUIPMENT CONNECTION. TO BE LOCATED FOR PROPER EQUIPMENT ENTRANCE. PENETRATION THRU CONCRETE TO HAVE SCHEDULE 80 PVC PIPE SEGMENT.

ABBREVIATIONS	
AC	ALTERNATING CURRENT
A/C	AIR CONDITIONING
AI	ANALOG INPUT
AO	ANALOG OUTPUT
AUTO	AUTOMATIC
C,COND	CONDUIT
C	CONDUCTORS (#/C IN CABLE)
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CTRL	CONTROL
CU	COPPER
DC	DIRECT CURRENT
DS	DISCONNECT SWITCH
DI	DIGITAL INPUT
G,GRD,GND	GROUND
GALV	GALVANIZED
GFI	GROUND FAULT INTERRUPTER
HOA	HAND OFF AUTOMATIC
J,JB	JUNCTION BOX
KVA	KILOVOLT-AMPERE
LT	LEVEL TRANSDUCER
LTG	LIGHTING
MIN	MINIMUM
MTR	METER
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
PC	PHOTOCELL
PH	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL
PP	POWER PANEL
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
PWR	POWER
R	RELAY
REQD	REQUIRED
RF	RADIO FREQUENCY
RGS	RIGID GALVANIZED STEEL
SA	SURGE ARRESTOR
SCADA	SUPERVISORY CONTROL AND DATA AQUISITION
SS	STAINLESS STEEL
TWSH/PR	TWISTED SHIELDED PAIR
UGE	UNDERGROUND ELECTRIC
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VP	VAPOR PROOF
W	WITH
WP	WEATHER PROOF
XFMR	TRANSFORMER
XMTR	TRANSMITTER

(A) LEGEND
SCALE: N.T.S.



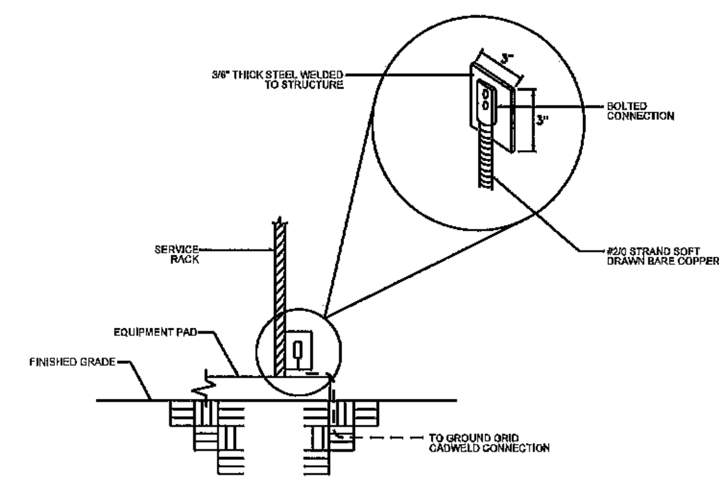
(B) TYPICAL DUCT BANK TRANSITION DETAIL
SCALE: N.T.S.



NOTES:

1. PROVIDE 100% CONCRETE ENCASEMENT BOTH HORIZONTALLY AND VERTICALLY.
2. WRAP ALL CONCRETE ENCASED ALUMIUM PER SPECIFICATIONS.

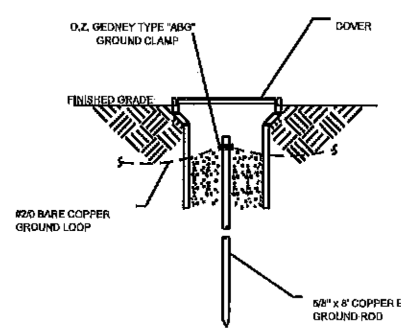
(C) TYPICAL LOW VOLTAGE DUCT BANK SECTION
SCALE: N.T.S.



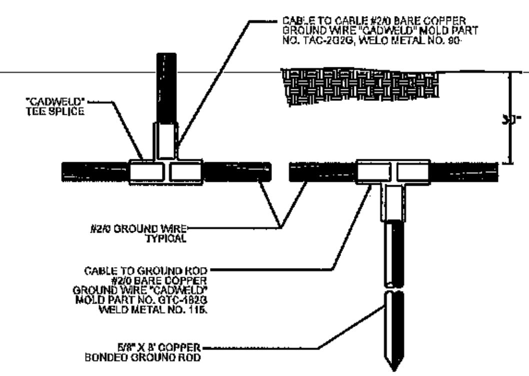
(F) TYPICAL STRUCTURE GROUND DETAIL
SCALE: N.T.S.

NOTE:

IF METAL STRUCTURES ARE NOT FURNISHED WITH PROVISION FOR BOLTED CONNECTION TO GROUNDING GRID, CONTRACTOR SHALL PROVIDE WELDED PAD FOR GROUND CONNECTION.



