SAN ANTONIO WATER SYSTEM
DSP Clayton Tank Replacement Project
SAWS Job No. 14-6101
Solicitation No. CO-00028

ADDENDUM NO. 4
November 3, 2015

TO BIDDER OF RECORD:

The following changes, additions, and/or deletions are hereby made a part of the Contract Documents for the SAWS DSP Clayton Tank Replacement Project, for the San Antonio Water System, San Antonio, Texas, Dated October 2015, as fully and completely as if the same were set forth therein.

BIDDING AND CONTRACT DOCUMENTS

Contract Documents

1. QUOTES PAGE

   REMOVE AND REPLACE the Quotes page included as part of Addendum #2 in its entirety with the revised version attached.

Specifications

2. SPECIFICATION – SECTION 01200

   REMOVE AND REPLACE Section 01200 included as part of Addendum #2 in its entirety with the revised version attached.

3. SPECIFICATION - SECTION 02510

   REMOVE AND REPLACE Section 02510 – Buried Steel Pipe and Fittings in its entirety with the revised version attached.

4. SPECIFICATION – SECTION 11261

   REMOVE AND REPLACE Section 11261 – Chlorination Equipment in its entirety with the revised version attached.

5. SPECIFICATION – SECTION 11312

   REMOVE Section 11312 – Booster Pumps in its entirety.

6. SPECIFICATION – SECTION 15072
   REMOVE AND REPLACE Section 15072 – Steel Pipe and Fittings in its entirety with the revised version attached.

7. SPECIFICATION – SECTION 16722
   REMOVE Section 16722 – CCTV Surveillance and Security System in its entirety.

Drawings

8. SHEET G-4

   REMOVE AND REPLACE Sheet G-4 (Sheet 4 of 99) in its entirety with the revised version attached.

9. SHEET C-SPS-5, NOTE 1

   Note 1 on Sheet C-SPS-5 (Sheet 5 of 99) states, "Power line, water, and sewer connections shall be relocated completely within the first two months after the receipt of the authorization to proceed from the owner. Relocation shall be performed at no cost to the owner."

   REVISE Note 1 on Sheet C-SPS-5 to state "Power line and water service connections shall be relocated and reconnected completely within the first two months after the receipt of the authorization to proceed from the owner."

10. SHEET C-SPS-6

    REMOVE AND REPLACE Sheet C-SPS-6 Overall Demolition Plan & Existing Yard Piping (Sheet 10 of 99) in its entirety with the revised version attached.

11. SHEET C-SPS-19
    REMOVE AND REPLACE Sheet C-SPS-19 Chemical Yard Piping Plan (Sheet 23 of 99) in its entirety with the revised version attached.

12. SHEET C-SPS-20
    REMOVE AND REPLACE Sheet C-SPS-20 Chemical Yard Piping Sheet Inset (Sheet 24 of 99) in its entirety with the revised version attached.

13. SHEET T-SPS-2

REMOVE AND REPLACE the Roof Elevation Plan detail on Sheet T-SPS-1 and the Tank Pilasters Plan View detail on sheet T-SPS-5 in their entirety with the revised detail attached as Exhibit B attached.

14. SHEET T-SPS-4

REMOVE AND REPLACE the Perimeter Drain detail on Sheet T-SPS-4 in its entirety with the revised detail attached as Exhibit C attached.

15. SHEET M-SPS-3

REMOVE AND REPLACE Sheet M-SPS-3 Proposed System PMID (Sheet 47 of 99) in its entirety with the revised version attached.

16. SHEET M-SPS-6

REMOVE AND REPLACE Sheet M-SPS-6 Proposed Chlorine System PMID (Sheet 50 of 99) in its entirety with the revised version attached.

17. SHEET M-SPS-7

REMOVE AND REPLACE Sheet M-SPS-7 Proposed Chlorine Building Plan (Sheet 51 of 99) in its entirety with the revised version attached.

18. SHEET M-SPS-8

REMOVE AND REPLACE Sheet M-SPS-8 Proposed Chlorine Building Sections (Sheet 52 of 99) in its entirety with the revised version attached.

19. SHEET M-SPS-9

REMOVE AND REPLACE Sheet M-SPS-9 Standard Mechanical Details I (Sheet 53 of 99) in its entirety with the revised version attached.

20. SHEET M-SPS-10

REMOVE AND REPLACE Sheet M-SPS-10 Standard Mechanical Details II (Sheet 54 of 99) in its entirety with the revised version attached.

21. SHEET C-CPS-2

REMOVE AND REPLACE Sheet C-CPS-2 Clayton Proposed Site Plan (Sheet 91 of 99) in its entirety with the revised version attached.

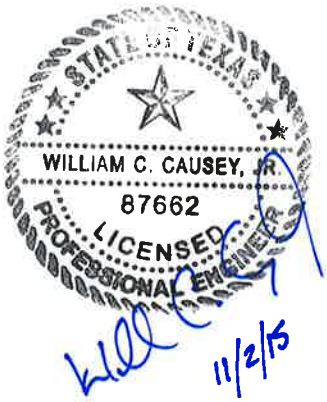
ACKNOWLEDGEMENT BY BIDDER

THE UNDERSIGNED ACKNOWLEDGES RECEIPT OF THIS ADDENDUM NO. 4 AND THE BID SUBMITTED HEREWITH IS IN ACCORDANCE WITH THE INFORMATION AND STIPULATION SET FORTH.

Date Signature of bidder

Appended hereto and part of Addendum No. 4 is:

- QUOTES PAGE
- SECTION 01200
- SECTION 02510
- SECTION 11261
- SECTION 15072
- SHEET G-4
- SHEET C-SPS-6
- SHEET C-SPS-19
- SHEET C-SPS-20
- EXHIBIT B – GST Roof/Pilaster Detail
- EXHIBIT C – GST Perimeter Drain Detail
- SHEET M-SPS-3
- SHEET M-SPS-6
- SHEET M-SPS-7
- SHEET M-SPS-8
- SHEET M-SPS-9
- SHEET M-SPS-10
- SHEET C-CPS-2



END OF ADDENDUM NO. 4

Quotes								
Line No.	**Item No.**	**Quote Category**	**SOV Item**	**Item Description**	**Unit**	**Quantity**	**Unit Bid Price**	**Total Price**
1	1	General Water Bid Items		Somerset Facility Improvements	LS	1		
2	2	General Water Bid Items		Clayton Facility Improvements	LS	1		
3	3	General Water Bid Items		Residential Existing Water Service Relocation and Reconnection.	LS	1		
4	4	General Water Bid Items		Trench Excavation Safety Protection	LS	1		
5	5	General Water Bid Items		WRIP Line Tie-In	LS	1		
6	6	General Water Bid Items		Mobilization and Demobilization (max. 8% for line items 1 through 5).	LS	1		
7	7	General Water Bid Items		CPS Energy - Overhead Electric Demolition, Relocation & Reconnection (Clayton & Somerset Facilities), $30,000	LS	1	$ 30,000.00	$ 30,000.00
8	8	General Water Bid Items		Start-Up/Commissioning Allowance, $40,000	LS	1	$ 40,000.00	$ 40,000.00
9	9	General Water Bid Items		Permitting Fees - Allowance for permitting fees associated with the Somerset and Clayton Facility Improvements, $2,000	LS	1	$ 2,000.00	$ 2,000.00

SECTION 01200
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section defines the method that will be used to determine the quantities of Work performed or materials supplied and establish the basis upon which payment will be made.

1.2 PRICE PROPOSAL

A. Required items of Work and incidentals necessary for the satisfactory completion of the Project shall be considered incidental to the specified Work required under this contract and shall be considered as included in the unit prices for the various price items. The CONTRACTOR shall prepare his price accordingly to allow for such items:

1. Not specifically listed in the price proposal form.
2. Not specified in this section to be measured or to be included in one of the items listed in the price proposal form.
3. To include CONTRACTOR's overhead and profit.

B. Work includes the furnishing of all labor, materials, equipment, tools, and related items for performing all operations required to complete the Project satisfactorily in place, as specified by the contract documents.

1.3 RELATED WORK

A. Section 01290 – Schedule of Values

B. Section 01300 - Submittals

1.4 PRICE ITEMS DESCRIPTION

A. Price Proposal Item No. 1 – Somerset Facility Improvements

1. Description –
   a. Demolition of Existing Site Components:
      1) 0.3 MG Steel GST
         a) Including Tank, Concrete Pads, and other appurtenances,
      2) Pump Station Building,
      3) Chlorine Building,
      4) Underground Piping and Electrical Utilities,
      5) Water Dispensing Station,
      6) Gate Entrance

7) Perimeter Fencing
    a) Removal of Existing Fence along South Property Line

b. Construction of 1.5 MG GST Tank and Sitework
    1) New 1.5 MG Pre-stressed Concrete, Type III GST. (Existing GST is to remain operational throughout construction with exception of temporary shut-down for system switchover to new GST.),
    2) Perimeter fence replacement as notes in the plans,
    3) Design of concrete road paving,
    4) Site grading for:
        a) New tank,
        b) Control Station No. 3,
        c) Existing Tank (existing GST to be demolished),
        d) Chemical Building,
        e) Drainage Structures, and
        f) Paving

c. Construction of Control Station No. 3
    1) New water supply control station including:
        a) Valves
        b) Piping
        c) Flow Meter
        d) Concrete Slab, and
        e) Instrumentation for the Control Station to operate as specified.

d. Construction of New Water Dispenser
    1) New Public Water Dispenser including:
        a) Concrete Structure

e. Mechanical
    1) New Control Station No. 3 including valves and piping.
    2) New Water Dispenser Station mechanical components.
    3) Yard piping modification for the new 3.5 MG GST and the new Control Station No. 3 (Prior to work in the yard, CONTRACTOR shall perform subsurface utility investigation (SUE) in yard for all tie-in locations).
    4) Above grade chemical injection improvements.
    5) Tank overflow drainage system
        a) Overflow structure at the GST with an air-gap,
        b) Tank overflow drain line to the TxDOT right-of-way along Somerset Road.

f. Chemical
    1) Design of a chlorine feed system with 150 lb cylinders. The proposed chlorine system will be located in the new chlorine building. The pump station is to remain in service during all chemical system improvements. Testing and disinfection shall be completed prior to acceptance.

2) Replacement of Chlorine yard piping required to reconnect the existing injection point to the new system.

g. Architectural and Structural
   1) New Chlorine Building
      a) CMU Masonry
   2) Water Dispenser Station
      a) CMU Masonry
      b) Stone Façade as required in contract documents
   3) Drainage Structures
   4) Slab/Pad for Control Station No. 3
   5) Canopy for the new electrical racks

h. HVAC and Plumbing
   1) Chemical Building
      a) Design the exhaust fans,
      b) Louvers,
      c) Actuators,
      d) Ducts,
      e) Dampers and
      f) HVAC system controls
   2) Eyewash for the new Chlorine Building

i. Electrical and Instrumentation
   1) Electrical feed to the new Chlorine Building
   2) Electrical feed to the new Water Dispenser Station
   3) Electrical feed to the new Control Station No. 3
   4) Electrical feed to the new site security and lighting systems.
   5) Connections to the existing SCADA system.
   6) Automatic Vehicular Entry Gate and Card Reader
      a) Card reader for one automatic vehicular entry gate
   7) New GST, Chlorine System and Control Station No. 3 instrumentation upgrades.
      a) Control narrative for the proposed system.

j. Yard Maintenance (During Construction)

k. Construction Site and Facility Security (During Construction)
   1) On-Site Security Guard: This item includes all costs to provide an on-site security guard during performance of the work, as specified in Section 01500 – Temporary Facilities and Controls

l. "Asbestos Abatement Work Plan" and "Removal, Transportation, and Disposal" as defined in Section 02504 – Asbestos Containing Material(s) Removal.

m. Lead remediation as specified in Section 02503 – Lead Paint Removal

n. All miscellaneous improvements for a complete in-place facility including all yard maintenance and site security requirements.

o. This Price Item includes all work for the Somerset Facility other than work indicated in Price Items 3 thru 8.

2. Measurement – Measurement of the Price Item No. 1 will be by the lump sum as the work progresses.

3. Payment – This item will be paid for at the contract lump sum price for work performed in accordance with the Schedule of Values. The lump sum will be pro-rated based on the percentage of work successfully completed. Payment for delivered or stored items will be allowed for major equipment and materials as approved by the OWNER. No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings and 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 prior to installation 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 the costs listed in the supplier's paid invoices and shall be in accordance with the General Conditions of the Contract.

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

   The CONTRACTOR is required to provide a cash flow projection or forecast from which cash flow graphs and charts can easily be generated and updated. The projection may be developed in Microsoft Excel or any other acceptable software. The cash flow projection must be structured in a table format and must clearly indicate the following:

   a. Period of cash flow projection
   b. Monthly budget
   c. Cumulative budget

d. Monthly actual
e. Cumulative actual

With each pay estimate, the CONTRACTOR shall also furnish baselined progress schedules that can be cross-referenced with the Schedule of Values (SOV) and Cash Flow Projection. The cash flow projections shall reflect the progress claimed on the progress schedule. Schedules shall be in accordance with Section 01300 – Submittals.

The CONTRACTOR shall provide all labor, supervision, tools, equipment, and materials necessary to furnish, install and complete tasks associated with Price Item No. 1.

1) 0.3 MG Steel GST,
2) Pump Station Building,
3) Chlorine Building,
4) Underground Piping and Electrical Utilities,
5) Water Dispensing Station,
6) Gate Entrance

B. Price Proposal Item No. 2 – Clayton Facility Improvements

1. Description –
   a. Demolition of Existing Site Components:
      1) 100,000 Gallon Steel Elevated Storage Tank,
      2) 50,000 Gallon Steel Ground Storage Tank,
      3) Existing Building/Pump House,
      4) Plug and Cap Four (4) Exisitng Wells,
      5) Miscellaneous Concrete and Drain Piping,
      6) Yard Piping and below grade Electrical Utilities
      7) Soil Testing prior to Construction and Post-Construction for Total Cadmium, Chromium VI, and Lead.

   b. Sitework
      a) Site grading to restore the site to near natural conditions.

   c. Yard Maintenance (During Construction)

   d. Construction Site and Facility Security (During Construction)
      1) On-Site Security Guard: This item includes all costs to provide an on-site security guard during performance of the work, as specified in Section 01500 – Temporary Facilities and Controls

   e. “Asbestos Abatement Work Plan” and “Removal, Transportation, and Disposal” as defined in Section 02504 – Asbestos Containing Material(s) Removal.

   f. Lead remediation as specified in Section 02503 – Lead Paint Removal

g. All miscellaneous improvements for a complete in-place facility including all yard maintenance and site security requirements.

h. This Price Item includes all work for the Clayton Facility other than work indicated in Price Items 3 thru 8.

2. Measurement – Measurement of the Price Item No. 2 will be by the lump sum as the work progresses.

3. Payment – This item will be paid for at the contract lump sum price for work performed in accordance with the Schedule of Values. The lump sum will be pro-rated based on the percentage of work successfully completed. Payment for delivered or stored items will be allowed for major equipment and materials as approved by the OWNER.

The CONTRACTOR is required to provide a cash flow projection or forecast from which cash flow graphs and charts can easily be generated and updated. The projection may be developed in Microsoft Excel or any other acceptable software. The cash flow projection must be structured in a table format and must clearly indicate the following:

a. Period of cash flow projection
b. Monthly budget
c. Cumulative budget
d. Monthly actual
e. Cumulative actual

With each pay estimate, the CONTRACTOR shall also furnish baselined progress schedules that can be cross-referenced with the Schedule of Values (SOV) and Cash Flow Projection. The cash flow projections shall reflect the progress claimed on the progress schedule. Schedules shall be in accordance with Section 01300 – Submittals.

The CONTRACTOR shall provide all labor, supervision, tools, equipment, and materials necessary to furnish, install and complete tasks associated with Price Item No. 2.

C. Price Proposal Item No. 3 – Residential Existing Water Service Relocation and Reconnection

1. Description – This item shall be for the relocation of existing residential water service associated with the DSP Clayton Tank Replacement Project scope. CONTRACTOR shall conduct Subsurface Utility Engineering (SUE) as necessary and part of this Item to determine the Schedule of Values for this work. CONTRACTOR shall also coordinate relocations with the appropriate service provider. This item shall include furnishing all labor, materials, tools, equipment and incidentals required to relocate and reconnect existing residential utilities for the DPS Clayton Tank

Replacement Project, in accordance with the contract documents, complete in place.

2. Measurement – Measurement of the Price Item No. 3 will be by the lump sum as the work progresses.

3. Payment – This item will be paid for at the contract lump sum price for work performed in accordance with the Schedule of Values. The lump sum will be pro-rated based on the percentage of work successfully completed. Payment for delivered or stored items will be allowed for major equipment and materials as approved by the OWNER.

   The CONTRACTOR is required to provide a cash flow projection or forecast from which cash flow graphs and charts can easily be generated and updated. The projection may be developed in Microsoft Excel or any other acceptable software. The cash flow projection must be structured in a table format and must clearly indicate the following:

   a. Period of cash flow projection
   b. Monthly budget
   c. Cumulative budget
   d. Monthly actual
   e. Cumulative actual

   With each pay estimate, the CONTRACTOR shall also furnish baselined progress schedules that can be cross-referenced with the Schedule of Values (SOV) and Cash Flow Projection. The cash flow projections shall reflect the progress claimed on the progress schedule. Schedules shall be in accordance with Section 01300 – Submittals.

   The CONTRACTOR shall provide all labor, supervision, tools, equipment, and materials necessary to furnish, install and complete tasks associated with Price Item No. 3.

D. Price Proposal Item No. 4 – Trench Excavation Safety Protection

1. Description – This item shall be for the relocation of existing residential utility services associated with the DSP Clayton Tank Replacement Project scope. CONTRACTOR shall conduct Subsurface Utility Engineering (SUE) as necessary and part of this Item to determine the Schedule of Values for this work. CONTRACTOR shall also coordinate relocations with the appropriate service provide for electric, water, wastewater and other utilities encountered. This item shall include furnishing all labor, materials, tools, equipment and incidentals required to relocate existing residential utilities for the DPS Clayton Tank Replacement Project, in accordance with the contract documents, complete in place.

2. Measurement – Measurement of the Price Item No. 4 will be by the lump sum as the work progresses.

3. Payment – This item will be paid for at the contract lump sum price for work performed in accordance with the Schedule of Values. The lump sum will be pro-rated based on the percentage of work successfully completed.

E. Price Proposal Item No. 5 – WRIP Line Tie-In

1. Description – This item shall be for the tie-in connection from the Somerset Facility to the WRIP Line as shown in Addendum No. 2, Exhibit A. This Item is required if the new WRIP line stub-out is constructed prior to the completion of the Somerset Facility Improvements. This Item shall include the removal of the cap and blow-off assemblies, closure of the pipe segments and disinfection of the lines as required by SAWS.

2. Measurement – Measurement of the Price Item No. 5 will be by the lump sum as the work progresses.

3. Payment – This item will be paid for at the contract lump sum price for work performed in accordance with the Schedule of Values. The lump sum will be pro-rated based on the percentage of work successfully completed.

   The CONTRACTOR shall provide all labor, supervision, tools, equipment, and materials necessary to furnish, install and complete tasks associated with Price Item No. 5.

F. Price Proposal Item No. 6 – Mobilization and Demobilization

1. Description – This item shall be for the mobilization and demobilization costs associated with the Clayton Tank Replacement Project scope. This shall include furnishing all labor, materials, tools, equipment and incidentals required to mobilize, demobilize, bond and insure the Work for the Clayton Tank Replacement Project, in accordance with the contract documents, complete in place.

2. Measurement – Measurement of the item “Mobilization” will be by the lump sum as the work progresses. Mobilization price amount for the project shall be limited to a maximum of 8 percent of the subtotal of price amount.

3. Payment – Partial payments of the lump sum price for mobilization will be as follows:
   a. When 1% of the adjusted contract amount for construction items (which is defined as the total contract amount less the lump sum price for mobilization) is earned, 50% of the mobilization lump sum price or 5% of the total contract amount, whichever is less, will be paid. Insurance and bonds will be paid on the intial request for payment under a sub-heading to mobilization entitled “Insurance and Bonds”.

The amount paid for insurance and bonds will not exceed 3% of the total contract amount for construction items. Receipts or other proof of payment for the full amount of compensation requested under the sub-heading of "Insurance and Bonds" shall be provided to the OWNER with the request for payment.

b. When 5% of the adjusted contract amount for construction items is earned, 75% of the mobilization lump sum price or 10% of the total contract amount, whichever is less will be paid.

c. When 10% of the adjusted contract amount for construction items is earned, 90% of the mobilization lump sum price or 15% of the total contract amount, whichever is less will be paid.

d. No payments on mobilization will be made until the following documents are submitted and approved by the OWNER:
   1) Health and Safety Plan,
   2) Quality Assurance/Quality Control Plan,
   3) Pre-Construction Video,
   4) Schedule of Values and
   5) Construction Schedule (to include Submittal Schedule and Sequence of Construction).

e. Upon completion of all work under this contract, payment for the remainder of the lump sum price for mobilization will be made.

G. Price Proposal Item No. 7 – CPS Energy – Overhead Electric Demolition, Relocation and Reconnection (Clayton & Somerset Facilities)

1. Description – This item shall be for the removal and relocation of existing Overhead Electric services associated with the DSP Clayton Tank Replacement Project scope. CONTRACTOR shall coordinate with CPS Energy as necessary and part of this Item to determine the Schedule of Values for this work. This item shall include furnishing all labor, materials, tools, equipment and incidentals required to either remove or relocate existing overhead electric utilities for the DPS Clayton Tank Replacement Project, in accordance with the contract documents, complete in place. This Item applies to both the Clayton Facility as well as the Somerset Facility.

2. Measurement – Measurement of the Price Proposal Item No. 7 will be by allowance and shall not exceed $30,000.00

3. Payment – Payment of this item shall be a reimbursement to the CONTRACTOR for work, CPS Energy fees, permitting fees and other necessary items associated with removing and relocating overhead electricity. Reimbursement amount shall be the actual cost incurred by the CONTRACTOR to remove or relocate overhead lines associated with the project scope. CONTRACTOR shall provide CPS Energy receipts to OWNER for reimbursement.

The CONTRACTOR shall provide all labor, supervision, tools, equipment, and materials necessary to furnish, install and complete tasks associated with Price Item No. 7.

H. Price Proposal Item No. 8 – Start-up/Commissioning Allowance

1. Description – This item shall be an allowance for unforeseen construction-related items (not included in the project scope) associated with the pre-startup, startup, and commissioning services that are necessary to provide for an operational and functional system. This item shall include furnishing all labor, materials, tools, equipment and incidentals required to construct these project-related items at SAWS request and to be negotiated under the contract terms and conditions for complete in place.

2. Measurement – Measurement of the Price Proposal Item No. 8 will be by allowance and shall not exceed $40,000.00

3. Payment – This item will be paid for at the negotiated lump sum price which will be negotiated and agreed to through a Request for Proposal process by the OWNER, should additional work be necessary to be performed in accordance with the Schedule of Values.

I. Price Proposal Item No. 9 – Permitting Fees

1. Description – This item shall be for the permitting fees associated with the DSP Clayton Tank Replacement Project scope. This shall include furnishing all labor, materials, tools, equipment and incidentals required to obtain all necessary permits for the DPS Clayton Tank Replacement Project, in accordance with the contract documents, complete in place.
2. Measurement – Measurement of the item “Permitting Fees” will be by allowance and shall not exceed $2,000.00.

3. Payment – Payment of this item shall be a reimbursement to the CONTRACTOR for the permitting fees. Reimbursement amount shall be the actual fees incurred for obtaining the permits associated with the project scope. CONTRACTOR shall provide permit receipts to OWNER for reimbursement.

1.5 SUBMITTALS

A. Schedule of Values: Submit on CONTRACTOR’S standard form.

B. Monthly Application for Payment: Submit on form provided by ENGINEER.

C. Final Application for Payment: Submit on form provided by ENGINEER.

1.6 SCHEDULE OF VALUES

A. Prepare a separate Schedule of Values for each phase of Work under the Agreement. Submit the Schedule of Values in accordance with Section 01290 – Schedule of Values.

B. Use line items in the proposal as line items in the Schedule. Provide adequate detail to allow easy determination of the percentage of work completed for each item.

C. Lump Sum Work.

1. Reflect Schedule of Values format included in conformed Price Proposal Form, specified allowances, alternates, and equipment selected by Owner, as applicable.
2. List bonds and insurance premiums, mobilization, demobilization, facility startup, and contract closeout separately.
3. Separate product costs and installation costs. Break down by Division 2 thru Division 17 for each of the Project Facilities.
    a. Product costs include cost for product, delivery and unloading, royalties and patent fees, taxes, and other cost paid directly to the supplier or vendor.
    b. Installation costs include cost for the supervision, labor and supervision, labor and equipment for field fabrication, erection, installation, start-up, initial operation and CONTRACTOR's overhead and profit.
4. Divide principal subcontract amounts into an adequate number of line items to allow determination of the percentage of work completed for each item. These line items may be used to establish the value of work to be added or deleted from the project.

D. An unbalanced or front-end loaded schedule will not be acceptable.

E. Summation of the complete Schedule of Values representing all Work shall equal the Contract Price.

1.7 APPLICATION FOR PAYMENT

A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of CONTRACTOR.

B. Use detailed Application for Payment Form provided by ENGINEER.

C. Provide separate form for each schedule as applicable.

D. Include accepted schedule of values for each schedule or portion of Work, the unit price breakdown for the Work to be paid on unit price basis, a listing of OWNER-selected equipment, if applicable, and allowances, as appropriate.

E. Preparation:

1. Round values to nearest dollar.
2. List each Change Order and Written Amendment executed prior to date of submission as separate line item. Totals to equal those shown on the Transmittal Summary Form for each schedule as applicable.
3. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by ENGINEER.

1.8 MEASUREMENT—GENERAL

A. Weighing, measuring, and metering devices used to measure quantity of materials for Work shall be suitable for purpose intended and conform to tolerances and specifications as specified in National Institute of Standards and Technology, Handbook 44.

B. Whenever pay quantities of material are determined by weight, material shall be weighed on scales furnished by CONTRACTOR and certified accurate by state agency responsible. Weight or load slip shall be obtained from weigher and delivered to OWNER's representative at point of delivery of material.

C. If material is shipped by rail, car weights will be accepted provided that actual weight of material only will be paid for and not minimum car weight used for assessing freight tariff, and provided further that car weights will not be acceptable for material to be passed through mixing plants.

D. Vehicles used to haul material being paid for by weight shall be weighed empty daily and at such additional times as required by ENGINEER. Each vehicle shall bear a plainly legible identification mark.

E. Materials that are specified for measurement by the cubic yard measured in the vehicle shall be hauled in vehicles of such type and size that actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. Vehicles shall be loaded to at least their water level capacity. Loads hauled in vehicles not meeting above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejection, and no compensation will be allowed for such material.

F. Where measurement of quantities depends on elevation of existing ground, elevations obtained during construction will be compared with those shown on Drawings. Variations of 1 foot or less will be ignored, and profiles shown on Drawings will be used for determining quantities.

G. Units of measure shown on Bid Form shall be as follows, unless specified otherwise.

Item	Method of Measurement
AC	Acre—Field Measure by ENGINEER
CY	Cubic Yard—Field Measure by ENGINEER within limits specified or shown
CY-VM	Cubic Yard—Measured in Vehicle by Volume
EA	Each—Field Count by ENGINEER
GAL	Gallon—Field Measure by ENGINEER
HR	Hour
LB	Pound(s)—Weight Measure by Scale
LF	Linear Foot—Field Measure by ENGINEER
LS	Lump Sum—Unit is one; no measurement will be made
SF	Square Foot
SY	Square Yard
TON	Ton—Weight Measure by Scale (2,000 pounds)

Item	Method of Measurement
VF	Vertical Foot-Field Measure by Engineer

H. Measurement of Linear Items: Where payment will be made based on linear quantities and on parameters other than length, those parameters shall be as follows:

ITEM	MEASUREMENT PARAMETERS
Linear Foot (LF)	Pipe will be measured by the linear foot for the various types, sizes and classes. Where a line ties into an existing system, the length of the new line will be measured from the visible end of the existing system at the completed joint. Unless otherwise indicated, the length of lines will be measured along pipe horizontal centerline stationing through fittings, valves, and other appurtenances. Restrained joint length for payment purposes will be measured from the center of the fitting to last restrained joint. Restrained joint length beyond the end of steel casing not installed inside of the casing will be measured from the end of the steel casing to the last restrained joint.

1.9 PAYMENT

A. Reference contract documents General Conditions.

B. General:

1. The date for CONTRACTOR's submission of monthly Application for Payment shall be in accordance with General Condition.

C. Payment for all Work shown or specified in the Contract Documents is included in the Contract Price. No measurement or payment will be made for individual items.

1.10 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of CONTRACTOR to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. Defective Work not accepted by OWNER.
6. Material remaining on hand after completion of Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 02510
BURIED STEEL PIPE AND FITTINGS

4

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install NSF-61 certified fusion bonded epoxy lined and polyurethane coated steel pipe and fittings in accordance with AWWA C200, C213, C222, and the Contract Documents. Fusion bonded epoxy shall be compatible for fluoride and chlorine chemical application for potable water pipe. The work also includes supervision necessary to make the installation complete.

B. This section also includes the furnishing, installation, and testing of pipe, fittings, specials, pipe supports, closure pieces, test plugs, night caps, bulkheads, restrained joints, and all required appurtenances as shown on the drawings and as required to make the entire piping system operable. The steel pipe for this project shall be fabricated by a single fabricator. Fittings and Specials shall be fabricated by a single fabricator.

1.02 RELATED WORK

A. Section 01300 – Submittals

B. Section 01561 – Trench Safety System

C. Section 01450 – Quality Control

D. Section 02217 – Excavating, Backfilling, and Compaction for Utilities

E. Section 09900 – Paint and Coatings

F. Section 15074 – Disinfection of Waterlines

G. Section 15099 – Pipe Corrosion Control

1.03 REFERENCE STANDARDS

A. American Water Works Association (AWWA):

1. C200- Steel Water Pipe – 6 Inches and Larger
2. C206- Field Welding of Steel Water Pipe
3. C207- Steel Pipe Flanges for Waterworks Service- Sizes 4 In. thru 144 In.
4. C208- Dimensions for Fabricated Steel Water Pipe Fittings
5. C213- Fusion-Bonded Fusion Bonded Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
6. C215- Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines
7. C216- Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
8. C-222- Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
9. C604- Installation of Buried Steel Water Pipe – 4 In. and Larger
10. M11 (Manual) - Steel Pipe - A Guide for Design and Installation

B. American Welding Society (AWS):
   1. A2.4- Standard Symbols for Welding, Brazing, and Nondestructive Examination
   2. A3.0- Standard Welding Terms and Definitions
   3. B2.1, Specification for Welding Procedure and Performance Qualification
   4. D1.1, Structural Welding Code – Steel
   5. QC 1, Standard for AWS Certification of Welding Inspectors

C. American Society for Testing and Materials (ASTM):
   1. A20- Specification for General Requirements for Steel Plates for Pressure Vessels
   2. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   3. A370- Test Methods and Definitions for Mechanical Testing of Steel Products
   4. A435- Specification for Straight-Beam Ultrasonic Examination of Steel Plates
   5. A516- Specification for Pressure Vessel Plates, Carbon Steel, for Moderate-and Lower-Temperature Service
   6. A1018- Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
   7. D16- Terminology for Paint, Related Coatings, Materials and Applications
   8. D522- Test Methods for Mandrel Bend Test of Attached Organic Coatings
   9. D2240- Test Method for Rubber Property 8212; Durometer Hardness
   10. D4541- Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
   11. E165- Standard Practice for Liquid Penetrant Inspection Method
   12. E329- Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspection
   13. E709- Standard Guide for Magnetic Particle Testing
   14. E1255- Standard Practice for Radioscopy
   15. E1444- Standard Practice for Magnetic Particle Testing

D. Society for Protective Coatings (SSPC):
   1. SP-1- Solvent Cleaning
   2. SP-10- Near-White Blast Cleaning
   3. PA/Guide 3- A Guide to Safety in Paint Application
   4. PA/Guide 17- A Guide for Selecting Urethane Painting Systems

E. International Institute of Welding (IIW)

F. International Organization for Standardization (ISO)

G. NSF 61- Drinking Water System Components - Health Effects.

1.04 SUBMITTALS

A. Shop Drawings

1. Prior to the fabrication of the pipe, submit fabrication and laying drawings in accordance with AWWA Manual M11 to the ENGINEER for review. The pipe layout drawing shall include as a minimum following:
    a. Base stationing and elevation convention as shown on Drawings.
    b. Maximum Laying Lengths: Select lengths to accommodate installation operation.
    c. Specific number, location, and direction of each pipe, joint, and fitting or special. Number each pipe in installation sequence.
    d. Station and invert elevation at changes in grade or horizontal alignment.
    e. Station and invert elevation to which bell end of each pipe will be laid.
    f. Elements of curves and bends, both in horizontal and vertical alignment.
    g. Location of mitered pipe sections, beveled ends for alignment conformance, butt straps, and deep bell lap joints for temperature stress control.
    h. Location of closures, cutoff sections for length adjustment, temporary access manways, vents, and welds lead outlets for construction convenience.
        (i) Provide for adjustment in pipe laying headings and to conform to indicate stationing.
        (ii) Changes in pipe section location will require ENGINEER's written approval.
    i. Location of bulkheads, both those shown and/or required for hydrostatic testing of pipeline.
    j. Locations of valves, manholes, and other mechanical equipment.
    k. Location and design of all thermal control joints.
2. Pipe outside diameter, wall thickness, location of welded seams, and working pressure rating.
3. Fabrication Information:
    a. Design calculations for pipe, fittings and specials including opening reinforcement details of collars, wrappers, and crotch plates. The calculations shall show maximum design pressure, surge pressure, deflection, buckling, extreme loading condition; special physical loading such as supports or joint design and thermal expansion and/or contraction. Wall thickness calculations shall be prepared by the MANUFACTURER.
    b. Details including dimensions and fabrication tolerances for both bell and spigot ends for rubber gasket joints.
    c. Manufacturing tolerances.
    d. Maximum angular deflection limitations of field joints.
    e. Closure sections and cutoffs for field length adjustment.
    f. Details of bulkheads, including method of attachment to the pipe and

details for removal of test bulkheads and repair of lining.

g. Joint restraint length requirement for thrust forces. Restraint length calculations shall be prepared and sealed by a Professional ENGINEER licensed in the State where the project is located.

h. Stulling size, spacing, and layout.

4. Material data of pipe, fittings and rubber gasket.
5. Fusion Bonded Epoxy for interior joints and patches.
6. Limits of each reach of field welded joints, rubber gasket joints and concrete encasement.
7. Call out of weld sizes and dimensions of thrust ring collars, flanges, reinforcing collars, wrapper plates and crotch plates.
8. Submit joint details.
9. Submit details of lining and coating. Provide MANUFACTURER's coating product information, application recommendations, field touch-up procedure and thickness of coatings.
10. Material data of heat shrink sleeves and installation recommendations.
11. Submit drawings of butt straps, couplings, and flanges.
12. The CONTRACTOR's Proposed Field Welding Procedure in accordance with AWWA C206 and AWS D1.1.
13. Pipe MANUFACTURER's written Quality Assurance/Control Plan.
14. Temperature Stress Control Submittal.

B. Certifications:

1. Mill test certificates for steel plate and steel coil. The MANUFACTURER shall perform the tests described in AWWA C200, for all pipe, fittings, and specials. The certificates shall include chemical and physical test results for each heat of steel.
2. Lining Materials: Submit Documentation that lining system used for all pipes and fittings is currently approved for potable water contact in accordance with NSF 61 and satisfies current applicable governmental health and safety requirements for use in potable water.

C. Statements of Qualification:

1. Welders or Welding Operators:
   a. Name of welder.
   b. Welding procedures/positions for which welder is qualified to weld.
   c. Assigned certification stamp number.
   d. Certification date.
   e. Current certification status.

D. Submit Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) for each welding process.

E. Field Hydrostatic Testing Plan: Submit at least 15 days prior to testing and include at least the following information:

1. Testing dates.
2. Piping system and sections to be tested.

3. Method of isolation.
4. Method of conveying water from source to system being tested.
5. Calculation of maximum allowable leakage for piping sections to be tested.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Pipe MANUFACTURER:

a. All welded steel pipe, fittings and specials shall be the product of one MANUFACTURER who has no less than five years of successful experience in manufacturing pipe of the particular type and size indicated. All pipes shall be new and not supplied from inventory.

c. Experience shall include successful fabrication to conform AWWA C200 standards within last 5-year period.

2. Polyurethane Coating:

a. The coating MANUFACTURER shall have a minimum of five years of experience in the production of coating specified herein. The acceptable MANUFACTURERS for polyurethane coating are:

(i) 3M,

(ii) Carboline,

(iii) Sherwin-Williams and

(iv) Tnemec

3. Fusion Bonded Epoxy Lining:

a. The lining MANUFACTURER shall have a minimum of five years of experience in the production of lining specified herein. The acceptable MANUFACTURERS for fusion bonded epoxy lining are:

(i) 3M

b. Applicator Qualifications

(i) Equipment shall be certified by the lining MANUFACTURER to meet the requirements for material mixing, temperature control, application rate, and ratio control for multi-part coatings.

(ii) Equipment not meeting the written requirements of coating MANUFACTURER shall be rejected for coating application until repairs or replacement of the equipment is made to the satisfaction of SAWS.

(iii) Personnel responsible for the application of the lining system shall provide certification of attendance at the lining MANUFACTURER's training class within the last 3 years. Lining application personnel shall be present during all lining application and shall have responsibility for controlling all aspects of the lining application.

4. Welders and Welding Operators:

a. Shop Welders: In accordance with ASME BPVC SEC IX.

b. Field Welders: In accordance with AWS D1.1.

B. OWNER Testing and Inspection

1. Pipe will be subject to inspection by an independent testing laboratory, selected and retained by the OWNER. Representatives of the laboratory or the ENGINEER shall have access to the work whenever it is in preparation or progress, and the Pipe MANUFACTURER shall provide proper facilities for access and for inspection. Material, fabricated parts, and pipe, which are discovered to be defective, or which do not conform to the requirements of this specification shall be subject to rejection at any time prior to OWNER's final acceptance of the product.

C. Factory Testing

1. Hydrostatic Pressure Testing:
   a. Each joint of pipe shall be hydrostatically tested prior to application of lining or coating. The internal test pressure shall be that which results in a fiber stress equal to 75% of the minimum yield strength of the steel used. Each joint of pipe tested shall be completely watertight under maximum test pressure. As a part of testing equipment, the Pipe MANUFACTURER shall maintain a record of test data including reference number of pipe tested. The pipe shall be numbered in order that this information can be recorded.
   b. Air test shall be made by applying air to the welds at 10 pounds per square inch pressure and checking for leaks around and through welds with a soap solution
2. Elongation: For the tensile test specified in ASTM A370, 2-inch test specimens shall show elongations not less than 22 percent for each heat of steel.