(D) GROUND TEST WELL ARRANGEMENT
SCALE: N.T.S.



NOTE: THIS DETAIL DOES NOT EXCLUDE CONTRACTOR FROM USING OTHER APPROVED PRODUCTS.

(E) TYPICAL GROUNDING DETAIL
SCALE: N.T.S.

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

GRUBB ENGINEERING, INC.
ELECTRICAL POWER SYSTEMS DESIGN AND TESTING
3128 SIDNEY BROOKS, SAN ANTONIO, TEXAS 78235
BUS: (210) 658-7250 FAX: (210) 658-9805
TBPE FIRM REGISTRATION #2904

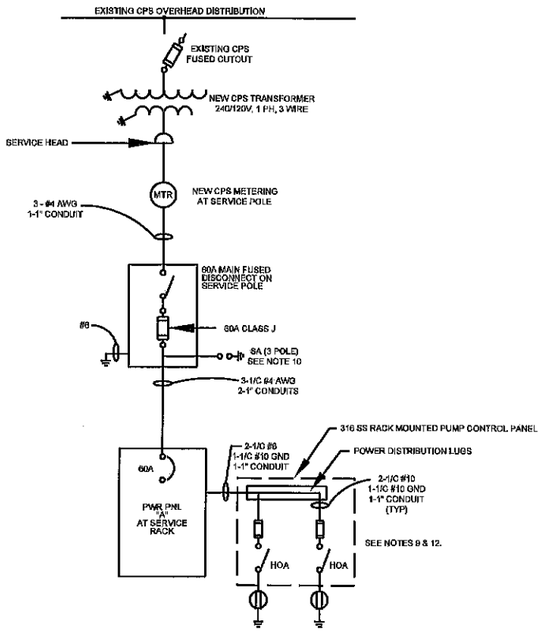
Date: 5-10-12
Drawn by: SG
Designed by: BD
Checked by: SM
Scale: AS NOTED
Aproved by: RDG
Map No:

San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

GENERAL ELECTRICAL LEGEND AND MISCELLANEOUS DETAILS

DRAWING NO.



ELECTRICAL LOAD ANALYSIS

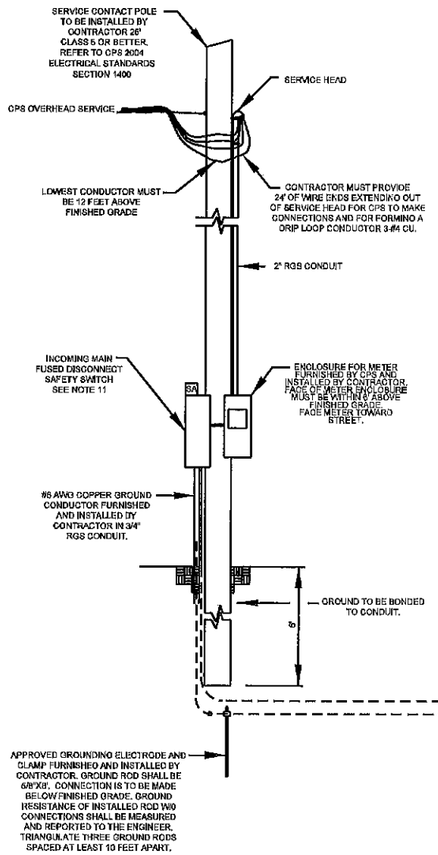
	CONNECTED LOAD
POWER PANEL "A"	6KVA

A ONE LINE DIAGRAM
SCALE: N.T.S.

POWER PANEL "A"							
TYPE: 100A COPPER BUS 60A MAIN BREAKER 240V/120V 1-PHASE, 3-WIRE							SERVICE ENTRANCE RATED WITH ISOLATED NEUTRAL BUS WITH ISOLATED GROUND BUS
PUMP CONTROL PANEL	40	1	1	2	1	20	RACK RECEPT.
SCADA/RADIO PANEL	20	1	3	4	1	20	SITE LIGHT
SCADA PANEL HEATER	20	1	5	6	1	20	SCADA PANEL A/C
SPARE	20	1	7	8	1	20	SPARE
SPARE	20	1	9	10	1	20	SPARE

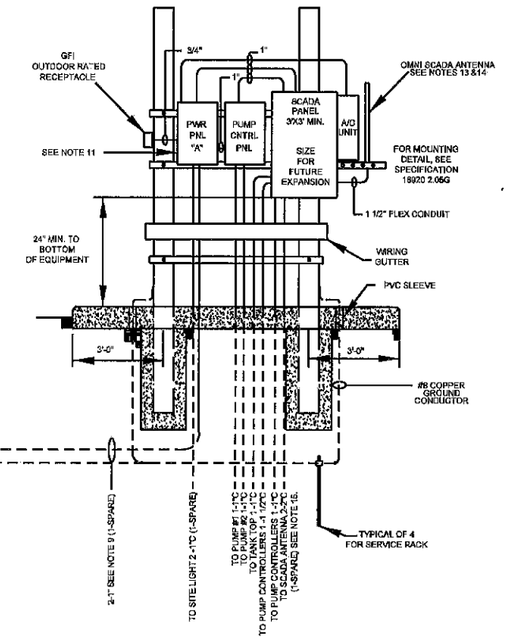
NOTE: EACH CIRCUIT SHALL HAVE SEPARATE HOT, NEUTRAL, GROUND WIRES. DO NOT SHARE NEUTRAL OR GROUND WIRES FROM OTHER CIRCUIT.

B ELECTRICAL PANEL SCHEDULE
SCALE: N.T.S.

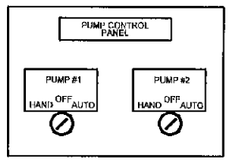


C ELECTRICAL RISER POLE
SCALE: N.T.S.

NOTES:
1. ALL UNDERGROUND ELECTRIC CONDUIT RUNS SHALL BE CONCRETE ENCASED.
2. ABOVEGROUND CONDUIT SHALL BE ALUMINUM.
3. UNDERGROUND CONDUIT SHALL BE RIGID NON-METALLIC CONDUIT.
4. ALL ENCLOSURES AND DISCONNECTS MUST BE PAD-LOCKABLE.
5. ALL MOUNTING HARDWARE AND STRUT SHALL BE 316 STAINLESS STEEL.
6. CONTROL PANELS SHALL BE NEMA 4X, 316 STAINLESS STEEL, PROVIDED WITH TOP AND SIDE SUNSHIELD.
7. SERVICE RACK STRUTS NEED TO BE 1-1/2" MINIMUM 316 STAINLESS STEEL AND BE MOUNTED ON I-BEAMS AS SHOWN.
8. THERE SHALL BE 6' MINIMUM SPACING BETWEEN EQUIPMENT MOUNTED ON THE RACK.
9. AUTOMATIC POSITION OF HOA SWITCH WILL NOT BE CONNECTED AS PART OF THIS PROJECT.
10. PROVIDE BREAKER FOR SURGE ARRESTOR AS RECOMMENDED BY MANUFACTURER.
11. POWER PANEL AND DISCONNECT SWITCH SHALL BE NEMA 4X 316 STAINLESS STEEL.
12. RECEPTACLES SHALL BE 20AMP OUTDOOR RATED UNITS.
13. FOR COMMUNICATION DIAGRAM, SEE SHEET 21 DETAIL A.
14. APPLIES TO NORTHWEST SIDE SERVICE CENTER LOCATION ONLY.
15. APPLIES TO MISSION TRAILS LOCATION ONLY.



D INCOMING SERVICE RACK
SCALE: N.T.S.



E PUMP CONTROL PANEL SWING PANEL LAYOUT
SCALE: N.T.S.