D. MANUFACTURER’s Technician For Pipe Installation

1. During the construction period, the Pipe MANUFACTURE shall furnish the services of a factory trained, qualified, job experienced technician to advise and instruct as necessary in pipe laying and pipe jointing. The technician shall assist and advise the CONTRACTOR in his pipe laying operations and shall instruct construction personnel in proper joint assembly and joint inspection procedures. The technician shall be on-site full time for the first week of pipe installation, and thereafter as needed by the CONTRACTOR or requested by the ENGINEER, or OWNER for installation assistance and inspection, at no additional cost to OWNER.
2. The Pipe MANUFACTURER shall provide services of the Coating MANUFACTURER's representative and a representative from the Heat Shrink Joint MANUFACTURER for a period of not less than one week at the beginning of actual pipe laying operations to advise CONTRACTOR and OWNER regarding installation, including but not limited to, handling and storage, cleaning and inspecting, coating repairs, field applied coating, heat shrink installation procedures and general construction methods and how they may affect the pipe coating. The MANUFACTURER's Representative shall be required to return if, in the opinion of the ENGINEER, the coating or the CONTRACTOR's construction methods do not comply with the specifications. Cost of MANUFACTURER’s Representatives to return to the Site shall be at no additional cost to the OWNER.

1.06 DESIGN REQUIREMENTS

A. Design Criteria: All pipe, fittings and specials shall be designed for a combination of the following internal, external and surge pressures:

1. Internal Design Pressure: Sizes and design pressure shall be as shown below. Minimum design pressure shall be 150 psi.
2. External Load: Earth loads shall be as shown on the Drawings. External live load shall be at least equivalent to AASHTO HS-20 loading. External design earth load shall be calculated based on the trench condition as shown on the drawings. Earth load shall be calculated based on a unit weight of 120 pounds per cubic foot. External live load shall be Coopers E80 loading where the pipeline crosses railroad. Minimum cover shall be 5 foot.
3. Surge Pressure: Unless otherwise indicated, provide for 50% of design pressure for surge in addition to design pressure.
4. Restrained pipe shall be designed to withstand the thrust forces on the pipe. Thrust forces shall be calculated based on design pressure plus surge pressure.
5. Test Pressure: 1.5 times the design pressure at the lowest point in-the pipeline or design plus maximum surge pressure whichever is greater.
6. Thermal change: 30 degrees F cooling from installation to water temperature.
7. Modulus of Soil Reaction (E'): For compacted granular backfill material in pipe zone, use 1,500 psi. For flowable backfill material in pipe zone, use 3,000 psi.
8. Bedding Constant K: 0.1
9. Deflection Lag Factor DL = 1.2
10. Maximum allowed deflection: 3% of pipe diameter for polyurethane coated and fusion bonded epoxy lined steel pipe.
11. Steel shall meet the requirements of AWWA C200 and shall be of continuous casting. Steel shall be homogeneous and shall be suitable for field welding, and fully kilned. Steel shall have minimum yield strength of 42,000 psi.
12. The Stress due to design pressure shall be no greater than 50% of the minimum yield strength of the steel. The stress due to design plus surge pressure shall not exceed 75 percent of the yield strength. In no case the design stress shall not be greater than 21,000 psi, at design pressure.

B. Fittings and Specials:

1. The specials shall be of the diameter and wall thickness shown on the Drawings, and in accordance with these Contract Documents. Where not shown, design reinforcement in accordance with AWWA Manual M11, AWWA C200, and AWWA C208.
2. Design fittings, specials, associated joints and all field and shop welds with load capacities equal to or greater than those of connecting pipe segments.

4. Design and locate weld lead outlets as needed.
5. Design and locate flushing and sampling ports, as needs, for hydrostatic testing and disinfection.
6. All pipe and pipe fittings located at or near the proposed 1.5 MG GST shall be designed to account for tank settlement. Prior to fabrication, CONTRACTOR

shall submit shop drawings showing the location and type of fittings near proximity of the 1.5 GST to ENGINEER for review.

C. Provision for Thrust

1. Thrust at bends, tees, or other fittings shall be fully resisted by welded joints. Thrust blocking is not allowed in pump station piping unless shown otherwise in the Contract Drawings.
2. Restrained joints shall be used a sufficient distance from each side of the bend, tee, plug, or other fitting to resist thrust which develops at the design working pressure plus surge pressure of the pipe.
3. The length of pipe with restrained joints to resist thrust forces shall be determined by the Pipe MANUFACTURER in accordance with AWWA Manual M-11 and the following:
    a. The Weight of earth shall be calculated as the weight of the projected soil prism above the pipe.
    b. Soil Density = 110 pcf (maximum value to be used).
    c. Coefficient of Friction = 0.25 (maximum value to be used).
    d. The above values apply to unsaturated soil conditions. In locations where groundwater is encountered, the soil density shall be reduced to its buoyant weight for all backfill below the water table, and the coefficient of friction shall be reduced to 0.15.

D. Stulling (Strutting):

1. Design stulling for pipe, specials, and fittings such that damage is avoided during handling, storage, and installation.
2. Design such that pipe deflection is prevented and to support backfill, plus backfilling and compaction equipment loads.

1.07 MARKING, DELIVERY, HANDLING, AND STORAGE

A. Pipe Marking:

1. Legibly mark installation sequence number on pipe, fittings, and specials in accordance with piping layout.
2. Special pipe sections and fittings shall be marked at each end with notation “TOP FIELD CENTERLINE”.
3. The word “TOP” shall be painted or marked on outside top spigot of each pipe section.
4. Mark “TOP MATCH POINT” for compound bends per AWWA C208 so end rotations can be easily oriented in field.

B. Delivery:

1. Pipe, fittings and specials shall be carefully supported during shipment and storage.
2. Securely bulkhead or otherwise seal ends of pipe, specials, and fittings prior to loading at manufacturing Site.
3. Ship pipe on padded bunks with tie-down straps approximately over stulling.
4. Internally support with stulls each pipe length and fittings to maintain a true circular shape.
5. Pipe ends shall remain sealed until installation.

6. Damage to pipe, fittings, or specials, in shipment shall not be delivered to the project site unless such damaged pipe, fittings or specials is properly repaired.

7. Coordinate delivery of the pipe with the CONTRACTOR.

C. Handling:

1. Handle as a minimum at the 1/3 points by use of wide slings padded cradles, or other devices designed and constructed to prevent damage to the pipe coating. The use of chains, hooks or other equipment which might injure the pipe coating will not permitted.

D. Storage:

1. Support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.
2. Support on sand or earth berms free of rock exceeding 3 inches in diameter.
3. Store pipe at the MANUFACTURER's yard until CONTRACTOR is ready to accept the delivery at the site.
4. Deliver, handle, and store pipe, fittings and specials in accordance with the MANUFACTURER's recommendations to protect the coating system.
5. Protect pipe lining from drying by means of plastic and covers banded to the pipe ends.
6. Maintain covers over the pipe ends at all times until ready to be installed.

1.08 SEQUENCING AND SCHEDULING

A. Notify ENGINEER in writing of the following:

1. Pipe Manufacturing: Not less than 14 days prior to starting pipe, fittings and specials fabrication.
2. Not less than 5 days prior to start of each of the following:
   a. Welding.
   b. Coating application.
   c. Lining application.
   d. Shop hydrostatic testing.

PART 2 PRODUCTS

2.01 GENERAL

A. Steel pipe, fittings, and specials shall be manufactured, tested, inspected, and marked to comply with AWWA C200 and additional requirements of these Contract Documents.

B. In lieu of collar reinforcement, pipe, fittings, or specials with outlets may be fabricated in their entirety of steel plate having thickness equal to sum of pipe wall plus required reinforcement.

C. Unless shown otherwise, the diameter shown shall be considered finished inside diameter after lining.

D. Materials furnished shall be NSF 61 approved for use with potable water.

2.02 PIPE BARREL

A. Steel: Provide steel coils for spiral welded steel pipe or steel plate for straight seam welded steel pipe per AWWA C200 and as follows:

1. Minimum Yield Strength: 42,000 psi.
2. Minimum Tensile Strength: 60,000 psi.
3. Minimum Elongation in 2-inch Gauge Length: 22 percent.
4. Pressure Vessel Quality as follows:
   a. Coils: Continuous cast process, fully-killed, fine grained practice conforming to physical, manufacturing and testing requirements of ASTM A1018.
   b. Plate:
      (i) Fully-kilned, conforming to ASTM A20, fine grained practice conforming to physical, manufacturing and testing requirements of ASTM A516, Grade 70.
      (ii) Steel Chemistry: Conform to ASTM A516, Grade 70. Steel plates that are 3/4 inch thick or greater shall be normalized.
5. Wall Thickness:
   a. The pipe wall thickness shall be in accordance with AWWA C200, except that all pipes shall have a minimum wall thickness of ¼-inch with zero minus tolerance and an internal nominal diameter to wall thickness ratio not to exceed 200.
   b. Pipe which is to be placed in casing or tunnel shall have a nominal diameter to wall thickness ratio not to exceed 144 or minimum pipe wall thickness shall be 0.375 inches, whichever is greater
6. Inside Diameter of the pipe shall be as shown on the plans or as specified in the Contract Documents.

2.03 FITTINGS AND SPECIALS

A. Fabrication:

1. Shop fabricate fittings and specials. No field fabrication will be allowed.
2. Fabricate from materials or straight pipe in full conformance with requirements of these Contract Documents and dimensions of AWWA C208, unless otherwise indicated.
3. Design Pressure: All fittings and specials shall be designed to withstand internal pressure, both circumferential and longitudinal, and external loading conditions.

B. Elbows, Unless Otherwise Indicated:

1. Minimum Radius: 2.5 times pipe diameter.
2. The minimum thickness of plate for pipe from which specials are to be fabricated shall be the thickness of adjacent mainline pipe, the thickness shown on the Drawings or ¼-inch thickness, whichever is thicker.
3. Maximum Miter Angle: 11-1/4 degrees on each section resulting in a maximum deflection angle of 22.5 degrees per miter weld as recommended in AWWA C208.
4. Maximum total allowable angle for beveled joints shall be 3 degrees per pipe

joint. Bevel shall be provided on the bell ends. Mitering of the spigot ends will not be permitted.

5. Complete joint penetration (CJP) welds on miter welds.

C. Outlets:

1. Outlets 12-inch and smaller shall be fabricated from ASTM A53, Type E or S, Grade B, standard weight steel pipe in the standard outside diameters. Unless otherwise shown, wall thickness and collar reinforcing shall be designed by the pipe MANUFACTURER as specified. Collars shall be manufactured with the same steel as specified for the mainline piping.
2. Fabricate collar or wrapper reinforcement using same steel as specified for main pipe barrel.
3. Where outlets for taps are threaded, furnish and install Type 304 stainless steel bushings for the outlet size indicated on the drawings.
4. The CONTRACTOR may use outlets for access for weld leads.

2.04 JOINTS

A. Rubber Gasket:

1. General:
   a. For pipes smaller than 24 inches, use expanded bell and rolled groove spigot with rubber gasket. For pipes 24 inches and larger, use Carnegie shape rubber gasket joint.
   b. In accordance with AWWA C200.
   c. Clearance between bell and spigot shall, when combined with gasket groove configuration and gasket itself, provide watertight joints under all pressure conditions.
2. Rubber Gasket Carnegie Spigot and Expanded Bell:
   a. Standard Spigot Shapes in Accordance with AWWA manual M11.
   b. Weld spigots to pipe cylinder using single fillet welded lap joint.
   c. Bell:
      (i) Form by expanding press or by moving axially over a die, in such a manner as to stretch steel plate beyond its elastic limit to form a truly round bell of suitable diameter and shape.
      (ii) Do not roll bell ends.
      (iii) Minimum Radius: 15 times wall thickness of pipe barrel on either side of bell slope.
      (iv) Minimum Bell Depth: 3 inches.
      (v) Expanded bells shall have no noticeable depressions or irregularities.

B. Field Welded:

1. Field welded joints shall be in accordance with AWWA C206.
2. Typical field welded joint in restrained sections shall be single fillet lap joint located inside pipe for pipe sizes 24-inch or larger. For pipe sizes smaller than 24-inch use single fillet lap joint located outside of pipe. Lap welded joints shall be in accordance with AWWA C200.

3. Butt Joint Welded: As needed for closures or other locations required for construction. Plain ends beveled as required by AWWA C200 and CONTRACTOR's field WPS.
4. Double welded lap joints and butt-strap joints shall be tapped and drilled for testing in accordance with AWWA C206.

C. Flanges:
1. Flanged joints shall be used on all pipes, fittings and specials on welded steel piping exposed in vaults and on buried pipe systems to connect valves and appurtenances.
2. Use slip-on or ring type flanges. Pipe flanges and welding of flanges to steel pipe shall conform to the requirements of AWWA C206 and AWWA C207.
3. Pressure rating of flanges shall be equal or greater than the adjacent pipe class.
4. Flange bolt circle shall match the bolt circle of the fittings or appurtenances which are to be connected.
5. Flange bolts, and nuts are specified in Section 15120 – Piping Specialties. Nuts and bolts shall be coated.
6. Gaskets: Full face for use with flat face flanges and ring type for use with raised face flanges. Gaskets shall be 1/8-inch thick, cloth-inserted rubber, Garlok 3000or equal in accordance with SAWS Material Standard Specification for steel water pipe. Blind flange gasket shall cover entire inside surface of blind flange.
7. Additional flanges may be added by the CONTRACTOR to facilitate fabrication, handling, transportation and field assembly at no additional cost.
8. Coordinate the dimensions, hole drillings and type of flange face (flat or raised) of the flanges furnished with the companion flanges of valves, pumps and equipment to be connected to or installed in the piping.

D. Butt Strap Closure: Butt strap shall be the same thickness and material as the pipe wall, at least 10 inches wide, rolled to fit the outside cylinder diameter in two half sections, and should be centered over the plain ends of the pipe sections they are to join.

E. Mechanical Couplings: Sleeve type mechanical couplings and flange coupling adaptors are specified in Section 15120 – Piping Specialties.

2.05 THERMAL CONTROL JOINTS

A. Provide thermal control joints as specified in Paragraph 3.01 of this Section.

2.06 STULLING (STRUTTING)

A. Materials:
1. Shop-Lined Pipe: Wood stulls and wedges.
2. Unlined Pipe: Steel or wood.

B. Install stulling for pipe, specials, and fittings in accordance with reviewed submittal and as soon as practical after pipe is fabricated or, for shop-lined pipe, after lining has been applied.

C. Install stulling in manner that will not harm lining.

1. Maintain stulling in place until pipe is backfilled.
2. The stulling may be temporarily removed to perform interior welding of the pipe joints if welding is performed prior to backfilling.
3. If the stulling is temporarily removed, it shall be reinstalled prior to backfilling.
4. Stulling shall be reinstalled so that the pipe is not out-of-round from a true circle by more than 1 percent.

2.07 COATINGS

A. General:

1. Notify ENGINEER at least 5 days prior to application of coating products.
2. Holdback of coating from field-welded joints shall be as follows:
   a. For lap welded joints and flexible couplings, 8 inches.
   b. For butt weld and butt strap joints, 6 inches.
2. Furnish inspection devices that are calibrated and in good working condition for detection of holidays and measurement of coating film thickness and adhesion testing.

B. Exterior Polyurethane Coating:

1. Polyurethane Coating shall be factory applied and meet the requirements of AWWA C222. Use a Coating Standard ASTM D16 Type, V system which is a 100 percent solids, 2-component polyurethane (or 2-package polyisocyanate, polyol-cured urethane) coating. The components are mixed in 1:1 ratio at time of application based on the MANUFACTURER's product recommendation. The components shall have balanced viscosities in their liquid state and shall not require agitation during use. The cured coating shall have the following properties:
   a. Conversion to Solids by Volume: 97 percent plus or minus 3 percent
   b. Temperature Resistance: Minus 40^0 F and plus 130^0 F.
   c. Minimum Adhesion: 1500 psi, when applied to steel pipe which has been blasted to comply with SSPC-SP10.
   d. Cure Time: For handling in 1 minute at 120^0 F, and full cure within 7 days at 70^0 F.
   e. Maximum Specific Gravities- Polyisocyanate resin, 1.20. Polyol resin, 1.15.
   f. Minimum Impact Resistance. 80 inch-pounds using 1-inch diameter steel ball.
   g. Minimum Tensile Strength- 2000 psi.
   h. Hardness: Minimum Durometer hardness 65 plus on the Shore D scale in accordance with ASTM D2240.
   i. Flexibility Resistance ASTM D522 using 1-inch mandrel. Allow coating to cure for 7 days. Perform testing on test coupons held for 15 minutes at temperature extremes specified above.
   j. Dry Film Thickness: 30 mils.

C. Exterior Polyurethane Coating for Specials, Joints, Fittings, or Repair of Steel Pipe

1. The shop applied and field applied coatings shall be in accordance with AWWA

C222 Standard. The shop applied and field applied coating shall have the properties specified in paragraph 2.07.B. Mix and apply polyurethane coatings in accordance with the coating MANUFACTURER's recommendations.

D. Factory Applied Exterior Polyurethane Coatings

1. Surface Preparation
   a. Remove deposits of oil, dirt, grease and other contaminants prior to application of coating.
   b. Remove surface imperfections such as metal slivers, burrs, weld splatter, gouges or delamination in the metal by filing or grinding prior to abrasive surface preparation.
   c. Wire wheel or blast exterior surfaces in accordance with SSPC-SP10; to a near white metal blast cleaning with an angular profile in bare steel.
2. Equipment: Two component, heated airless spray unit in accordance with coating MANUFACTURER's recommendation.
3. Temperature: Minimum 5^0 F above dew point temperature. The temperature of the surface shall not be less than 60^0 F during application.
4. Humidity: Heating of pipe surfaces may be required to meet requirements of Paragraph 2.07.D.3, if relative humidity exceeds 80 percent.
5. Do not thin or mix resins; use as received. Store resins at a temperature recommended by the coating MANUFACTURER.
6. Application: Apply directly to pipe to achieve a total (DFT) dry film thickness of 30 mils. Multiple pass, one coat application process is permitted provided maximum allowable recoat time specified by coating MANUFACTURER is not exceeded. Provide cutbacks in accordance with coating MANUFACTURER's recommendations as appropriate for the type of joint and heat shrink sleeve to be used. The cutback area shall be sand blasted in the shop to facilitate easier field surface preparation. The exterior bare steel area of the pipe shall be adequately protected during pipe handling and shipment.
7. Recoating: Recoat only when coating has cured less than maximum time specified by coating MANUFACTURER. When coatings has cured for more than recoat time, brush-blast or thoroughly sand the surface. Blow-off cleaning using clean, dry, high pressure compressed air.
8. Curing: Do not handle pipe until coating has been allowed to cure, per MANUFACTURER's recommendations.

E. Field Coating of Buried Pipe and Bolted Joints:

1. Heat-shrink Sleeves:
   a. High recovery, Type II, heat-shrinkable cross-linked polyolefin in accordance with AWWA C216, unless otherwise indicated.
   b. Sleeve Length: Extend minimum of 3 inches onto adjacent pipe coating.
   c. As-Supplied Sleeve Thickness (prior to heat shrinking): 90 mils, minimum.
   d. Filler: As recommended and supplied by the heat shrink sleeve MANUFACTURER.
   e. Provide MANUFACTURER's recommended sleeve thickness, length, and size required for specific type of joint and pipe.
   f. MANUFACTURER and Product: Canusa or Raychem.