STATE OF TEXAS
ROBERT D. GRUBB
38772
REGISTERED PROFESSIONAL ENGINEER
5/10/12

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

GRUBB ENGINEERING, INC.
TBPE FIRM REGISTRATION #3594
TBPE FIRM REGISTRATION #3594

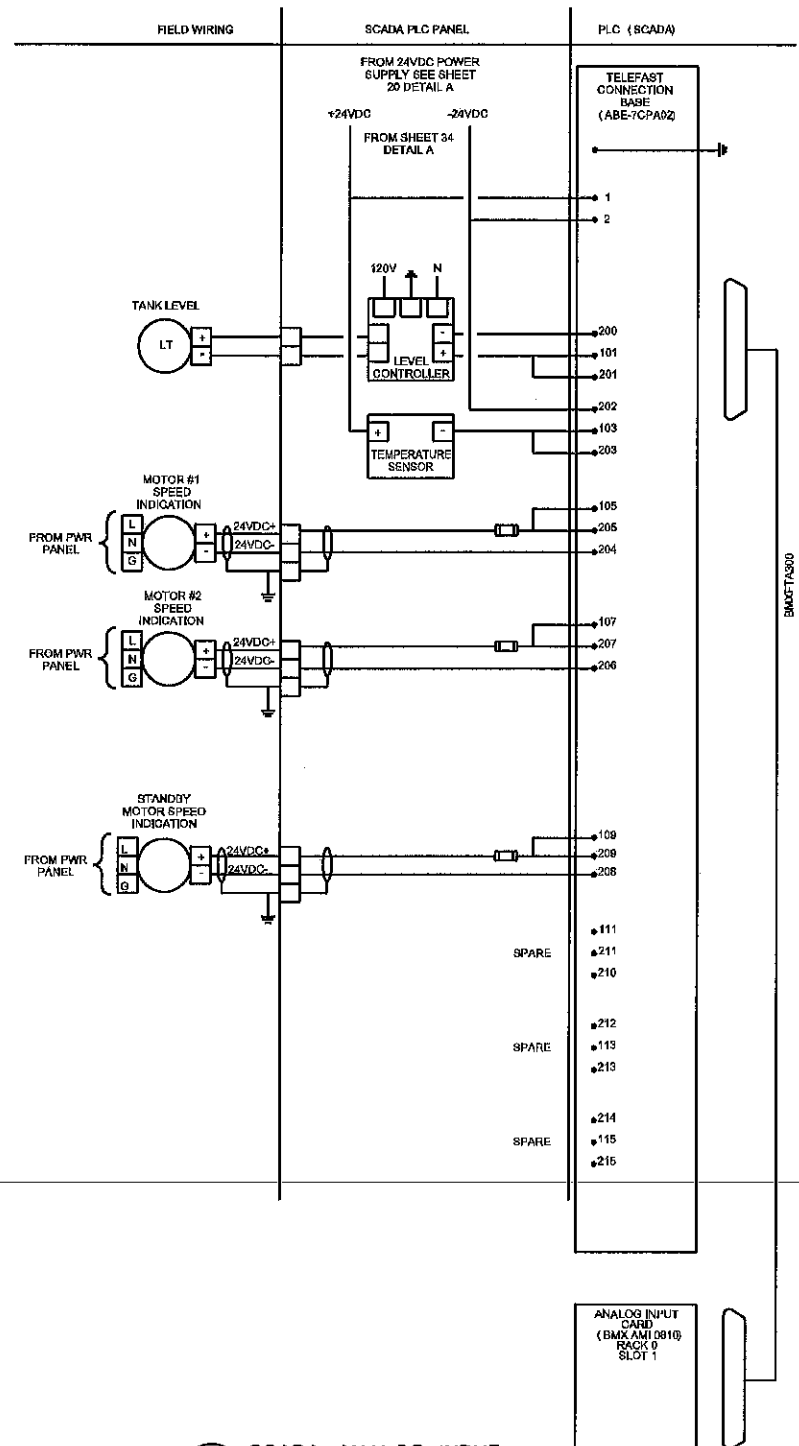
Date: 5-10-12
Drawn by: SG
Designed by: BD
Checked by: SM
Scale: AS NOTED
Aproved by: RDG
Map No:

San Antonio Water System

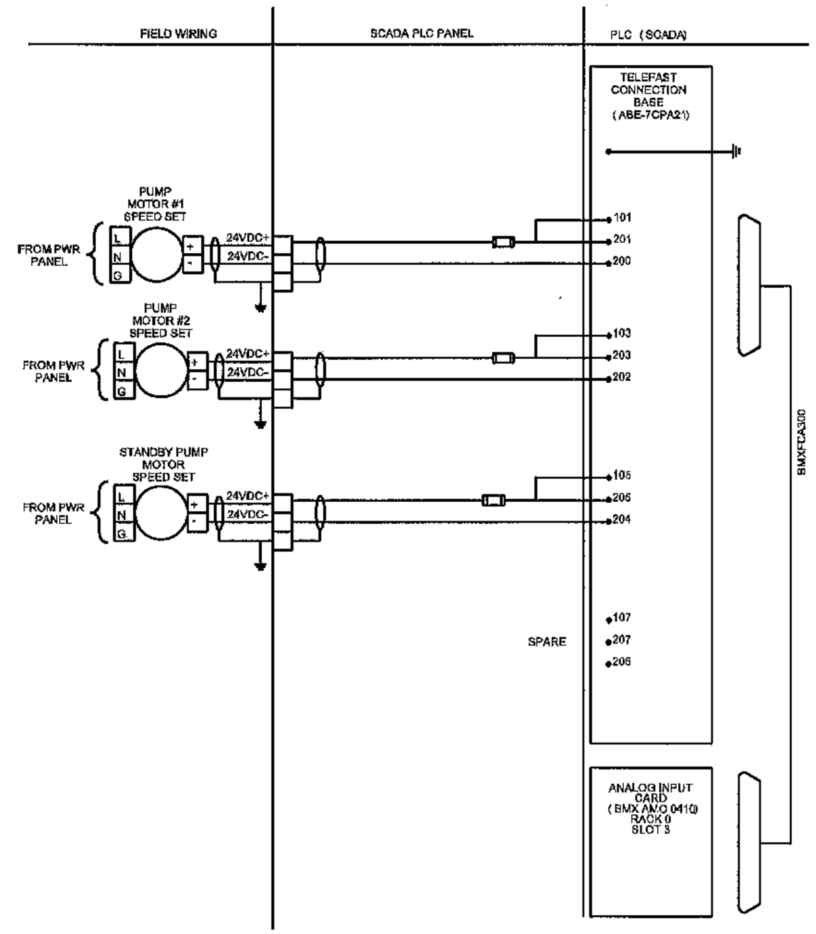
PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