2.08 LININGS

A. General:

1. Notify ENGINEER at least 5 days prior to application of lining products.
2. Holdback of lining from field-welded joints shall be as follows:
   a. For lap-welded joints and flex couplings, 8 inches.
   b. For butt-weld and butt-strap joints, 6 inches.

B. Shop-Applied Fusion Bonded Epoxy Lining:

1. Manually spray, automatically spray or apply centrifugally in conformance with AWWA C213. Minimum thickness shall be in accordance with AWWA C213.
2. Prepare surface as recommended by MANUFACTURER.
   a. Pipe surfaces shall be abrasive blast cleaned in accordance with AWWA C213 and SSPC0SP 10/NACE No.2.
   b. Surface Preparation for steel shall be blast cleaned with materials having an angular profile such as mineral abrasives, slag abrasives or steel grit in accordance with AWWA C213. For requirements of selecting and evaluation mineral and slag abrasives see SSPC-AB 1 and SSPC-AB 3.
3. Interior lining for buried potable water piping must be NSF 61 certified.
4. Interior lining for buried potable water piping must be corrosion resistant for fluoride and chlorine chemical application service.
5. Lining machine type that has been used successfully for similar work and acceptable to ENGINEER.
6. Maintain pipe in round condition during lining operation and thereafter by suitable bracing or strutting.
7. Provide polyethylene or other suitable bulkhead on ends of pipe and on special openings to prevent drying out of lining. Bulkheads shall be substantial enough to remain intact during shipping and storage until pipe is installed.
8. Pipe shall be left bare where field joints occur.
9. Ends of lining shall be left square and uniform. Feathered or uneven edges will not be permitted.

C. Field-Applied Fusion Bonded Epoxy Lining:

1. Shall be applied to pipe joints in accordance with AWWA C213, unless stated otherwise.
2. Field applied linings shall be applied by qualified coating MANUFACTURER.
3. Materials conforming to AWWA C213.
4. Minimum thickness shall be in accordance with AWWA C213.
5. Prepare surface as recommended by MANUFACTURER.
   a. Pipe surfaces shall be abrasive blast cleaned in accordance with AWWA C213 and SSPC0SP 10/NACE No.2.
   b. Surface Preparation for steel shall be blast cleaned with materials having an angular profile such as mineral abrasives, slag abrasives or steel grit in accordance with AWWA C213. For requirements of selecting and evaluating mineral and slag abrasives see SSPC-AB 1 and SSPC-AB 3.

2.09 PIPE LENGTH

A. Maximum joint length shall not exceed 50 foot. Maximum joint length of steel pipe installed in casing shall not exceed 25 foot.

B. All non-restrained pipe that is deflected or that has mitered joints in order to maintain alignment on horizontal or vertical curves shall have a minimum length of 8 feet, unless otherwise acceptable to the ENGINEER.

2.10 PIPELINE MARKING TAPE

A. Pipeline marking tape shall be minimum 4 mil thick polyethylene which is impervious to alkalis, and chemicals and solvents which are likely in the soil. Tape shall be 12 inches wide. Imprinted lettering shall be one-inch tall, permanent black on a blue background, and shall read "WATER LINE BURIED BELOW" Tape shall be manufactured by Reef Industries (Terra Tape), or Allen (Markline).

2.11 CATHODIC PROTECTION

A. Provide as shown and as specified in Section 15099 – Pipe Corrosion Control.

2.12 JOINT BONDING

A. Provide joint bonding for non-welded steel pipe joints as specified in Section 15099 – Pipe Corrosion Control.

2.13 FACTORY TESTS

A. The MANUFACTURER shall perform all tests as required by the applicable AWWA standards and as listed herein.

B. Polyurethane Coating: The Polyurethane coating shall be tested in accordance with AWWA C222.

1. Thickness: Test thickness of coating in accordance with SSPC PA 2.
2. Test coating system applied to the pipe for holidays according to the procedures outlined in NACE SP 0188 using a high voltage spark tester (operating at 100 volts per mil), for the dry film thickness (DFT) specified of 30 mil.
3. Adhesion Testing:
   a. Polyurethane coatings
      (i) Polyurethane coatings shall have an adhesion to steel of 1,500 pounds per square inch, minimum.
      (ii) Test polyurethane coating adhesion to steel substrates using pneumatic pull off equipment, such as HATE Model 108 or Delfesko Positest, in accordance with ASTM D4541 and AWWA C222.

C. Fusion Bonded Epoxy Lining: The fusion bonded epoxy lining shall be tested in accordance with AWWA C213.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. Install steel pipe, fittings, specials and appurtenances as specified herein, as specified in AWWA M11, in accordance with the pipe MANUFACTURER's recommendations and as required for the proper functioning of the completed pipeline.
2. Lay pipe to the lines and grades as indicated in the Drawings.
3. Excavate, embed and backfill trenches in accordance with Section 02217-Excavating, Backfilling and Compaction for Utilities.
4. Joints and related work for field assembly of fittings and specials shall conform to requirements for straight pipe, unless otherwise shown.
5. Make minor field adjustments by pulling standard joints.
   a. Maximum Allowable Angle: 75 percent of MANUFACTURER's recommended, or angle that results from 3/4-inch pull out from normal joint closure, whichever is less.
   b. Maximum Allowable Gap: 1/8 inch between bell and spigot at weld location.
6. Horizontal deflections or fabricated angles shall fall on alignment, as shown.
7. Vertical deflections shall fall on alignment, and pipe angle point locations shall match those indicated on Drawings.
8. Pipe 30 Inches in Diameter and Larger:
   a. Assure that maximum penetration of spigot end into bell end is achieved through use of shop-welded tabs on inside circumference of bell end.
   b. Remove welded metal tabs prior to welding inside of joint.
9. Maintain stulling in place until pipe trench is backfilled to the surface.
   a. Out-of-Round Pipe: Pipe which deviates from a true circle by more than 1 percent shall be laid with its larger diameter vertical, or by using struts on continuous head and sill timbers to correct the vertical diameter where acceptable to the ENGINEER. Struts shall be left in place until the joints at each end have been completed and embedment and backfill for the section have been placed to the top of the trench. Final inspection, repair, and checking of interior lining shall be performed after the struts have been removed.
   b. Pipe Deflection: After completion of backfilling and before acceptance of the Work, all pipes 30 inches and larger in diameter shall be tested for excessive deflection by measuring the actual inside vertical diameter. Deflection measurements will be made by the CONTRACTOR and verified by the OWNER. Pipe diametric deflection shall not exceed 2.25 percent of the nominal inside diameter measured in the vertical direction at any point in the pipe. Diametric deflection greater than 2.25 percent shall be corrected by the CONTRACTOR at no additional cost to the OWNER.
10. Grade Adaptors: Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the OWNER may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters or by the use of additional fittings. However, in no case shall the

deflection in the joint exceed 75 percent of the maximum deflection recommended by the pipe MANUFACTURER or the amount that results in more than a 1/8-inch gap at the weld location, whichever is less. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint. In all cases the joint opening, before finishing with the protective mortar or fusion bonded epoxy lining inside the pipe, shall be the controlling factor.

11. Marking Tape: Continuously install marking tape along the pipe at a depth two feet above the top of pipe, unless otherwise shown on the drawings, in accordance with the recommendations and instructions of the marking tape MANUFACTURER.

B. Control of Temperature Stresses in Restrained Pipe:

1. Control temperature stresses in accordance with AWWA C206, the reviewed temperature stress control submittal, and these Specifications.
2. To control temperature stresses, the unbackfilled special temperature control joint areas of all pipe shall be shaded from the direct rays of the sun by the use of properly supported awnings, umbrellas, tarpaulins, or other suitable materials until the pipe is backfilled at least 1 foot over the top of the pipe. The Temperature Control Joint Area is defined as the entire length of pipe left exposed near a control joint after placing the pipe backfill between it and the other control joints in each direction. Shading materials at the joint area shall not rest directly on the pipe but shall be supported to allow air circulation around the pipe. Shading of the pipe joints need not be performed when the ambient air temperature is below 45 degrees F.
3. At intervals not exceeding 300 feet along welded reaches of the pipeline, at the first regular lap-welded field joint outside concrete encasements and structures, and where shown, the pipe shall be supplied with a special temperature control lap joint and laid with an initial lap in accordance with the Drawings. Where temperature control lap joints occur in a traveled roadway or other inconvenient location, the location of the joint may be adjusted, as acceptable to the ENGINEER.
4. Provide and install thermocouple temperature gauges to monitor the temperature of the steel pipe wall as it lies in the trench. All pipe temperature requirements specified herein shall be measured at the top inside of the steel cylinder using the thermocouple gauges specified herein. Specific temperature requirements for the pipeline steel cylinder shall be met prior to installation of the trench backfill, during and after placement of trench backfill, and during welding of the special temperature control joints. If atmospheric conditions do not allow the conditions to be met, supplemental cooling shall be provided by the CONTRACTOR. The following outlines the specific temperature control requirements.
    a. Prior to and during placement of the trench backfill, the pipeline steel temperature shall be at or below 75^0 F. The specific temperature shall be maintained for at least three hours after the placement of backfill. Provide supplemental cooling as required.
    b. Placement of backfill shall proceed in the direction of pipe laying from one special temperature control joint to the next. During placement of backfill, the lead end of the pipe section (toward the next special temperature control joint) shall be left unbackfilled or otherwise

unrestrained such that the end of the pipe is free to move in response to expansion or contraction due to temperature changes. Backfill shall not be placed in a direction which would result in backfill placement proceeding in a direction toward previously or simultaneously placed backfill without the written permission of the ENGINEER. The direction of backfill placement will not be limited for placement at the short unbackfilled section immediately adjacent to the special temperature control joints.

c. During period between backfill placement operations, any section of pipeline that is partially backfilled with pipe bedding zone material (less than one foot over the top of pipe) shall be shaded from the direct rays of the sun by the use of properly supported awning, umbrellas, tarpaulins, or other suitable materials until the pipe is backfilled at least 1 foot over the top of the pipe. Shading materials shall not rest directly on the pipe but shall be supported to allow air circulation around the pipe. Shading of the partially backfilled pipe need not be performed when the CONTRACTOR can demonstrate to the satisfaction of the OWNER's Field Representative, using thermocouple data, that shading is not necessary to meet the specified temperature requirements. The temperature of the partially backfilled pipe shall not be allowed to exceed 110^0 F at any time. Provide supplemental cooling as required.

d. Prior to welding the special temperature control joints, the pipeline extending 300 feet each direction from the joint shall be maintained at or below 75^0 F. Additionally, the pipeline extending 300 feet each direction from the joint shall be backfilled with pipe zone material to at least one foot over the top of the pipe. At or below the specified temperature, the special temperature control joints can be welded. Begin and complete the weld during the coolest interval within a 24-hour day. Use the thermocouple data to demonstrate to the ENGINEER the coolest interval of the day.

e. After welding any temperature control joint, the pipe temperature for 150 feet in each direction from the control joint shall be maintained below 110^0 F for a minimum of 24 hours after the temperature control joint area has been backfilled to at least 1 foot over the top of the pipe. This requirement is in addition to the shading and backfill placement temperature requirements specified herein.

3.02 WELDING

A. Conform to AWS D1.1, AWWA C206, approved welding procedures, and referenced welding codes. In case of conflict AWS D1.1 shall govern.

B. Preheat and Interpass temperature requirements for unlisted base metals shall be determined according to AWS D1.1, Annex XI Guideline on Alternative Methods for Determining Preheat.

B. Rejected weld defects shall be repaired or redone, and retested until sound weld metal has been deposited in accordance with appropriate welding codes.

D. CONTRACTOR shall field weld joints for joint restraint for connecting existing pipe as shown on the restrained length submittal.

E. Any changes in vertical or horizontal alignment from that provided in the drawings may necessitate a change in restrained joint lengths. CONTRACTOR shall contact ENGINEER any time a change in alignment is necessary.

3.03 RUBBER GASKET JOINT PIPE

A. Each joint shall be checked by the CONTRACTOR, as recommended by the pipe MANUFACTURER, to determine that the pipe joint and the rubber gasket are installed properly.

3.04 EXTERIOR JOINT PROTECTION FOR POLYURETHANE COATED STEEL PIPE

A. General: Buried pipe joints shall be field coated after pipe assembly in accordance with AWWA C216, using Heat Shrink Sleeves. Width of heat shrink sleeve shall be sufficient to overlay the polyurethane coating by a minimum of 3-inches. Overlapping of two or more heat shrink sleeves to achieve the necessary width will not be permitted.

B. Installation

1. Clean pipe surface and adjacent coating of all mud, oil, grease, rust, and other foreign contaminates with a wire brush in accordance with SSPC-SP2, Hand Tool Cleaning, or SSPC-SP3, Power Tool Cleaning. Remove oil or grease contamination by solvent wiping the pipe and adjacent coating in accordance with SSPC-SP1, Solvent cleaning. Clean the full circumference of the pipe and a minimum of 6 inches onto the existing coating.
2. Remove all loose or damaged pipe coating at joint and either repair the coating as specified herein or increase the length of the joint coating, where reasonable and practical.
3. Complete joint bonding of pipe joints before application of joint coating.
4. Joint bonds shall be low profile bonds and all gaps and crevices around the Joint bonds shall be filled with mastic sealant.
5. Store sleeves in shipping box until use is required. Keep dry and sheltered from exposure to direct sunlight. Store off the ground or concrete floors and maintain at temperature between 60^0 F and 100^0 F as recommended by the sleeve MANUFACTURER.
6. Metal surface shall be free of all dirt, dust, and flash rusting prior to sleeve application.
7. Preheat pipe uniformly to 140^0 F to 160^0 F or as recommended by the sleeve MANUFACTURER. Monitor pipe temperature using a surface temperature gauge, infrared thermometer, or color changing crayons. Protect preheated pipe from rain, snow, frost, or moisture with tenting or shields and do not permit the joint to cool.
8. Prime joint with specified primer and fill all cracks, crevices, and gaps with mastic filler in accordance with the MANUFACTURER's recommendations for the full circumference of the pipe.
9. Apply heat shrink sleeve when it is at a minimum temperature or 60^0F and while maintaining the pipe temperature above the preheat temperature specified. Apply sleeve in accordance with the MANUFACTURER's instructions and center the sleeve over the joint to provide a minimum of 3-inches overlay onto the existing pipe coating.

10. Apply heat to the sleeve using either propane fire infrared heaters or wrap around heaters. Hold flame a minimum of 6-inches from the sleeve surface. Periodically roll the coating on the pipe surface. Heat from the center of the sleeve to the outer edge until properly seated, then- begin in the opposite direction. Monitor sleeve for color change, where appropriate, or with appropriate temperature gauges.
11. Completed joint sleeve shall be fully bonded to the pipe and existing coating surface, without voids, mastic beading shall be visible along the full circumference of the sleeve, and there shall be no wrinkling or excessive burns on the sleeves. Sleeves which do not meet these requirements shall be removed and the joint recoated as directed by the ENGINEER. Minor repairs may be repaired using heat shrink sleeve repair kits.
12. Allow the sleeve to cool before moving, handling, or backfilling. In hot climates, provide shading from direct sunlight. Water quenching will be allowed only when permitted by the sleeve MANUFACTURER.

3.05 REPAIR AND FIELD TOUCHUP OF POLYURETHANE COATING

A. Apply repair or Touch Up material as recommended by Coating manufacturer for main line coating for repair and field touch-up of polyurethane coating.

B. Repair Procedure - Holidays:
1. Remove all traces of oil, grease, dust, dirt, etc.
2. Roughen area to be patched by sanding with rough grade sandpaper (40 grit).
3. Apply a 30 mil coat of repair material described above. Work repair material into scratched surface by brushing or rolling in accordance with MANUFACTURER's recommendations and technical data.
4. Retest for Holiday after appropriate state of cure as directed by technical data.

C. Repair Procedure - Field Cuts or Large Damage:
1. Remove burrs from field cut ends or handling damage and smooth out edge of polyurethane coating.
2. Remove all traces of oil, grease, dust, dirt, etc.
3. Roughen area to be patched with rough grade sandpaper (40 grit). Feather edges and include overlap of 2 inches of roughened polyurethane in area to be patched.
4. Apply a 30 mil coat of repair material described above, in accordance with MANUFACTURER's recommendations. Work repair material into scratched surface by, brushing. Feather edges of repair material into prepared surface. Cover at least 1 inch of roughed area surrounding damage, or adjacent to field cut.
   a. Test repairs for Holidays per Paragraph 3.05.B. of this Section.

3.06 CONNECTIONS WITH EXISTING PIPES

A. Connections to existing pipes shall be made using suitable joints and fittings for the conditions encountered. Each connection with an existing pipe shall be made at the time and under conditions which will least interfere with normal operation. Connections with buried existing flanges shall require removal of grout from the flanges. Remove concrete thrust block when encountered for connections to the existing pipes.

B. Facilities shall be provided for proper dewatering and for disposal of all water removed

from the dewatering lines and excavations without damage to adjacent property.

C. Existing valves will leak when in closed position. CONTRACTOR shall provide whatever means and equipment is necessary to control water during construction.

3.07 CATHODIC PROTECTION

A. Apply to pipe as shown and as specified in Section 15099 – Pipe Corrosion Control.

3.08 FIELD QUALITY CONTROL

A. Field Welding:

1. All welds (100 percent inspection) shall be VT inspected by CONTRACTOR's CWI and marked to indicate acceptance or rejection.
2. The CONTRACTOR will be required to fully uncover a maximum 10 joints, selected at random by the ENGINEER or the OWNER to visually inspect and test the joints after welding.
3. Any damage must be repaired.
4. CONTRACTOR to perform in the presence of OWNER or an independent testing laboratory dye penetrant tests in accordance with ASTM E165, or magnetic particle test in accordance with AWWA C206 and set forth in AWS D1.1.
5. Welds that are defective shall be repaired or replaced whichever is deemed necessary by the ENGINEER, at the CONTRACTOR's expense.
6. If the CONTRACTOR disagrees with the ENGINEER's interpretation of welding test, test sections may be cut from the joint for physical testing.
7. The procedure of repairing the joint shall be acceptable to the ENGINEER before proceeding.
8. Test butt-strap or double-welded lap joint welds by pressurizing connection between the two fillet welds in accordance with AWWA C206.
    a. Apply air or other ENGINEER-accepted gas into connection between the two fillet welds.
    b. Paint welds with soap solution.
    c. Mark leaks indicated by escaping gas bubbles.
    d. Close threaded openings with flush pipe plugs or by welding them.
9. Submit test results to ENGINEER.

B. Testing of Polyurethane Coating: The entire surface area of the pipe exterior shall be inspected using a full loop high voltage holiday tester. Perform testing in accordance with National Association of Corrosion Engineering (NACE) Standard RP0274-98- High Voltage Electrical Inspection of Pipeline Coatings.

C. Field Testing: All piping systems shall be pressure tested as specified in Section 15075-Water Pipeline Testing. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum design working pressure. The CONTRACTOR shall furnish all test equipment, labor, materials, and devices at no extra cost to the OWNER.

3.09 DISINFECTION

A. Disinfection of steel piping shall be in accordance with Section 15074 – Disinfection of Waterlines.

END OF SECTION

SECTION 11261
CHLORINATION EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and accessories required to install and test, complete and ready for operation, the chlorination system as specified herein and shown on the drawings. Maintain complete chlorination operating facilities at all times during construction.

B. The Chlorine System Includes: Requirements for furnishing and installing three (3) dual-type chlorine-cylinder scales, yoke auxiliary cylinder valves, header valves, cylinder emergency shut-off valves, vacuum regulators, vacuum switch high and low, automatic switchover system(s), pressure/vacuum gauges with diaphragms, two (2) gas rotameters (manual gas feeders), two (2) solenoid valves, injectors/ejectors, corporation cock diffusers, three (3) chlorine residual analyzers, eight (8) dual containment leak detection switches, one (1) 2 HP booster pump, chlorine gas leak detector with sensors, and isolation ball valves together with all controls and appurtenances necessary for a complete installation as indicated. All equipment to conform to Chlorine Institute guidelines. Refer to Specification Section 11312 – Booster Pumps for additional information.

C. Furnish all material, labor and equipment required for installation of eye wash stations, and hazardous stations as shown on the drawings specified herein. All material surfaces which come into contact with water or treated water for drinking shall be NSF 61 compliant.

D. CONTRACTOR shall coordinate with OWNER for furnishing of chlorine supply containers.

1.2 RELATED WORK

A. Division 1 – General Requirements

B. Section 09900 – Paints and Coatings

C. Section 11000 – Equipment General Provisions

D. Division 15 – Mechanical

E. Division 16 – Electrical

1.3 SYSTEM DESCRIPTION

A. Chlorine gas is provided by 150-pound cylinders at the Chlorine Building of the Somerset Pumping Station. The chlorination system consists of two (2) banks of cylinders. Each bank consists of three (3) cylinders. Each chlorine cylinder will be equipped with a vacuum regulator which will allow the chlorine system to be operated as a vacuum system downstream. The chlorine will be fed as a gas under vacuum through manually operated wall mounted rotameters. Two (2) gas rotameters shall be furnished and installed as shown on the drawings and as specified and shown in the table in Paragraph 2.3 of this Specification Section. The gas from the rotameters will be mixed with carrier water to create a chlorine solution. The chlorine solution will then be injected under pressure through a corporation cock solution diffuser at the feed point location as shown on the Drawing.

1. The components of the chlorine system shall include the following:

    a. Miscellaneous associated equipment required for the proper operation of the system, include but are not limited to ball valves, couplings, fittings, gauges etc.

B. All associated equipment shown on the Drawings shall be included whether specifically specified herein or not, at no added cost to OWNER. The chlorinator system shall be set up to accurately deliver chemical to the above ground application points identified in the drawings. Each designated chlorinator must provide the required turn down capability to meet the Minimum and Maximum capacities indicated on the table in Paragraph 2.3.A.

1.4 SUBMITTALS

A. Shop Drawings, Product Data and Related Information. Submittals shall conform to the requirements set forth in Section 01300 – Submittals. Drawings shall include as a minimum all information listed below with proper construction details and any other information necessary to completely describe the proposed equipment, materials, and coatings.

1. Certified drawings of all proposed equipment for each system including, but not limited to:

    a. A schematic showing all elements of the complete system including all specialized devices fully labeled showing MANUFACTURER and part identification.

    b. Dimensioned overall plan and elevation of the system and appurtenant devices. This plan must show arrangement of the equipment, interfaces with other systems and site components, and loads imposed on other site support structures.

    c. Shop drawings of each individually fabricated component showing design data including dimensions, materials, construction features and capacities.

    d. Product data sheets/individual catalog cuts for all purchased equipment of standard manufacture.

    e. Total system weight and mounting base details, including anchor bolt layout plans and sizes.

2. A complete control schematic detailing all control components, electrical point-to-point wiring and piping. Electrical drawings must include wiring schematics, interconnecting diagrams, panel layouts, electrical power requirements, bill of materials and enclosure door layout. Clearly delineate factory from field assembly. Define points of electric, water and chemical connections.

B. Submit proposed field test procedures.

C. Submit MANUFACTURER's installation and storage instructions.

D. Submit Record Drawings showing "as-built" conditions, including any field revisions.

E. Submit a Statement of Qualifications, including a list of installations that shows conformance with the experience requirements specified.

F. Submit operation and maintenance data in accordance with Section 01800 – Operation and Maintenance Data.

G. Submit a letter of certification in accordance with Paragraph 1.9 - Warranty - of this specification.

1.5 REFERENCE STANDARDS

A. All reference standard requirements as specified in related sections shall apply to the work described in this section.

B. Chlorine Basics, Pamphlet #1, Edition 7, 2008, The Chlorine Institute, Inc. or Latest Edition.

C. Occupational Safety and Health Act (OSHA).

D. The International Fire Code Institute (IFCI) – 2012 International Fire Code.

E. All installation, cleaning, and testing shall be in accordance with the Chlorine Institute's recommendations.

1.6 QUALITY ASSURANCE

A. All chlorination equipment shall be furnished by a single MANUFACTURER who is fully experienced for a minimum of 5 years, reputable, and qualified in the manufacture of the equipment to be furnished. All equipment shall be in accordance with specifications herein. Acceptable MANUFACTURER is Severn Trent Capital Controls of Colmar, PA.

B. Where equipment offered for approval varies from the description and requirements of this Section, such equipment will be considered only if the full intent of the design, including performance and long term reliability are clearly demonstrated to the complete satisfaction of the OWNER.

C. All equipment shall be of the highest standards construction available with components designed for safe, long and continuous operation in a corrosive (high humidity, chlorine-containing) atmosphere.

D. Chlorine feeders, injectors and accessories:

1. Verify compatibility of system components.
2. Verify pipe sizes are appropriate.
3. Verify all devices necessary have been provided.

1.7 OPERATION AND MAINTENANCE

A. Operating and Maintenance Instructions shall be furnished as specified in Section 01800.

B. A factory representative who has a complete knowledge of the proper operation and maintenance shall be provided to start-up the system and instruct the OWNER on proper operation and maintenance of the equipment.

1.8 SPARE PARTS

A. Special tools required for normal operation and maintenance shall be supplied for each piece of equipment furnished.

B. Each piece of equipment shall be furnished with the MANUFACTURER's recommended spare parts for the first one (1) year of operation and shall include the following:

1. Chlorine cylinder gaskets.
2. Miscellaneous tubing and gaskets.

3. Spare loose 200 pounds per day (ppd) rotameter:

C. All tools and spare parts shall be furnished in containers clearly identified with indelible markings as to their contents. Each container shall be packed with its contents protected for storage. All tools shall be furnished in steel tool boxes.

D. For booster pump spare parts refer to Specification Section 11312 – Booster Pumps.

1.9 WARRANTY

A. The MANUFACTURER shall provide an all-inclusive two-year extended warranty in addition to the CONTRACTOR's standard one-year warranty. The submittal shall provide a contract specific warranty document. The warranty shall include normal wear and tear parts. All materials, equipment, and workmanship shall be free from defects in material or workmanship.

B. MANUFACTURER's Certification: Provide a letter of certification addressed to the OWNER and signed by an authorized representative of the MANUFACTURER. The letter shall state the following:

1. The equipment will efficiently and thoroughly perform the required functions in accordance with these Specifications and the Drawings, that the materials are best suited for the chemicals handled, and that the MANUFACTURER accepts joint responsibility with the CONTRACTOR for coordination of equipment, including motors, variable speed drives, controls, and services required for proper installation and operation of the completely assembled and installed unit.

2. The equipment has been installed in accordance with the MANUFACTURER's recommendations, and is in proper adjustment and operating condition, the MANUFACTURER is prepared to warrant the equipment to perform in full compliance with these specifications, and the equipment is ready to be turned over to the OWNER for operation.

3. The MANUFACTURER has inspected the installation and verified training of the OWNER's operations and maintenance personnel upon completion of the system installation.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials: The chlorine system and all related components shall be constructed of materials which are resistant to corrosive attack of wet or dry chlorine gas, chlorine solution, water and the feed room atmosphere.

2.2 CHLORINE SCALES

A. Furnish three (3) dual-type cylinder scales capable of weighing two (2) 12-inch diameter cylinders each. The dual type scale shall have two independent weighing discs.

B. The materials of construction of the dual scale shall be corrosion resistant to chlorine gas.

C. The dual scale shall have a digital LCD readout capable of reading out the weight of the cylinders in pounds. The standard indicator shall be easy to read and have a 3-1/2 digit LCD display

D. The dual scales shall be capable of 0.1% accuracy of capacity.

E. The base of the scale shall be 32"x18".

F. The instrumentation tag name, description and scale range is listed below for each scale:

TAG	DESCRIPTION	RANGE
WIT-131	Chlorine Scale 1	0~349 lbs
WIT-132	Chlorine Scale 2	0~349 lbs
WIT-133	Chlorine Scale 3	0~349 lbs
WIT-134	Chlorine Scale 4	0~349 lbs
WIT-135	Chlorine Scale 5	0~349 lbs
WIT-136	Chlorine Scale 6	0~349 lbs

G. The acceptable dual scale MANUFACTURER shall be Scaletron Industries, LTD.

1. The acceptable dual scale model shall be Model 2350.

2.3 ROTAMETERS (WALL MOUNTED, MANUAL)

A. Furnish two (2) wall mounted manually operated 200 ppd rotameters and for installation as shown in the Drawings. The rotameters shall be designed to ensure maximum safety for operation personnel. The rotameter shall have clear visual markings to indicate the amount of flow the unit is feeding. The chlorine gas system shall operate under vacuum to prevent gas leakage. Each chlorinator shall be capable of a minimum manual turndown ratio of 20:1. Provide capacities as indicated in the tables below:

REQUIRED ROTAMETER SIZING AND FEED RANGES

Feeder No.	Feed Location	Flow (MGD)	Maximum Capacity (ppd)	Minimum Capacity (ppd)	Rotameter Capacity (ppd)	Back Pressure at Injection Point @ Injector Water Flow[(1)] (psig) / (gpm)
RTM-1301	Control Station No. 1 or Control Station No. 3	8.86	155	15	200[(1)]	60 psi @ 30 gpm
RTM-1302	Control Station No. 1 or Control Station No. 3	8.86	155	15	200[(1)]	60 psi @ 30 gpm
N/A	Standby w/ Spare loose Rotameter	8.86	155	15	200[(2)]	60 psi @ 30 gpm

(1) The available water supply pressure from the High Service Pump Station (HSPS) is approximately 107 psi. The OWNER has confirmed the pressures downstream of the HSPS will be maintained at approximately 53 psi when the HSPS is offline. A backup supply line is being provided with a booster pump as specified in Specification Section 11312 – Booster Pumps for when the HSPS is offline. MANUFACTURER/CONTRACTOR shall confirm water supply pressure prior to installation and shall field test and confirm selected injectors prior to completion of chlorine system.

(2) Refer to Paragraph 1.8 Spare Parts.

B. The capacity of the rotameter units shall be in ppd. Each unit shall be able to feed chlorine over the feed ranges provided in the table above.

2.4 VACUUM REGULATOR/AUTOMATIC BANK SWITCHOVER

A. Provide six (6) remote 100 ppd cylinder mounted vacuum regulators; one for each chlorine cylinder.

1. Vacuum regulators shall have integral switchover capabilities with pressure relief valve.
2. Safety Devices: Equip each vacuum regulator with safety devices to vent chlorine under emergency conditions. Equip the regulator with safety devices of simple construction that are accessible to permit inspection.
3. Vacuum regulator shall be Capitol Controls Series 200.

B. Provide one (1) automatic switchover valves as indicated in the drawings.

1. Automatic switchover valves shall be capable of safely and automatically switching service between banks of cylinders as shown in the contract drawings.

2.5 VACUUM SWITCH PANEL

A. Provide one (1) panel mounted vacuum high and low switches that shall be 120V and manufactured by Capital Controls Model BM-5727-1. The switches shall be set to alarm SCADA.

1. The high vacuum switch shall be equal to Capital Controls Model BM-5987. The switch shall be factory set to actuate at 5” of mercury.
2. The low vacuum switch shall be equal to Capital Controls Model BM-5964. The switch shall be set to actuate at 10” of water vacuum.

B. The vacuum switches shall be contained in a PVC housing with an electrical rating of NEMA 4X.

C. The vacuum switch shall connect to the 5/8” Sch. 80 PVC chlorine vacuum pipe with 3/8” polyethylene tubing.

2.6 INJECTORS/EJECTORS

A. General: Provide two (2) 250 ppd chlorine injectors of the 1-inch adjustable or fixed orifice type. Fixed orifice type injectors should be adjusted in the field with interchangeable throats to meet actual hydraulic conditions onsite. Fabricate each injector as PVC and equip it with a dual check valve system as well as an emergency drain valve to prevent water or solution from feeding back into the chlorine vacuum pipe. Provide an injector adequate for the maximum rate of feed.

B. Prior to installation, MANUFACTURER shall confirm the backpressures in the field and select the recommended fixed type injector(s)/ejector(s) size. During installation, the MANUFACTURER shall bring all selected injector(s)/ejector(s) to the feed room and install the best model based on all operational conditions.

C. Injector Hydraulic Conditions: MANUFACTURER shall field verify hydraulic conditions prior to installation. Refer to the table listed in Paragraph 2.3 above for injector hydraulic conditions.

2.7 PRESSURE GAUGES, VACUUM GAUGES AND PRESSURE SWITCHES

A. General: Provide tantalum diaphragm-protected pressure gauges and switches for chlorine gas service. Provide diaphragm-protected vacuum gauges for chlorine vacuum service. Provide each gauge, switch or pressure gauge/switch assembly with a shutoff valve for servicing pressure/vacuum indicators.

B. Design Requirement: Provide pressure gauges for chlorine gas service with an operating range of 0 to 200 psig. Provide 3-inch minimum diameter gauge with black numerals on a white dial under a glass cover. Provide pressure gauges for chlorine vacuum service in the chlorinator enclosures with an operating range recommended by the chlorinator MANUFACTURER. Provide the chlorine vacuum gauge at each injector with an operating range of 0 to 30 inches of Hg and with housing suitable for use with chlorine gas containing moisture.

C. Contact: Provide tantalum diaphragm-protected pressure switches each with a NEMA 4X enclosure with normally open, single pole contact, rated at 115 volts, 10 amperes. Provide switches for chlorine gas service with an operating range 0 to 200 psig, and near the vacuum regulator with an operating pressure of 0 to 100 psig. Provide switches for chlorine vacuum service in the chlorinator enclosures with an operating range recommended by the chlorinator MANUFACTURER.

D. Fill Fluid: Fill pressure gauges and switches with Fluorolube or Halocarbon.

E. Pressure Gauges shall be Ashcroft Type 1379 DURAGAUGE with stainless steel geared rotary-geared movement Teflon coated gears and bearings.

2.8 SUPPLEMENTAL EQUIPMENT AND PIPING

A. General: The CONTRACTOR shall provide all piping, valves fittings, gaskets, bolts, nuts, couplings, supports and other materials required for the entire installation. All materials in contact with chlorine shall be suitable for this service. All installation, cleaning, and testing shall be in accordance with the Chlorine Institute's recommendations. During erection, oil, grease and other foreign material inside any portion of the system shall be thoroughly removed by methods such as flushing or cleaning with cloth saturated with trichloroethylene or other suitable chlorinated solvent. CONTRACTOR SHALL NOT USE HYDROCARBONS OR ALCOHOLS FOR CLEANING. New equipment, pipe, fittings and accessories received in an oily condition shall be dismantled and cleaned before use.

B. CAUTION. Certain chlorinated solvents such as carbon tetrachloride (CCl4) can produce very serious physiological effects, unless used and disposed of in strictest compliance with the solvent MANUFACTURER's recommendations.

C. Piping:

1. All pressure and vacuum gauges mounted on either chlorine or chlorine solution lines shall be protected with diaphragm seals. Steel pipe and fittings used for chlorine pressure lines, and solvent-welded PVC pipe (ASTM D 1785) and pipe fittings (ASTM D 2467) used for chlorine gas under vacuum, and chlorine solution, shall be in accordance with the corresponding Sections of these Contract Documents. All unions on chlorine pressure piping shall be chlorine type, suitable for that service. All piping components shall be NSF 61 certified.

2. Polymer concrete box assemblies shall be installed at every change in direction for the below grade chlorine solution piping in the yard and upon exiting the chlorine building and entering below grade. The polymer concrete box assemblies shall be open bottom. The

loading rating shall be the highest available. The polymer concrete box assemblies shall be chemically resistant to high concentrations chlorine solution. The polymer concrete box assemblies shall be sized to allow for an 18 inch cover ~~bury depth~~ as specified per the OWNER's direction for the chlorine solution line. The CONTRACTOR shall transition from 24" minimum cover in yard to an 18" cover directly prior to entering the pull box and shall transition from 18" cover to a 24" minimum cover in yard directly after exiting the pull box.

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3. Per OWNER direction, all underground chlorine solution piping shall be double contained 2-inch Red Valuflex/GS hose manufactured by HDB/Thermoid ~~Frontier Red Horizon Rubber Hose manufactured by Continental~~ inside Sch. 80 PVC. The transition from Sch. 80 PVC to Red Rubber Hose and the termination of the double containment shall be per MANUFACTURER's recommendation and shall be the responsibility of the CONTRACTOR at no additional cost to the OWNER. The termination of double containment piping shall close the Sch. 80 PVC casing over the Continental Frontier Red Horizon Rubber Hose. The double containment piping shall begin on the inside of the chlorine buildingat the exterior face of the chlorine building prior to entering the polymer concrete box assembly and terminate at the polymer concrete box assembly at the above grade application pad. The double containment shall terminate after entering the pull box and begin prior to exiting the pull box. The transition to and from the Sch. 80 PVC to 2-inch Red Valuflex/GS hose manufactured by HDB/Thermoid ~~Continental Frontier Red Horizon Rubber Hose~~ shall take place within the double containment.

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D. ~~Leak Detection System~~

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1. ~~Install in strict accordance with the system manufacturer's instructions and recommendations. Leak detection shall be installed with a sensor located at the lowest point in the piping, with all pipe sloping to the location of the leak detection sensor. The leak detection system shall sound an alarm when a leak event occurs.~~

2. ~~Signal wires from the low point sensor shall be connected to the local output panel. Contact with any aqueous chemical shall result in an audible alarm and a LED signal. The local output panel shall be housed in a NEMA 4X enclosure. The leak detection output panel shall be located at the electrical rack at the back of the chlorine building. The output relays shall be capable of interfacing with the SCADA. Refer to Specification Section 17920 – Control Narrative for additional information.~~

3. ~~Carrier pipe shall have a tee installed in the vault for chlorine solution to allow for leak detection sensor installation. Leak detection sensor shall be Flowline Switch Tek Optic Leak detection switch, Model L010-230, or equal. Sensor shall be installed in the downward facing vertical branch of the tee.~~

4. ~~PVC drain valves shall also be installed in the vault to allow for draining of accumulated chemicals.~~

E. Valves:

1. Manual: Shut-off valves installed in chlorine pressure piping shall be true union chlorine cleaned ball valves, with vented ball to prevent trapping of compressed chlorine with minimum 300-lb rating. Ball valves shall be Grade I, Type I, PVC with Teflon seats for chlorine service, with 1/4 turn open or closed operator. Provide true unions upstream and downstream of all valves to allow for easy removal and maintenance. Seals shall be Viton. All valves shall be as manufactured by Nibco Chemtrol, Hayward, or equal.

2. Manual (Vacuum/Solution lines): Provide vented PVC ball valves as detailed in per this specification.

3. Solenoid: Solenoid valves shall be packless piston type direct acting, 2-way or 3-way valves and shall be ASCO Valve Red Hat as manufactured by Automatic Switch Co., for water service. Provide separate unions upstream and downstream of all valves to allow for easy removal and maintenance.

   a. Valves on water solution lines to feeders shall be of the normally closed type, interconnected with the chlorinator to shut down water flow when the chlorinator is not operating.

   b. Valves shall have forged brass bodies, NPT end connections of the size shown on the Drawings, 300 or 400 series stainless steel internal parts, and Buna n or Ethylene Propylene valve seats. Valves shall have a 150 psig (minimum) safe working pressure and zero minimum operating pressure differentials. Connections shall be threaded.

   c. Except as otherwise specified, valves shall have NEMA 4 solenoid enclosures, shall be suitable for operation on a 120V, 60 Hz, single phase power supply, and shall be provided with a continuous duty Class F coil and a manual operator.

   d. Solenoid valves on bypass piping shall be installed whether shown or not.