GENERAL ELECTRICAL ONE-LINES AND PANEL DETAILS

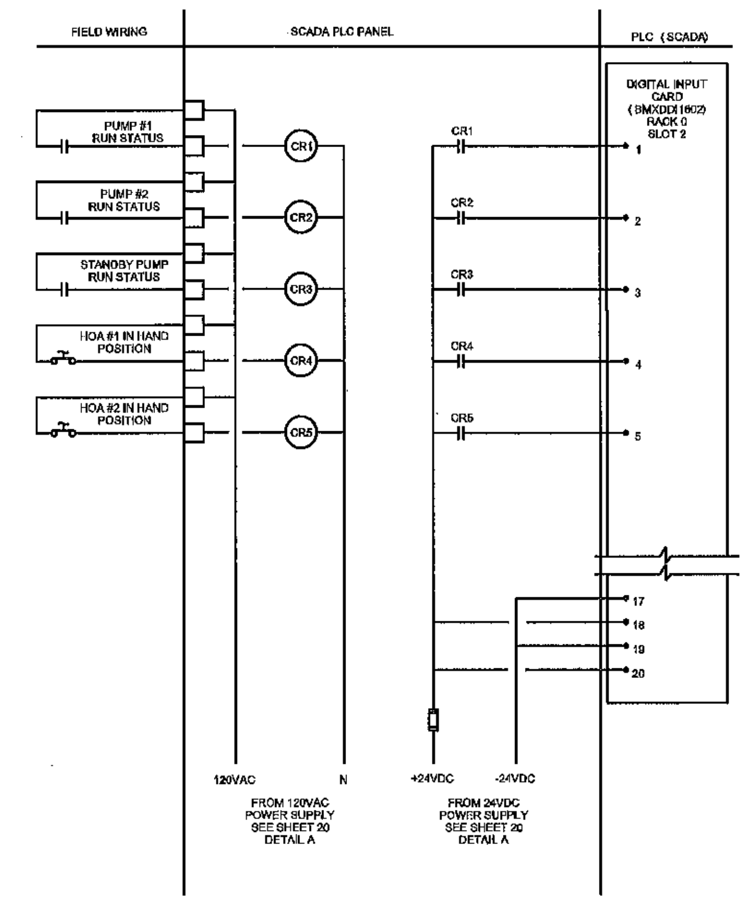
DRAWING NO.
18 OF 21



A SCADA ANALOG INPUT
SCALE: N.T.S.



B SCADA ANALOG OUTPUT
SCALE: N.T.S.

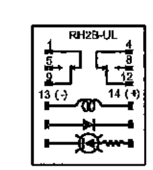


C SCADA DIGITAL INPUT
SCALE: N.T.S.

NOTE:

ALL DIAGRAMS APPLY TO BOTH SITES.

ITEM	DESCRIPTION	PART #	MFG
CR1-CR5	2PDT RELAY WITH LED PUMP RUN INDICATION	RH2B-UL-120VAC	IDEC



D DEVICE SCHEDULE
SCALE: N.T.S.

JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION
GRUBB ENGINEERING, INC.

Date: 5-10-12
Drawn by: SG
Designed by: BD
Checked by: SM
Scale: AS NOTED
Aproved by: RDG
Map No:

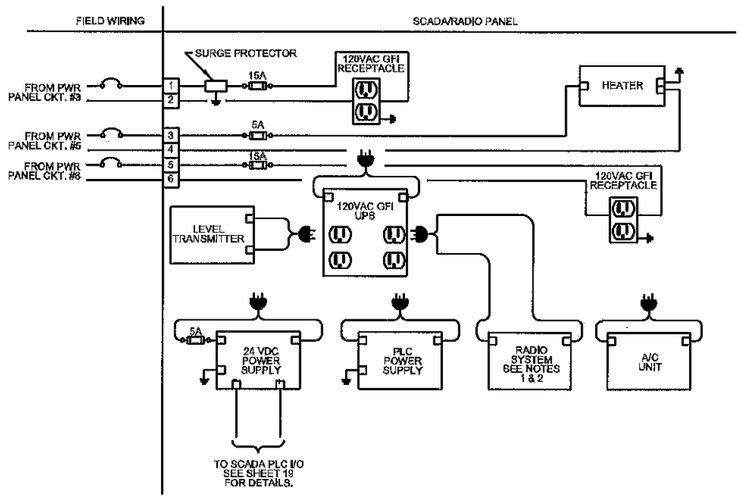
San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