4. Note that solenoid valves may be shown on Electrical and/or Mechanical Drawings, or may only be specified

F. Testing Chlorine Piping: Upon completion of the fabrication of piping, fittings, and valves for chlorine gas piping, steam shall be applied to the piping from the upper piping end. Condensate and foreign matter shall be drained from the piping at the lower end, but not into the chlorine storage cylinders. Steaming shall be continued until the line is thoroughly heated and cleaned. The steam supply shall then be disconnected and while the piping is still hot, nitrogen having a maximum dew point of minus 40 degrees F, shall be blown through the piping until the dew point of the discharge nitrogen equals that of the entering nitrogen. This may require several hours. The piping shall then be tightly sealed against entry of moisture.

G. System Testing: After drying, the piping system shall be flushed with trichloroethane to ensure that all oil or grease has been removed. The complete chlorine gas piping system shall be filled with dry 150 psi air and tested for leaks by application of soapy water to the outside of all joints. Leaks shall be repaired to the satisfaction of the OWNER and the line cleaned and redried. Small quantities of chlorine gas shall then be introduced into the line, the test pressure built up to 150 psi with dry air, and the entire system shall be tested for leaks.

Purging: All piping and equipment shall be thoroughly purged of chlorine before attempting any repairs.

2.9 CHLORINE ANALYZER

A. The vendor shall supply all components necessary for a functional system, including sensor(s); sensor holder with flow meter, flow control valve and mounting brackets; chlorine monitor and all required cables and spare parts. The sensor, holder and monitor shall all be made by the same MANUFACTURER to assure compatibility and provide sole source responsibility.

B. The chlorine analyzer shall continuously analyze a sample and produce a current proportional to the chlorine residual in the sample.

C. The analyzer shall determine free chlorine in a range of 0 to 10 ppm as Cl2 in fresh water.

D. The analyzer shall manually compensate for changes in the pH of the sample.

E. The sample pressure range requirement is 3 to 65 psig.

F. The process connection is a ¼-in OD tubing compression fitting. The drain connection shall be ¾-in barbed fitting and must drain to open atmosphere.

G. The analyzer shall be provided with an ABS, NEMA 4X enclosure.

H. The recorder output shall be 4-20 mA and connected to SCADA.

I. The analyzer shall be powered from a 115/230 Vac, 50/60 HZ, single phase power supply.

J. Residual chlorine analyzers shall be Rosemount Analytical Model FCL-01-220.

K. Each residual chlorine analyzer shall be furnished with a sample booster pump as specified in Specification Section 11312 – Booster Pumps.

2.10 AUTOMATIC SHUT-OFF VALVES

A. Each safety shut-off device shall be capable of only closing the cylinder valve; it should not reopen the cylinder valve.

B. The system shall include a battery operated actuator with electric motor.

C. The system shall include integral leak detection for automatic shutdown.

D. A remote control by leak detector, panic button, or other digital signals such as PLC or computer shall be included.

E. Monitors and controls are accomplished through an on-board microprocessor with integral LED displays for closed, align, and open.

F. Valve position shall be transmitted to the microprocessor from a direct-coupled potentiometer and displayed in degrees open

G. Enclosure shall be NEMA 4X.

H. Chlorine automatic shut-off valves shall be Robo-Control Model U.

I. The system shall include a Remote Control Panel that relays to operate all actuators and provides isolated contact output.

2.11 CHLORINE GAS LEAK DETECTORS

A. General:

1. Each chlorine gas detection system shall provide a warning of the presence of chlorine gas in the chlorine room where it is mounted. The chlorine gas detector shall consist of two (2) wall mounted sensors. One (1) receiver shall be located in the Chlorine Cylinder Storage Area and the other receiver in the Chlorine Feed Room. Each chlorine gas detector sensor shall be provided with visual and audible alarms on the local readout module.

2. A chlorine gas leak detector capable of receiving signal from both receivers equal to Model 1620 Dual Sensor Chlorine Leak Detector shall be furnished with a NEMA 4X rated enclosure, Attabox Polycarbonate Enclosure with Clear Cover model number AH14126C. The leak detector shall be located on the front exterior of the chlorine building located next to the feed room door as shown on the plans. The Dual Sensor Chlorine Leak Detector shall be furnished with a power back-up as described in item D of this subsection 2.10.

B. Design:

1. The sensor module shall be an electrochemical type requiring no chemical addition with a response time of 30 seconds maximum for 80% of full range to 10 ppm gas at 20 degrees C. The sensor shall be wall mounted and housed in a NEMA 4X enclosure.
2. The gas detector shall have a range of 0-10 parts per million (ppm) of chlorine.
3. The receiver shall provide a LED bar graph display. The LED bar graph display shall be color-coded to indicate sensor status, gas concentration and alarm set point. Additional LEDs shall provide for indication of set point alarm, sensor malfunction, power ON and sensor ready. The receiver shall be housed in a NEMA 4X enclosure.

C. Electrical:

1. The alarm and malfunction contacts shall be SPDT rated at 10 amps at 240 Vac or 28 Vdc maximum resistive or inductive load. The alarm and malfunction contacts shall be field configurable for manual reset (latching) or automatic reset (non-latching).
2. Communications between the sensor and receiver shall be 3-wire, shielded, 22 gauge cable. The maximum distance between the receiver and sensor shall be 1000 feet/305 meters.
3. The gas detector shall operate from a 120 Vac, 50/60 Hz, single phase power supply. The receiver and sensor electronics shall have provisions for protection against radio frequency/electromagnetic interference.
4. The output shall be non-insulated 4-20 mA and connected to SCADA.

D. Power Back-up:

1. The Gas Detector Power Back-up, with internal battery automatically provides power to the gas detectors in the event of a power failure. No manual switching is required. The Gas Detector Power Back-up shall automatically and continuously recharge to supply maximum support to the gas detector.
2. The Gas Detector Power Back-up shall be provided with a POWER switch, POWER indicator, a LED indicator for ALARM, an audible alarm and an OFF control for silencing the audible alarm. The Gas Detector Power Back-up shall provide charging rate and battery status LED indicators. A high and a low charging rate shall be provided to the internal 18 volt battery.
3. The Gas Detector Power Back-up shall be housed in a NEMA 4X enclosure.
4. The Gas Detector Power Back-up shall operate from a 120 Vac, 50/60 Hz, and single phase power supply. Terminals for battery power back-up shall be provided.
5. The Gas Detector Power Back-up shall be located in the chlorine building feed room on the same wall as the chlorine leak detector.

E. Chlorine leak detector and sensors shall be Capital Controls Series 1620B.

2.12 CHLORINE ALARMS

A. Provide local alarm lights on the exterior of all chlorine storage and feed rooms. Alarms shall indicate the presence of a chlorine leak.

B. Provide local audible alarms for each chlorine gas sensor.

C. Intrusion alarms will be provided on the chlorine storage and feed room doors to indicated the presence of an intruder.

2.13 EMERGENCY EYEWASH AND SHOWER

A. Combination emergency eyewash and shower stations shall be furnished and installed at the locations shown on the drawings. The station shall be of the non-freeze type with both valves activated simultaneously. Emergency drench showers located in exposed areas outside of buildings subject to freezing with shower head, manual valve, eyewash with spray head covers and face ring or heads, and 1 ¼ -inch supply shall be HAWS Model No. 8300FP with dust cover Model No. 9102, MK8A Freeze-Proof Eyewash Valve and MK81A Freeze-Proof Shower Valve. CONTRACTOR shall provide insulation and heat trace for the exposed eyewash piping in order to provide freeze protection.

2.14 ACCESSORIES

A. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location. The identification plate shall include at least the following information:

1. Name of MANUFACTURER - Vacuum regulators, rotameters, injectors, chlorine analyzer, leak detector, piping, valves, diffusers, controls, and instrumentation.
2. Model - Vacuum regulators, rotameters, injectors, chlorine analyzer, leak detector, piping, valves, diffusers, controls, and instrumentation.
3. Serial Number – Vacuum regulators, floor mounted feeders, injectors, chlorine analyzer, leak detector, piping, valves, diffusers, controls, and instrumentation.
4. Year of Manufacture - Vacuum regulators, floor mounted feeders, injectors, chlorine analyzer, leak detector, piping, valves, diffusers, controls, and instrumentation.
5. Voltage and Amperage Data - Vacuum regulators, floor mounted feeders, chlorine analyzer, leak detector, controls, and instrumentation.

B. Lifting Lugs: Equipment weighing over 100 pounds.

C. Anchor Bolts: Type 316 stainless steel, sized by equipment MANUFACTURER, 1/2-inch minimum diameter, and as specified in Section 05501.

2.15 FIRE EXTINGUISHERS

A. Manufacturers:

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Potter Roemer; Div. of Smith Industries, Inc.

B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

C. Valves: Manufacturer's standard.

D. Handles and Levers: Manufacturer's standard.

E. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

F. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

G. FIRE-PROTECTION CABINET

1. Manufacturers:
   a. JL Industries, Inc.
   b. Larsen's Manufacturing Company.
   c. Potter Roemer; Div. of Smith Industries, Inc.
2. Cabinet Type: Suitable for fire extinguisher.
3. Cabinet Construction: Nonrated.
4. Cabinet Material: Fiberglass.
5. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall; with trim.
6. Door Material: Manufacturer’s standard.
7. Door Style: Manufacturer’s standard.
8. Door Glazing: Wire glass.
9. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
10. Wire Glass: ASTM C 1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick.
11. Provide projecting lever handle with cam-action latch.
12. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

H. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
   b. Location: Applied to cabinet door.
   c. Application Process: Die cut
   d. Lettering Color: Red.
   e. Orientation: Vertical.

I. Finishes:

1. Manufacturer's standard
2. Coordinate with OWNER for the color of the cabinet.

J. MOUNTING BRACKETS

1. Manufacturers:
   a. JL Industries, Inc.
   b. Larsen's Manufacturing Company.
   c. Potter Roemer; Div. of Smith Industries, Inc.
2. Mounting Brackets: Manufacturer's standard stainless steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with Manufacturer's standard finish
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
4. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
5. Orientation: Vertical.

4 2.16 BACKFLOW PREVENTER ENCLOSURE

A. MODEL NO. & SIZE

1. Model No. shall be 300D-AL.
2. Inside dimensions shall be 48"W x 78"L x 44"H.

B. MATERIALS OF FABRICATION

1. Material of fabrication shall be 5052-H32 marine grade aluminum (.050/18 gauge), mill finish and shall meet ASTM B209.
2. Insulation shall be 1.5" (9.0 "R" value) minimum thickness polyisocyanurate foam laminated to a glass fiber reinforced facer (each side). The insulation shall have the following properties:
   a. Dimensional Stability-Less than 2% linear change, ASTM D-2126;
   b. Compressive Strength-20PSI, ASTM D-1621;
   c. Water Absorption-Less than 1% by volume, ASTM C-209;
   d. Moisture Vapor Transmission-Less than one (1) perm, ASTM E-96;
   e. Product Density-Nominal 2.0 lbs. per cubic foot, ASTM D-1622;
   f. Flame Spread=25, ASTM E-84;
   g. Service Temperature= -1000F to +2500F maximum.
   h. The insulation shall be of uniform thickness.
3. Structural members shall be redwood.

C. ROOF, WALLS & PANELS

1. The roof, walls & panels of the enclosure shall be constructed of 5052-H32 (.050/18 gauge) marine grade aluminum, mill finish, ASTM B209 outside with insulation 1 1/2" (9.0 "R" value) thick in the walls and panels and 3" (18.0 "R" value) thick in the roof.
2. The aluminum, insulation and redwood shall be securely bonded together to form a composite panel.

3. The aluminum panels shall be provided with a PVC or similar exterior film to prevent damage before installation. The film shall be removed before installation.
4. The complete assembly, including valve stems, shall be protected by being inside the enclosure.
5. The roof shall be securely attached to the walls with screws and inside roof connections.
6. All screws shall attach to redwood members.
7. The walls of the enclosure shall be securely attached to the concrete base with inside anchoring brackets.
8. Access panels shall be two (2) in number and each shall be 38 1/4"W x 44"H. One access panel shall contain the drain panel.
9. Access panels shall be completely removable.
10. Access panels shall be provided with built-in pad lockable folding T-Handles.
11. Clear opening drain panel area shall be 38 1/4"W x 6 1/2"H.
12. Drain panel shall have a stainless steel hinge and a stainless steel light strength spring as a positive means of closure so that the drain panel will not be activated by wind.
13. Drain panel shall be designed to remain closed except during water discharge.

D. Heating Equipment (ASSE 1060 Class I-Required; ASSE 1060 Class II-Optional)

1. Heating equipment shall be furnished and designed by the manufacturer of the enclosure to maintain an interior temperature of +400F with an outside temperature of -300F.
2. The heater shall have two electrical resistance elements completely enclosed within a solid aluminum cast platen base.
3. The platen heater shall be designed for installation to the concrete base with mounting hardware provided.
4. The platen heater shall be suitable for installation underneath a reduced pressure zone device and designed to sustain water spray without damage to or impeding the performance of the heater.
5. The platen heater shall be provided with a thermostat adjustable from +40°F to +100°F. The thermostat, all conduit and wiring fittings provided shall be suitable for “water-tight” installation.

E. MOUNTING HARDWARE

1. Mounting hardware shall be furnished and shall be 300 series stainless steel and/or T-6 aluminum.
2. All threaded fasteners shall be furnished and shall be 400 series stainless steel and/or Hilti type Tap-Fast w/QuickcoatTM and Flo Seal washer or equal.
3. All masonry fasteners shall be furnished and shall be stud type Hilti Kwik Bolt IITM and/or Hilti type Hit Anchors or equal.
4. All necessary drill bits shall be furnished.

F. NSTALLATION

1. Enclosure shall be mounted on a concrete pad 62"W x 92"L x 6"Thick.
2. Enclosure shall be assembled and mounted to concrete pad according to manufacturer's instructions.

3. Enclosure shall be assembled and mounted to concrete pad in such a way that it will remain locked and secured to pad even if outside screws are removed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: All equipment shall be installed in accordance with the MANUFACTURERs recommended and approved procedures submitted with the Shop Drawings, and in accordance with the recommendations of the Chlorine Institute, Inc., and as otherwise indicated herein.

B. Chlorine Diffusers: Chlorine diffusers shall be installed as indicated to feed chlorine solution into the above grade pipeline. All diffusers shall be securely supported with corrosion-resistant supports of Monel or suitable plastic, and they shall be installed for easy removal and disconnection. Refer to Contract Drawings for additional information.

C. The CONTRACTOR shall be responsible for installing equipment that the MANUFACTURER could not ship assembled as an integral part of the system due to shipping restrictions. These items shall be identified on the MANUFACTURER's approval drawings.

D. Do not begin fabrication or erection prior to submittal approval.

3.2 PAINTING

A. Finish painting shall be in accordance with Section 09900 – Paints and Coatings.

B. Factory painting shall conform to MANUFACTURER's standard factory finish.

C. Field Painting: Equipment that did not receive a factory finish shall be painted in accordance with the painting sections of these Contract Documents. Factory painted items requiring touching up in the field shall be thoroughly cleaned of all foreign material and shall be primed and top coated with the MANUFACTURER's standard factory finish, provided it does not discolor in the presence of high water vapor atmosphere, alkaline water vapor, or chlorine. Alternatively, the MANUFACTURER may refinish the marred surface at the factory.

3.3 FIELD TESTS

A. Functional Test. Prior to start-up, all equipment shall be inspected by the MANUFACTURER for proper alignment, quiet operation, proper connection and satisfactory performance.

3.4 START-UP AND TRAINING

A. General: The CONTRACTOR shall furnish the services of an authorized factory representative to advise on installation and start-up of all equipment, to make any necessary adjustments, and to instruct operating personnel in maintenance and operation. The operations personnel's normal work schedules will be accommodated in the training, with the factory representative instructing every shift during their normal working hours.

B. A MANUFACTURER's technical representative for the equipment specified herein shall be present at the jobsite and/or classroom designated by the OWNER for the minimum of three trips of three total person-days listed for the services herein under, travel time excluded:

1. 1 person-day for installation assistance, inspection, and certification of the installation.
2. 1 person-day for functional and performance testing.
3. 1 person-day for training session for OWNER's personnel.

C. OWNER will videotape all training sessions for future training of employees.

D. The MANUFACTURER shall submit a letter of certification that equipment has been installed properly and is operating properly.

E. Final acceptance of the chlorine system shall be determined by completion of thirty (30) days of continuous 24 hours per day operation without mechanical and/or electrical malfunctions.

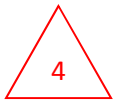
3.5 DELIVERY, STORAGE AND HANDLING

A. All equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling and storage. All equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Motors, drives, electrical equipment and other equipment having anti-friction or sleeve bearings shall be stored in weather tight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers should be avoided to prevent accumulation of condensate in gears and bearings.

B. Each component shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the Drawings, shall be provided on each piece of equipment supplied.

END OF SECTION

SECTION 15072
STEEL PIPE AND FITTINGS



PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install NSF-61 certified fusion bonded epoxy lined steel pipe and fittings for the above grade yard piping/chemical application point in accordance with AWWA C200, C207, C208, C213, and the Contract Documents. Fusion bonded epoxy shall be compatible for fluoride and chlorine chemical application for potable water pipe. Steel pipe shall have flanged or welded joints complete in place in accordance with AWWA standards. The work also includes supervision necessary to make the installation complete.

B. This section also includes the furnishing, installation, and testing of pipe, fittings, couplings, specials, pipe supports, closure pieces, test plugs, night caps, bulkheads, restrained joints, and all required appurtenances as shown on the drawings and as required to make the entire piping system operable and as required for proper connection to existing piping. The steel pipe for this project shall be fabricated by a single fabricator. Fittings and Specials shall be fabricated by a single fabricator. The exterior pipe coating shall be a UV resistant fluoropolymer. Refer to Section 09900 – Painting and Coatings for information on pipe coating.

1.02 RELATED WORK

A. Section 01300 – Submittals

B. Section 01561 – Trench Safety System

C. Section 01450 – Quality Control

D. Section 02217 – Excavating, Backfilling, and Compaction for Utilities

E. Section 09900 – Paint and Coatings

F. Section 15060 – Miscellaneous Process Piping

F. Section 15074 – Disinfection of Waterlines

G. Section 15140 – Supports and Hangers

1.03 REFERENCE STANDARDS

A. American Water Works Association (AWWA):
1. C200- Steel Water Pipe – 6 Inches and Larger
2. C206- Field Welding of Steel Water Pipe
3. C207- Steel Pipe Flanges for Waterworks Service- Sizes 4 In. thru 144 In.
4. C208- Dimensions for Fabricated Steel Water Pipe Fittings
5. C213- Fusion-Bonded Fusion Bonded Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
6. C222- Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and

Fittings

7. C604- Installation of Steel Water Pipe – 4 In. and Larger
8. M11 (Manual) - Steel Pipe - A Guide for Design and Installation

B. American Welding Society (AWS):

1. A2.4- Standard Symbols for Welding, Brazing, and Nondestructive Examination
2. A3.0- Standard Welding Terms and Definitions
3. B2.1, Specification for Welding Procedure and Performance Qualification
4. D1.1, Structural Welding Code – Steel
5. QC 1, Standard for AWS Certification of Welding Inspectors

C. American Society for Testing and Materials (ASTM):

1. A20- Specification for General Requirements for Steel Plates for Pressure Vessels
2. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
3. A370- Test Methods and Definitions for Mechanical Testing of Steel Products
4. A435- Specification for Straight-Beam Ultrasonic Examination of Steel Plates
5. A516- Specification for Pressure Vessel Plates, Carbon Steel, for Moderate-and Lower-Temperature Service
6. A1018- Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
7. D16- Terminology for Paint, Related Coatings, Materials and Applications
8. D522- Test Methods for Mandrel Bend Test of Attached Organic Coatings
9. D2240- Test Method for Rubber Property 8212; Durometer Hardness
10. D4541- Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
11. E165- Standard Practice for Liquid Penetrant Inspection Method
12. E329- Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspection
13. E709- Standard Guide for Magnetic Particle Testing
14. E1255- Standard Practice for Radioscopy
15. E1444- Standard Practice for Magnetic Particle Testing

D. Society for Protective Coatings (SSPC):

1. SP-1- Solvent Cleaning
2. SP-10- Near-White Blast Cleaning
3. PA/Guide 3- A Guide to Safety in Paint Application
4. PA/Guide 17- A Guide for Selecting Urethane Painting Systems

E. International Institute of Welding (IIW)

F. International Organization for Standardization (ISO)

G. NSF 61- Drinking Water System Components - Health Effects.

1.04 SUBMITTALS

A. Shop Drawings

1. Prior to the fabrication of the pipe, submit fabrication and laying drawings in accordance with AWWA Manual M11 to the ENGINEER for review. The pipe layout drawing shall include as a minimum following:

a. Locations and type of all fittings, joints, valves, supports, anchorage, restraints, and couplings.

b. Location of bulkheads, both those shown and/or required for hydrostatic testing of pipeline.

c. Pipe outside diameter, wall thickness, location of welded seams, and working pressure rating.

d. Fabrication information shall include:

i. Design calculations for pipe, fittings and specials including opening reinforcement details of collars, wrappers, and crotch plates. The calculations shall show maximum design pressure, surge pressure, deflection, buckling, extreme loading condition; special physical loading such as supports or joint design and thermal expansion and/or contraction. Minimum wall thickness for all steel pipe shall be 0.25-inches; Refer to Paragraph 2.1 below.

ii. Manufacturing tolerances,

iii. Details of bulkheads, including method of attachment to the pipe and details for removal of test bulkheads and repair of lining,

iv. Stulling size, spacing, and layout.

e. Manufacturer's product data for:

i. Pipe,

ii. Fittings,

iii. Rubber gasket, and

iv. Fusion bonded epoxy.

f. Call out of weld sizes and dimensions of thrust ring collars, flanges, reinforcing collars, wrapper plates and crotch plates.

g. Submit details of lining and coating to include:

i. Manufacturer's coating product information,

ii. Application recommendations,

iii. Field touch-up procedure,

iv. Thickness of coatings.

h. Submit drawings of couplings, and flanges.

2. The Contractor's Proposed Field Welding Procedure in accordance with AWWA C206 and AWS D1.1.

3. Pipe Manufacturer's written Quality Assurance/Control Plan.

B. Certifications:

1. Mill test certificates for steel plate and steel coil. The MANUFACTURER shall perform the tests described in AWWA C200, for all pipe, fittings, and specials. The certificates shall include chemical and physical test results for each heat of steel.

2. Lining Materials: Submit Documentation that lining system used for all pipes and fittings is currently approved for potable water contact in accordance with NSF 61 and satisfies current applicable governmental health and safety requirements for use in potable water.

C. Statements of Qualification:

1. Welders or Welding Operators:

a. Name of welder.

b. Welding procedures/positions for which welder is qualified to weld.

c. Assigned certification stamp number.

d. Certification date.

e. Current certification status.

D. Submit Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) for each welding process.

E. Field Hydrostatic Testing Plan: Submit at least 15 days prior to testing and include at least the following information:

1. Testing dates.

2. Piping system and sections to be tested.

3. Method of isolation.

4. Method of conveying water from source to system being tested.

5. Calculation of maximum allowable leakage for piping sections to be tested.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Pipe MANUFACTURER:

a. All welded steel pipe, fittings and specials shall be the product of one MANUFACTURER who has no less than five years of successful experience in manufacturing pipe of the particular type and size indicated. All pipes shall be new and not supplied from inventory.

b. Experience shall include successful fabrication to conform AWWA C200 standards within last 5-year period.

2. Fusion Bonded Epoxy Lining:

a. The lining MANUFACTURER shall have a minimum of five years of

experience in the production of lining specified herein. The acceptable MANUFACTURERS for fusion bonded epoxy lining are:

(i) 3M

b. Applicator Qualifications

(i) Equipment shall be certified by the lining MANUFACTURER to meet the requirements for material mixing, temperature control, application rate, and ratio control for multi-part coatings.

(ii) Equipment not meeting the written requirements of coating MANUFACTURER shall be rejected for coating application until repairs or replacement of the equipment is made to the satisfaction of SAWS.

(iii) Personnel responsible for the application of the lining system shall provide certification of attendance at the lining MANUFACTURER's training class within the last 3 years. Lining application personnel shall be present during all lining application and shall have responsibility for controlling all aspects of the lining application.

3. Welders and Welding Operators:

a. Shop Welders: In accordance with ASME BPVC SEC IX and certified with 4F and 5G certification.

b. Field Welders: In accordance with AWS D1.1.

B. OWNER Testing and Inspection

1. Pipe will be subject to inspection by an independent testing laboratory, selected and retained by the OWNER. Representatives of the laboratory or the ENGINEER shall have access to the work whenever it is in preparation or progress, and the Pipe MANUFACTURER shall provide proper facilities for access and for inspection. Material, fabricated parts, and pipe, which are discovered to be defective, or which do not conform to the requirements of this specification shall be subject to rejection at any time prior to OWNER's final acceptance of the product.

C. Factory Testing

1. Hydrostatic Pressure Testing:

a. Each joint of pipe shall be hydrostatically tested prior to application of lining or coating. The internal test pressure shall be that which results in a fiber stress equal to 75% of the minimum yield strength of the steel used. Each joint of pipe tested shall be completely watertight under maximum test pressure. As a part of testing equipment, the Pipe MANUFACTURER shall maintain a record of test data including reference number of pipe tested. The pipe shall be numbered in order that this information can be recorded.

b. Air test shall be made by applying air to the welds at 10 pounds per square inch pressure and checking for leaks around and through welds with a soap solution

2. Fusion Bonded Epoxy Lining: The fusion bonded epoxy lining shall be tested in

accordance with AWWA C213.

3. Elongation: For the tensile test specified in ASTM A370, 2-inch test specimens shall show elongations not less than 22 percent for each heat of steel.

1.06 DESIGN REQUIREMENTS

A. Design Criteria: All pipe, fittings and specials shall be designed for a combination of the following internal, external and surge pressures:

1. Internal Design Pressure: Sizes and design pressure shall be as shown below. Minimum design pressure shall be 150 psi.
2. Surge Pressure: Unless otherwise indicated, provide for 50% of design pressure for surge in addition to design pressure.
3. Restrained pipe shall be designed to withstand the thrust forces on the pipe. Thrust forces shall be calculated based on design pressure plus surge pressure.
4. Test Pressure: 1.5 times the design pressure at the lowest point in-the pipeline or design plus maximum surge pressure whichever is greater.
5. Thermal change: 60 degrees F
6. Steel shall meet the requirements of AWWA C200 and shall be of continuous casting. Steel shall be homogeneous and shall be suitable for field welding, and fully kilned. Steel shall have minimum yield strength of 42,000 psi.
7. The Stress due to design pressure shall be no greater than 50% of the minimum yield strength of the steel. The stress due to design plus surge pressure shall not exceed 75 percent of the yield strength. In no case the design stress shall not be greater than 21,000 psi, at design pressure.

B. Fittings and Specials:

1. The specials shall be of the diameter and wall thickness shown on the Drawings, and in accordance with these Contract Documents. Where not shown, design reinforcement in accordance with AWWA Manual M11, AWWA C200, and AWWA C208.
2. Threaded Fittings:
   a. Malleable iron per FS WW-P-521, Type 1, for use with black steel pipe or Type 2 for use with galvanized steel pipe.
   b. Forged steel for use with extra heavy weight pipe per ANSI B16.11.
3. Welded Fittings:
   a. Socket shall be welded, forged steel per ANSI B16.11.
   b. Butt weld shall be welded, steel per ANSI B16.9.
   c. Wrought carbon steel fittings of seamless or welded construction shall conform to requirements of ASTM A234.
   d. Fabricated steel fittings shall be of same material as pipe and shall comply with the requirements of AWWA C208 and AWWA M-11.
4. Design fittings, specials, associated joints and all field and shop welds with load capacities equal to or greater than those of connecting pipe segments.
5. Design and locate weld lead outlets as needed.
6. Design and locate flushing and sampling ports, as needed, for hydrostatic testing and disinfection.
7. All pipe and pipe fittings located at or near the proposed 1.5 MG GST shall

be designed to account for tank settlement. Prior to fabrication, CONTRACTOR shall submit shop drawings showing the location and type of fittings near proximity of the 1.5 GST to ENGINEER for review.

C. Stulling (Strutting):

1. Design stulling for pipe, specials, and fittings such that damage is avoided during handling, storage, and installation.
2. Materials:
   a. Shop-Lined Pipe: Wood stulls and wedges
   b. Unlined Pipe: Steel or wood.
3. Install stulling for pipe, specials, and fittings in accordance with reviewed submittals and as soon as practical after pipe is fabricated or, for shop-lined pipe, after lining has been applied.
4. Remove stulling after pipe is installed and supported with pipe supports.

D. Unions:

1. Threaded: Malleable iron per FS WW-U-531, Class 1, Type A, for use with black steel pipe and Type B for use with galvanized pipe.
2. Flanged: Use flanges as specified below.

1.07 MARKING, DELIVERY, HANDLING, AND STORAGE

A. Pipe Marking:

1. Legibly mark installation sequence number on pipe, fittings, and specials in accordance with piping layout.
2. Special pipe sections and fittings shall be marked at each end with notation “TOP FIELD CENTERLINE”.

B. Delivery:

1. Pipe, fittings and specials shall be carefully supported during shipment and storage.
2. Securely bulkhead or otherwise seal ends of pipe, specials, and fittings prior to loading at manufacturing Site.
3. Ship pipe on padded bunks with tie-down straps approximately over stulling.
4. Internally support with stulls each pipe length and fittings to maintain a true circular shape.
5. Pipe ends shall remain sealed until installation.
6. Damage to pipe, fittings, or specials, in shipment shall not be delivered to the project site unless such damaged pipe, fittings or specials is properly repaired.
7. Coordinate delivery of the pipe with the CONTRACTOR.

C. Handling:

1. Handle as a minimum at the 1/3 points by use of wide slings padded cradles, or other devices designed and constructed to prevent damage to the pipe coating. The use of chains, hooks or other equipment which might injure the pipe coating will not permitted.

D. Storage:

1. Support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.
2. Support on sand or earth berms free of rock exceeding 3 inches in diameter.
3. Store pipe at the MANUFACTURER's yard until CONTRACTOR is ready to accept the delivery at the site.
4. Deliver, handle, and store pipe, fittings and specials in accordance with the MANUFACTURER's recommendations to protect the coating system.
5. Protect pipe lining from drying by means of plastic and covers banded to the pipe ends.
6. Maintain covers over the pipe ends at all times until ready to be installed.

1.08 SEQUENCING AND SCHEDULING

A. Notify ENGINEER in writing of the following:

1. Pipe Manufacturing: Not less than 14 days prior to starting pipe, fittings and specials fabrication.
2. Not less than 5 days prior to start of each of the following:
   a. Welding.

PART 2 PRODUCTS

WELDED STEEL PIPE 6" AND LARGER

2.01 GENERAL

A. Steel pipe, fittings, and specials shall be manufactured, tested, inspected, and marked to comply with AWWA C200 and additional requirements of these Contract Documents.

B. In lieu of collar reinforcement, pipe, fittings, or specials with outlets may be fabricated in their entirety of steel plate having thickness equal to sum of pipe wall plus required reinforcement.

C. Unless shown otherwise, the diameter shown shall be considered finished inside diameter after lining.

D. Materials furnished shall be NSF 61 approved for use with potable water.

2.02 PIPE BARREL

A. Steel: Provide steel coils for spiral welded steel pipe or steel plate for straight seam welded steel pipe per AWWA C200 and as follows:

1. Minimum Yield Strength: 42,000 psi.
2. Minimum Tensile Strength: 60,000 psi.
3. Minimum Elongation in 2-inch Gauge Length: 22 percent.
4. Pressure Vessel Quality as follows:
   a. Coils: Continuous cast process, fully-killed, fine grained practice conforming to physical, manufacturing and testing requirements of ASTM A1018.

b. Plate:

(i) Fully-kilned, conforming to ASTM A20, fine grained practice conforming to physical, manufacturing and testing requirements of ASTM A516, Grade 70.

(ii) Steel Chemistry: Conform to ASTM A516, Grade 70. Steel plates that are 3/4 inch thick or greater shall be normalized.

5. Wall Thickness:

a. The pipe wall thickness shall be in accordance with AWWA C200, except that all pipes shall have a minimum wall thickness of ¼-inch with zero minus tolerance and an internal nominal diameter to wall thickness ratio not to exceed 200.

6. Inside Diameter of the pipe shall be as shown on the plans or as specified in the Contract Documents.

2.03 FITTINGS AND SPECIALS

A. Fabrication:

1. Shop fabricate fittings and specials. No field fabrication will be allowed.
2. Fabricate from materials or straight pipe in full conformance with requirements of these Contract Documents and dimensions of AWWA C208, unless otherwise indicated.
3. Design Pressure: All fittings and specials shall be designed to withstand internal pressure, both circumferential and longitudinal, and external loading conditions.

B. Elbows, Unless Otherwise Indicated:

1. Minimum Radius: 2.5 times pipe diameter.
2. The minimum thickness of plate for pipe from which specials are to be fabricated shall be the thickness of adjacent mainline pipe, the thickness shown on the Drawings or ¼-inch thickness, whichever is thicker.
3. Maximum Miter Angle: 11-1/4 degrees on each section resulting in a maximum deflection angle of 22.5 degrees per miter weld as recommended in AWWA C208.
4. Maximum total allowable angle for beveled joints shall be 3 degrees per pipe joint. Bevel shall be provided on the bell ends. Mitering of the spigot ends will not be permitted.
5. Complete joint penetration (CJP) welds on miter welds.

C. Outlets:

1. Outlets 12-inch and smaller shall be fabricated from ASTM A53, Type E or S, Grade B, standard weight steel pipe in the standard outside diameters. Unless otherwise shown, wall thickness and collar reinforcing shall be designed by the pipe MANUFACTURER as specified. Collars shall be manufactured with the same steel as specified for the mainline piping.
2. Fabricate collar or wrapper reinforcement using same steel as specified for main pipe barrel.
3. Where outlets for taps are threaded, furnish and install Type 304 stainless steel bushings for the outlet size indicated on the drawings.

4. The CONTRACTOR may use outlets for access for weld leads.

2.04 JOINTS

A. Rubber Gasket:

1. General:

a. For pipes smaller than 24 inches, use expanded bell and rolled groove spigot with rubber gasket. For pipes 24 inches and larger, use Carnegie shape rubber gasket joint.

b. In accordance with AWWA C200.

c. Clearance between bell and spigot shall, when combined with gasket groove configuration and gasket itself, provide watertight joints under all pressure conditions.

2. Rubber Gasket Carnegie Spigot and Expanded Bell:

a. Standard Spigot Shapes in Accordance with AWWA manual M11.

b. Weld spigots to pipe cylinder using single fillet welded lap joint.

c. Bell:

(i) Form by expanding press or by moving axially over a die, in such a manner as to stretch steel plate beyond its elastic limit to form a truly round bell of suitable diameter and shape.

(ii) Do not roll bell ends.

(iii) Minimum Radius: 15 times wall thickness of pipe barrel on either side of bell slope.

(iv) Minimum Bell Depth: 3 inches.

(v) Expanded bells shall have no noticeable depressions or irregularities.

B. Field Welded:

1. Field welded joints shall be in accordance with AWWA C206.

2. Typical field welded joint in restrained sections shall be double fillet lap joint located inside pipe for pipe sizes 24-inch or larger. For pipe sizes smaller than 24-inch use single fillet lap joint. Lap welded joints shall be in accordance with AWWA C206.

3. Butt Joint Welded: As needed for closures or other locations required for construction. Plain ends beveled as required by AWWA C200 and CONTRACTOR's field WPS.

4. Double welded lap joints and butt-strap joints shall be tapped and drilled for testing in accordance with AWWA C206.

5. After welding, the joints shall be prepared, primed, and coated/lined in accordance with Coatings and Linings that follow.

C. Flanges:

1. Flanged joints shall be used on all pipes, fittings and specials on welded steel piping exposed in vaults and on buried pipe systems to connect valves and appurtenances.

2. Use slip-on or ring type flanges. Pipe flanges and welding of flanges to steel pipe shall conform to the requirements of AWWA C206 and AWWA C207.

3. Pressure rating of flanges shall be equal or greater than the adjacent pipe class.
4. Flange bolt circle shall match the bolt circle of the fittings or appurtenances which are to be connected.
5. Flange bolts, and nuts are specified in Section 15120 – Piping Specialties. Unless otherwise noted, color and coating type of nuts and bolts for flanges shall match the flanges to which it is connected in accordance with Section 09900 – Paint and Coatings.
6. Gaskets: Full face for use with flat face flanges and ring type for use with raised face flanges. Gaskets shall be 1/8-inch thick, cloth-inserted rubber, Garlok 3000 or equal in accordance with SAWS Material Standard Specification for steel water pipe. Blind flange gasket shall cover entire inside surface of blind flange.
7. Additional flanges may be added by the CONTRACTOR to facilitate fabrication, handling, transportation and field assembly at no additional cost.
8. Coordinate the dimensions, hole drillings and type of flange face (flat or raised) of the flanges furnished with the companion flanges of valves, pumps and equipment to be connected to or installed in the piping.

D. Butt Strap Closure: Butt strap shall be the same thickness and material as the pipe wall, at least 10 inches wide, rolled to fit the outside cylinder diameter in two half sections, and should be centered over the plain ends of the pipe sections they are to join.

E. Mechanical Couplings: Sleeve type mechanical couplings and flange coupling adaptors are specified in Section 15120 – Piping Specialties.

2.05 COATINGS

A. General:
1. Exterior surface of pipe and fittings in exposed locations shall be cleaned by abrasive grit blasting, and applying prime coat in the shop. Apply finish coat in the field. Prior to adding the prime coating, the exterior surface of pipe shall be prepared per MANUFACTURER's recommendation. Prime coat and finished painting shall be as specified in Section 09900 – Paint and Coatings. Color for water pipe shall be Pantone #284C or as directed by OWNER. CONTRACTOR shall coordinate with OWNER prior to selecting color.
2. Shop coat machined surfaces with a rust preventative compound.

2.06 LININGS

A. General:
1. Notify ENGINEER at least 5 days prior to application of lining products.
2. Holdback of lining from field-welded joints shall be as follows:
   a. For lap-welded joints and flex couplings, 8 inches.
   b. For butt-weld and butt-strap joints, 6 inches.