GENERAL SCADA DETAILS

ROBERT D. GRUBB 36772

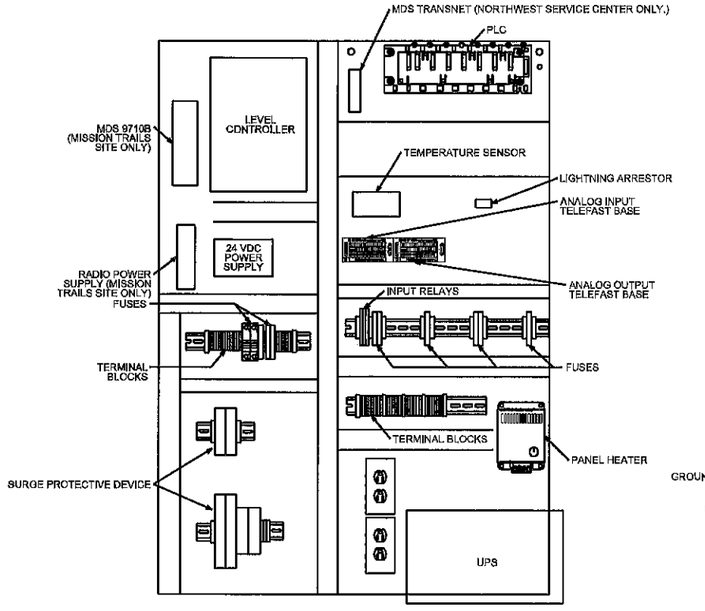
DRAWING NO.
19 OF 21



A SCADA POWER DISTRIBUTION

SCALE: N.T.S.

NOTES:
1. MISSION TRAILS SITE SHALL BE EQUIPPED WITH MDS P70 UNIT TO INCLUDE MDS 9710 RADIO TRANSCEIVER.
2. NORTHWEST SERVICE CENTER SITE SHALL BE EQUIPPED WITH MDS P70 UNIT TO INCLUDE MDS TRANSNET RADIO TRANSCEIVER.

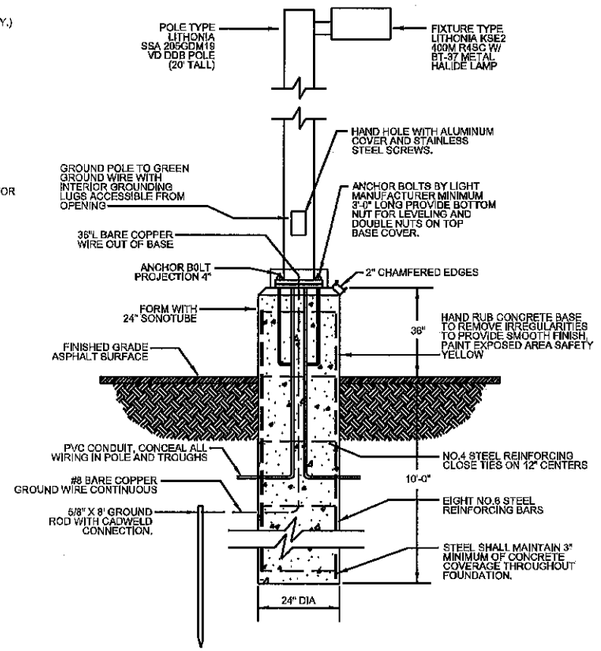


B SCADA PANEL LAYOUT (3'X3' MINIMUM)

SCALE: N.T.S.

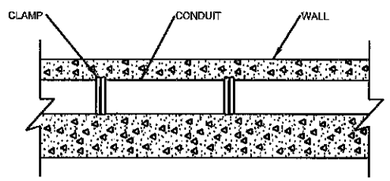
NOTE:

SIZE SCADA PANEL FOR FUTURE EXPANSION. SEE NOTES 1 & 2 DETAIL A



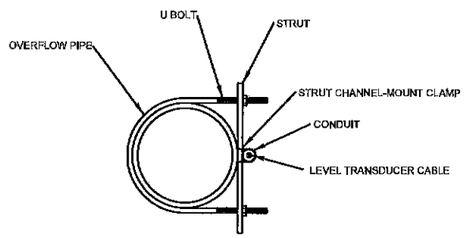
C LIGHT POLE FOUNDATION (TYP.)

SCALE: N.T.S.



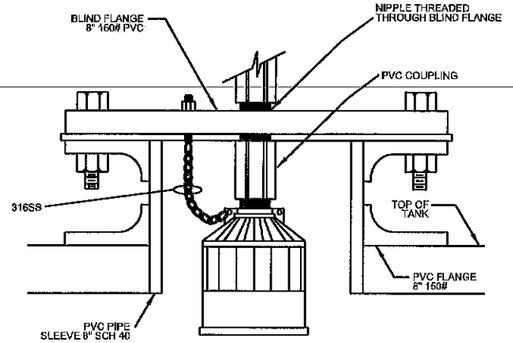
D CONDUIT MOUNTING DETAIL

SCALE: N.T.S.



E LEVEL TRANSDUCER CABLE MOUNTING DETAIL

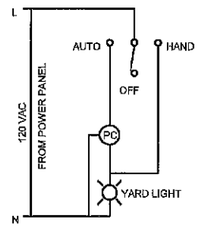
SCALE: N.T.S.



NOTE: NO SPLICES IN TRANSDUCER CABLE.

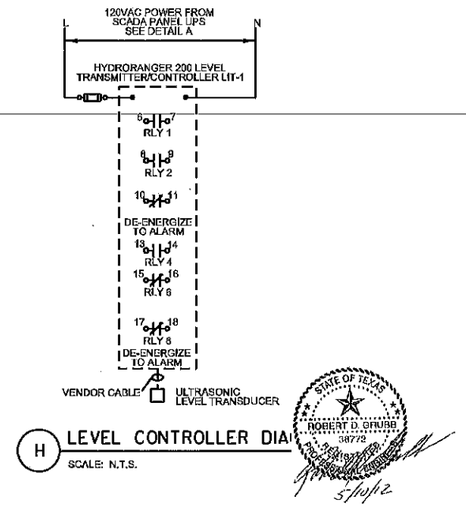
F LEVEL TRANSDUCER MOUNTING DETAIL

SCALE: N.T.S.



G PHOTOCELL SCHEMATIC

SCALE: N.T.S.



H LEVEL CONTROLLER DIA

SCALE: N.T.S.

STATE OF TEXAS
ROBERT D. GRUBB
38772
5/10/12

JOB NO.
08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

GRUBB ENGINEERING, INC.
REGISTERED ENGINEERING FIRM F-2595
REGISTERED LANDSCAPE ARCHITECTURAL FIRM
3139 STANLEY BROOKS, SAN ANTONIO, TEXAS 78235
(210) 521-9992 FAX (210) 521-9993
TBPE FIRM REGISTRATION #2624

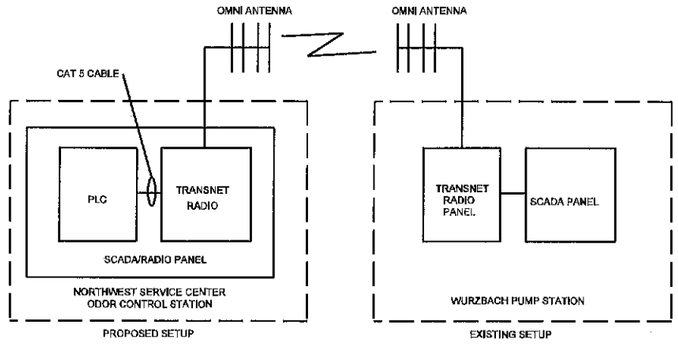
Date: 5-10-12
Drawn by: SG
Designed by: BD
Checked by: SM
Scale: AS NOTED
Aproved by: RDG
Map No:

San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

GENERAL
SCADA AND TRANSDUCER MOUNTING DETAILS

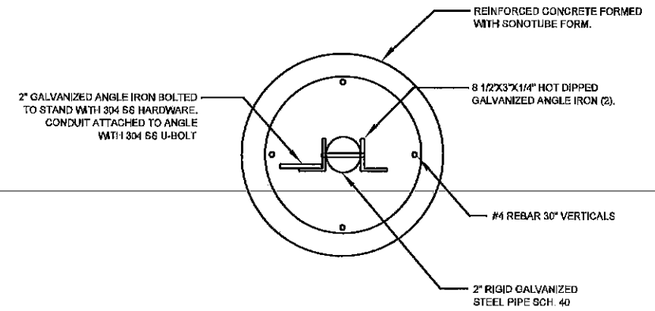
DRAWING NO.
20 OF 21



APPLIES TO NORTHWEST SERVICE CENTER SITE ONLY.

A RADIO COMMUNICATION DETAIL

SCALE: N.T.S.

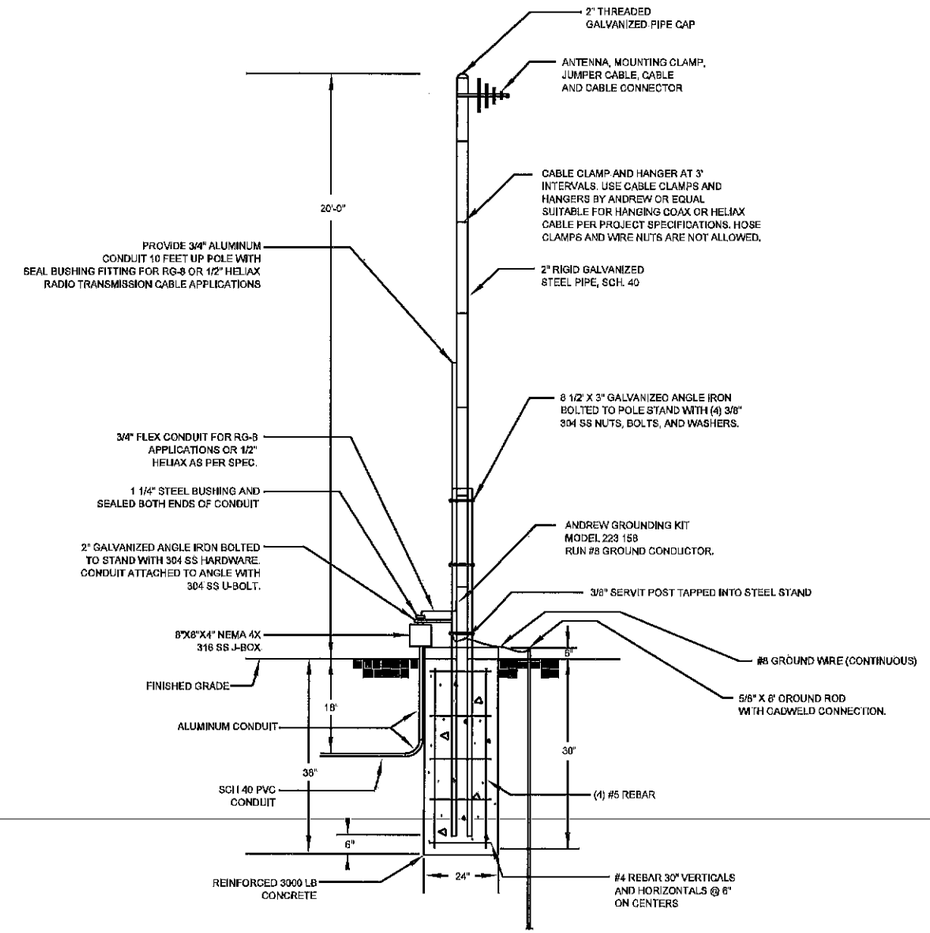


B PLAN VIEW SCADA ANTENNA POST & FOUNDATION

SCALE: N.T.S.

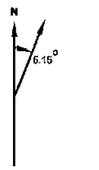
NOTES:

1. FOR COMPUTER BASED RADIO PATH SURVEY REPORT, SEE SPEC SECTION 16620 APPENDIX C.
2. GRUBB ENGINEERING WAS TO PERFORM COMPUTER BASED STUDY ONLY AND DOES NOT GUARANTEE RESULTS WITHOUT PHYSICAL STUDY. SAWS IS RESPONSIBLE FOR VERIFICATION OF RESULTS VIA FIELD MEASUREMENTS.
3. SAWS INSPECTOR TO COORDINATE WITH SAWS TECHNICIAN THE RADIO PATH STUDY FIELD VERIFICATION.
4. ANTENNA HEIGHT MAY CHANGE SUBJECT TO SAWS RADIO PATH FIELD VERIFICATION. IF HEIGHT EXCEEDS 20 FT, CONTRACTOR TO USE ROHN TOWER. PART NUMBERS & DETAILS SHALL BE PROVIDED BY SAWS TECHNICIAN.



C SIDE VIEW SCADA ANTENNA POST & FOUNDATION

SCALE: N.T.S.



TO HILDEBRAND TANK

ANTENNA ORIENTATION
APPLIES TO MISSION TRAILS SITE

JOB NO. 08-2504

LIFT STATIONS REHABILITATION DESIGN - PHASE 3

INFORMATION

GRUBB ENGINEERING, INC.
ELECTRICAL & CIVIL CONSULTING ENGINEERS AND SURVEYORS
3138 SIDNEY BROOKS, SAN ANTONIO, TEXAS 78235
PHONE: (210) 521-9992 FAX: (210) 520-8999
TBPE FIRM REGISTRATION #2604

Date: 5-10-12
Drawn by: SG
Designed by: BD
Checked by: SM
Scale: AS NOTED
Aproved by: RDG
Map No:

San Antonio Water System

PART II: ODOR CONTROL SYSTEM IMPROVEMENTS PHASE II

GENERAL
RADIO COMMUNICATIONS AND MAST DETAILS

DRAWING NO.

21 OF 21