B. Shop-Applied Fusion Bonded Epoxy Lining
1. Manually spray, automatically spray or apply centrifugally in conformance with AWWA C213. Minimum thickness shall be in accordance with AWWA C213.
2. Prepare surface as recommended by MANUFACTURER.
   a. Pipe surfaces shall be abrasive blast cleaned in accordance with AWWA C213 and SSPC0SP 10/NACE No.2.
   b. Surface Preparation for steel shall be blast cleaned with materials having

an angular profile such as mineral abrasives, slag abrasives or steel grit in accordance with AWWA C213. For requirements of selecting and evaluation mineral and slag abrasives see SSPC-AB 1 and SSPC-AB 3.

3. Interior lining for potable water piping must be NSF 61 certified.
4. Interior lining for potable water piping must be corrosion resistant for fluoride and chlorine chemical application service.
5. Lining machine type that has been used successfully for similar work and acceptable to ENGINEER.
6. Maintain pipe in round condition during lining operation and thereafter by suitable bracing or strutting.
7. Provide polyethylene or other suitable bulkhead on ends of pipe and on special openings to prevent drying out of lining. Bulkheads shall be substantial enough to remain intact during shipping and storage until pipe is installed.
8. Pipe shall be left bare where field joints occur.
9. Ends of lining shall be left square and uniform. Feathered or uneven edges will not be permitted.

C. Field-Applied Fusion Bonded Epoxy Lining:

1. Shall be applied to pipe joints in accordance with AWWA C213, unless stated otherwise.
2. Field applied linings shall be applied by qualified coating MANUFACTURER.
3. Materials conforming to AWWA C213.
4. Minimum thickness shall be in accordance with AWWA C213.
5. Prepare surface as recommended by MANUFACTURER.
   a. Pipe surfaces shall be abrasive blast cleaned in accordance with AWWA C213 and SSPC0SP 10/NACE No.2.
   b. Surface Preparation for steel shall be blast cleaned with materials having an angular profile such as mineral abrasives, slag abrasives or steel grit in accordance with AWWA C213. For requirements of selecting and evaluating mineral and slag abrasives see SSPC-AB 1 and SSPC-AB 3.

2.07 PIPE LENGTH

A. Maximum joint length shall not exceed 50 foot. Maximum joint length of steel pipe installed in casing shall not exceed 25 foot.

B. All non-restrained pipe that is deflected or that has mitered joints in order to maintain alignment on horizontal or vertical curves shall have a minimum length of 8 feet, unless otherwise acceptable to the ENGINEER.

STEEL PIPE (GALVANIZED OR STEEL) SMALLER THAN 6”

2.08 GENERAL

A. Pipe shall be seamless steel pipe, Grade A, Type S, Schedule 40 and shall conform to ASTM A53. Galvanized pipe shall be hot-dipped galvanized after fabrication.

B. Joints for pipe 2-inch or less shall be threaded joints. Threaded joints shall be made up with good quality thread compound and applied to the male thread only. After having been set

up, a joint shall not be backed off unless the joint is completely broken, the threads cleaned and new compound applied. All joints shall be air tight. A sufficient number of unions shall be provided to allow for convenient removal of piping.

C. Fittings for steel pipe 2-inch or less shall be malleable iron, 150 lb. service rating, and shall be hot-dipped galvanized.

D. Where flanged connections are indicated or otherwise required on pipe 2-inch or less for connection to flanged valves, fittings, and appurtenances, they shall be made up using companion type flanges. Where flanged fittings are indicated or otherwise required, they shall be made up using threaded steel nipples and steel companion type flanges. Companion flanges shall be steel, 150 lb. ANSI standard flat face flanges of the threaded type. Flanges shall be spot faced on the back around each bolt hole. Flanges shall also be hot-dipped galvanized.

E. Steel pipe greater than 2-inch size for water service shall have threaded, flanged or welded joints. Air piping greater than 2-inch size shall have welded joints, except where flanges are required for valves or other appurtenances. Threaded joints, fittings, and flanges shall be as specified in this section. Welded pipe joints shall have beveled ends for welding. Fittings shall be steel, butt weld type, standard wall, conforming to ANSI B16.9 and ASTM A234, Grade WPB.

BLACK STEEL PIPE

2.09 GENERAL

A. Pipe shall be black steel, designated BS on the drawings, seamless, Type S, Grade B, Schedule 80, pipe in conformance with ASTM A53 and ANSI B36.10.

B. Fittings shall be seamless, Grade B, welding type in conformance with ANSI B16.9 and ANSI B36.10 and ASTM A234.

2.12 JOINT BONDING

A. Provide joint bonding for non-welded steel pipe joints as specified in Section 15099 – Pipe Corrosion Control.

2.13 FACTORY TESTS

A. The MANUFACTURER shall perform all tests as required by the applicable AWWA standards and as listed herein.

B. Fluoropolymer Coating: The Fluoropolymer coating shall be tested in accordance with Table 1 of Section 4 and Table 2 of Section 5 of AWWA C222.
   1. Cathodic Disbondment
   2. Flexibility
   3. Impact Resistance
   4. Abrasion Resistance

5. Chemical Resistance
6. Dielectric Strength
7. Water Absorption
8. Hardness
9. Cure Test
10. Coating Appearance (Visual)
11. Dry Film Thickness
12. Electrical Continuity
13. Pull-Off Adhesion:

a. Fluoropolymer coatings shall have an adhesion to steel of 1,500 pounds per square inch, minimum.

C. Fusion Bonded Epoxy Lining: The fusion bonded epoxy lining shall be tested in accordance with AWWA C213.

PART 3 EXECUTION

3.01 GENERAL

A. Steel pipe shall be installed as specified in Section 15060 – Miscellaneous Process Piping, true to alignment, and rigidly supported anchors shall be provided where indicated. After installation, the piping shall be tested as specified in 15075 – Water Pipeline Testing. If any joint or pipe proves to be defective, it shall be repaired to the satisfaction of the ENGINEER.

B. All threads shall be clean, machine cut, and all pipes shall be reamed before erection. Each length of pipe as erected shall be up-ended and rapped to dislodge dirt and scale.

C. Screwed joints shall be made up with good quality thread compound and applied to the male thread only. After having been set up, a joint must not be backed off unless the joint is completely broken, the threads cleaned and new compound applied. All joints shall be air tight.

D. All piping shall have a sufficient number of unions to allow convenient removal of piping. Unions shall be compatible with pipe.

E. When cutting of pipe is required, the cutting shall be done by machine in a neat workmanlike manner without damage to the pipe. Cut ends shall be smooth and at right angles to the axis of the pipe.

F. All field welding shall be in accordance with the American Welding Society Standards and shall comply with AWWA C206. The strength of the field weld shall develop the strength of pipe.

3.02 INSTALLATION

A. Piping Exposed, 3-inch and smaller

1. Piping Layout:

a. Use drawings as guide, field route lines, and give special attention to

appearance of completed installation.
b. Make provisions for expansion and contraction during normal operations.
c. Do not obstruct openings or passage ways.
d. Keep free of contact with building construction or installed items.
e. Provide unions to permit removal of equipment, pumps, and valves.
f. Provide dielectric unions for connection to copper piping.

2. Cutting: Cut pipe from measurement taken at the site, using drawings as guide.
3. Water Piping: Arrange so system can be completely drained.
4. Air Piping: Grade to points of drainage collection.

B. Piping, Exposed, Greater than 3-inches
1. Piping Layout:
a. Install as shown on the drawings and per fabricator's shop drawings.
b. In placing the pipe, hold pipe by one or more padded slings. Handle in a manner that will prevent damage to the pipe or the protective coating. Support pipe adequately while being fitted and joined with adjoining pipe section.
c. After each section of pipe has been set into position, attach to the adjoining section as specified or shown on the drawings.
2. Provide drains and high point vents to facilitate pressure testing.
3. Install valves with operator positioned to permit access for operation.

3.03 PIPE SUPPORTS

A. Although some supports are indicated on the drawings no attempt has been made to indicate all required pipe supports. Design, furnish and install pipe supports as defined in Section 15140 – Supports and Hangers.

B. Provide supports as required to support piping such that its weight is not supported by the pumps or equipment and to limit pipe deflection.

3.04 CLEANING

A. Keep inside of all pipe, fittings, and valves clean and free from dirt and debris.

B. Thoroughly clean piping.

3.05 WELDING

A. Conform to AWS D1.1, AWWA C206, approved welding procedures, and referenced welding codes. In case of conflict AWS D1.1 shall govern.

B. Preheat and Interpass temperature requirements for unlisted base metals shall be determined according to AWS D1.1, Annex XI Guideline on Alternative Methods for Determining Preheat.

C. Rejected weld defects shall be repaired or redone, and retested until sound weld metal has been deposited in accordance with appropriate welding codes.

D. CONTRACTOR shall field weld joints for joint restraint for connecting existing pipe as

shown on the restrained length submittal.

E. Any changes in vertical or horizontal alignment from that provided in the drawings may necessitate a change in restrained joint lengths. CONTRACTOR shall contact ENGINEER any time a change in alignment is necessary.

3.06 REPAIR AND FIELD TOUCHUP OF POLYURETHANE COATING

A. Apply repair or Touch Up material as recommended by Coating manufacturer for main line coating for repair and field touch-up of polyurethane coating.

B. Repair Procedure - Holidays:

1. Remove all traces of oil, grease, dust, dirt, etc.
2. Roughen area to be patched by sanding with rough grade sandpaper (40 grit).
3. Apply a 30 mil coat of repair material described above. Work repair material into scratched surface by brushing or rolling in accordance with MANUFACTURER's recommendations and technical data.
4. Retest for Holiday after appropriate state of cure as directed by technical data.

C. Repair Procedure - Field Cuts or Large Damage:

1. Remove burrs from field cut ends or handling damage and smooth out edge of polyurethane coating.
2. Remove all traces of oil, grease, dust, dirt, etc.
3. Roughen area to be patched with rough grade sandpaper (40 grit). Feather edges and include overlap of 2 inches of roughened polyurethane in area to be patched.
4. Apply a 30 mil coat of repair material described above, in accordance with MANUFACTURER's recommendations. Work repair material into scratched surface by, brushing. Feather edges of repair material into prepared surface. Cover at least 1 inch of roughed area surrounding damage, or adjacent to field cut.
5. Test repairs for Holidays per Paragraph 3.06.B. of this Section.

3.07 CONNECTIONS WITH EXISTING PIPES

A. Connections to existing pipes shall be made using suitable joints and fittings for the conditions encountered. Each connection with an existing pipe shall be made at the time and under conditions which will least interfere with normal operation. Connections with buried existing flanges shall require removal of grout from the flanges. Remove concrete thrust block when encountered for connections to the existing pipes.

B. Facilities shall be provided for proper dewatering and for disposal of all water removed from the dewatering lines and excavations without damage to adjacent property.

C. Existing valves will leak when in closed position. CONTRACTOR shall provide whatever means and equipment is necessary to control water during construction.

D. CONTRACTOR shall be responsible for coordinating with Pipe and Lining MANUFACTURER to install a pipe lining system that properly transitions from an existing pipe lining to the new epoxy lining. The transition from existing liner to new liner shall be designed/installed such that water flow does not damage the new epoxy lining.

CONTRACTOR shall submit the proposed lining transition/connection to ENGINEER for review prior to fabrication of pipe. Modifications for tying in the existing pipe lining to the proposed lining with transition shall be made at no additional cost to the OWNER.

3.08 FIELD QUALITY CONTROL

A. Field Welding:

1. All welds (100 percent inspection) shall be visually inspected by CONTRACTOR's CWI and marked to indicate acceptance or rejection.
2. The CONTRACTOR will be required to visually inspect and test the joints, selected at random by the ENGINEER or the OWNER after welding.
3. Any damage must be repaired.
4. CONTRACTOR to perform in the presence of OWNER or an independent testing laboratory dye penetrant tests in accordance with ASTM E165, or magnetic particle test in accordance with AWWA C206 and set forth in AWS D1.1.
5. Welds that are defective shall be repaired or replaced whichever is deemed necessary by the ENGINEER, at the CONTRACTOR's expense.
6. If the CONTRACTOR disagrees with the ENGINEER's interpretation of welding test, test sections may be cut from the joint for physical testing.
7. The procedure of repairing the joint shall be acceptable to the ENGINEER before proceeding.
8. Test butt-strap or double-welded lap joint welds by pressurizing connection between the two fillet welds in accordance with AWWA C206.
    a. Apply air or other ENGINEER-accepted gas into connection between the two fillet welds.
    b. Paint welds with soap solution.
    c. Mark leaks indicated by escaping gas bubbles.
    d. Close threaded openings with flush pipe plugs or by welding them.
9. Submit test results to ENGINEER.

B. Testing of Polyurethane Coating: The entire surface area of the pipe exterior shall be inspected using a full loop high voltage holiday tester. Perform testing in accordance with National Association of Corrosion Engineering (NACE) Standard RP0274-98- High Voltage Electrical Inspection of Pipeline Coatings.

C. Field Testing: All piping systems shall be pressure tested as specified in Section 15075-Water Pipeline Testing. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum design working pressure. The CONTRACTOR shall furnish all test equipment, labor, materials, and devices at no extra cost to the OWNER.

3.09 DISINFECTION

A. Disinfection of steel piping shall be in accordance with Section 15074 – Disinfection of Waterlines.

END OF SECTION

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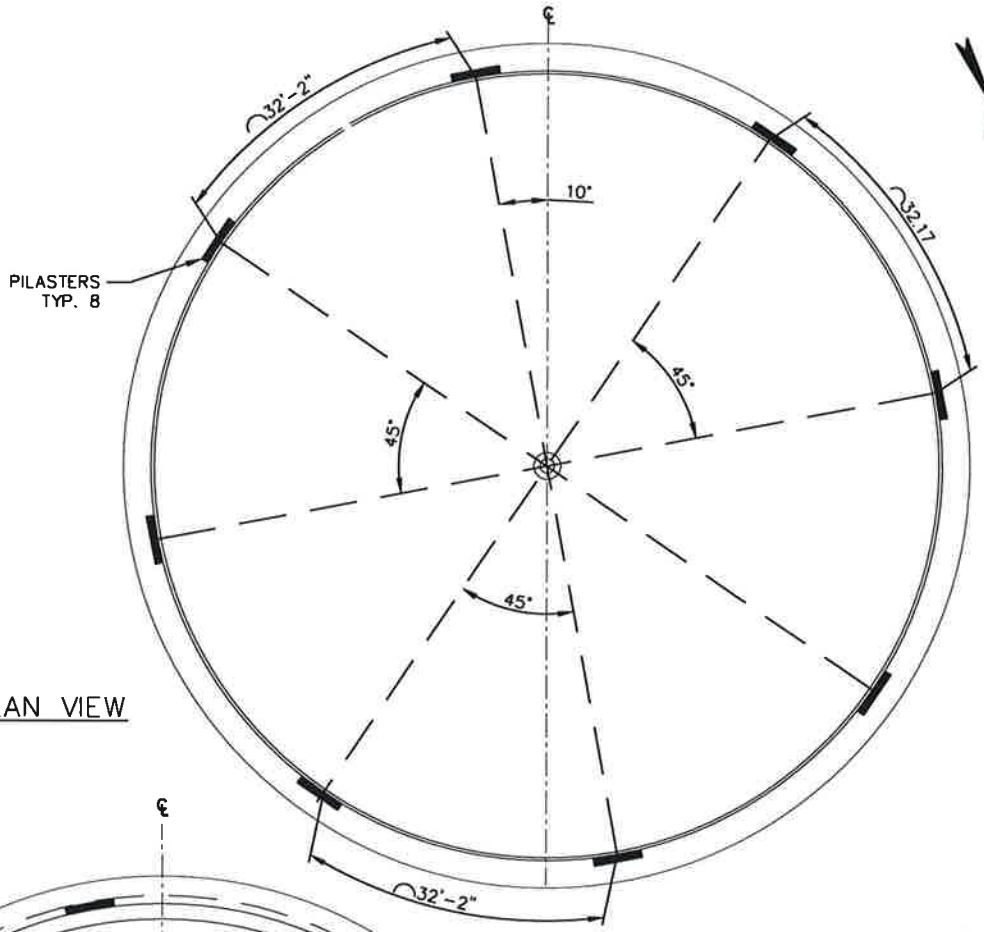
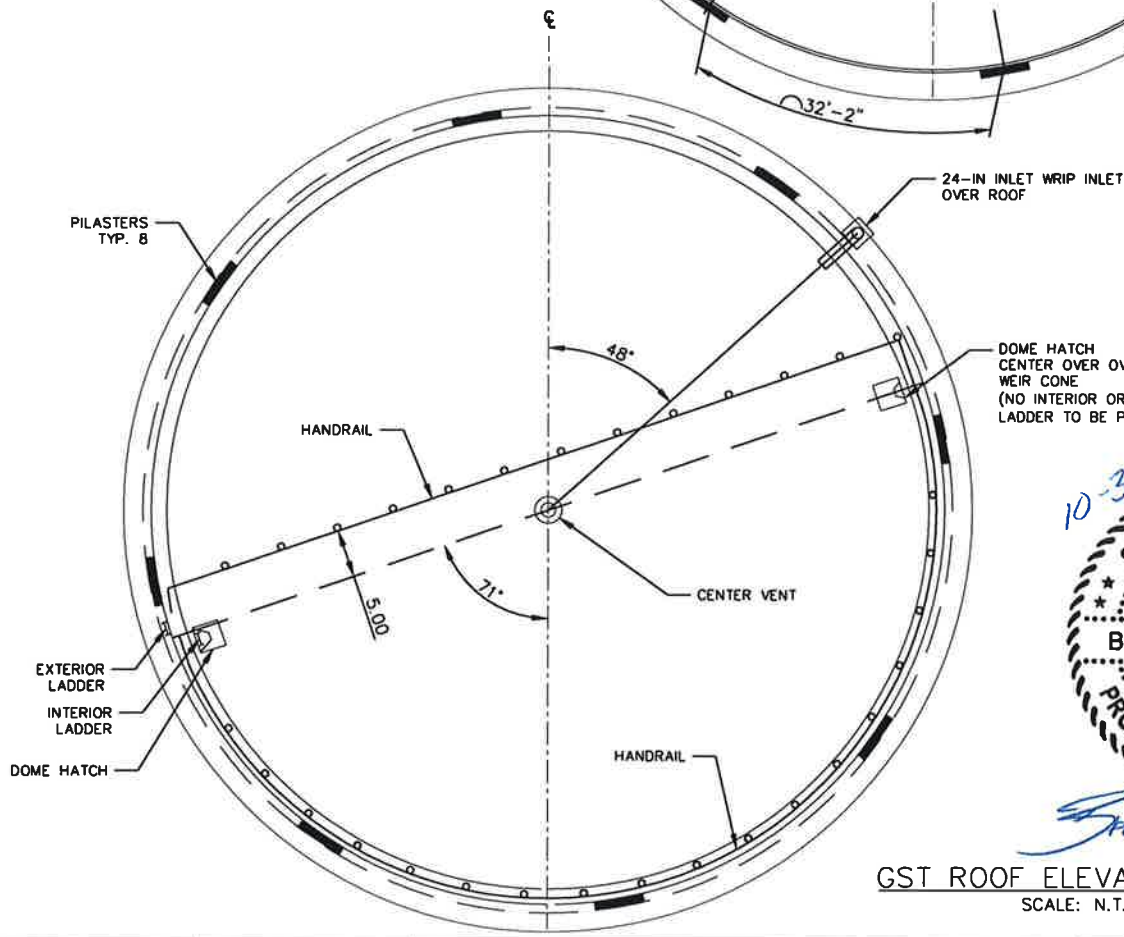


GST PILASTERS PLAN VIEW
SCALE: N.T.S.



10-30-2015

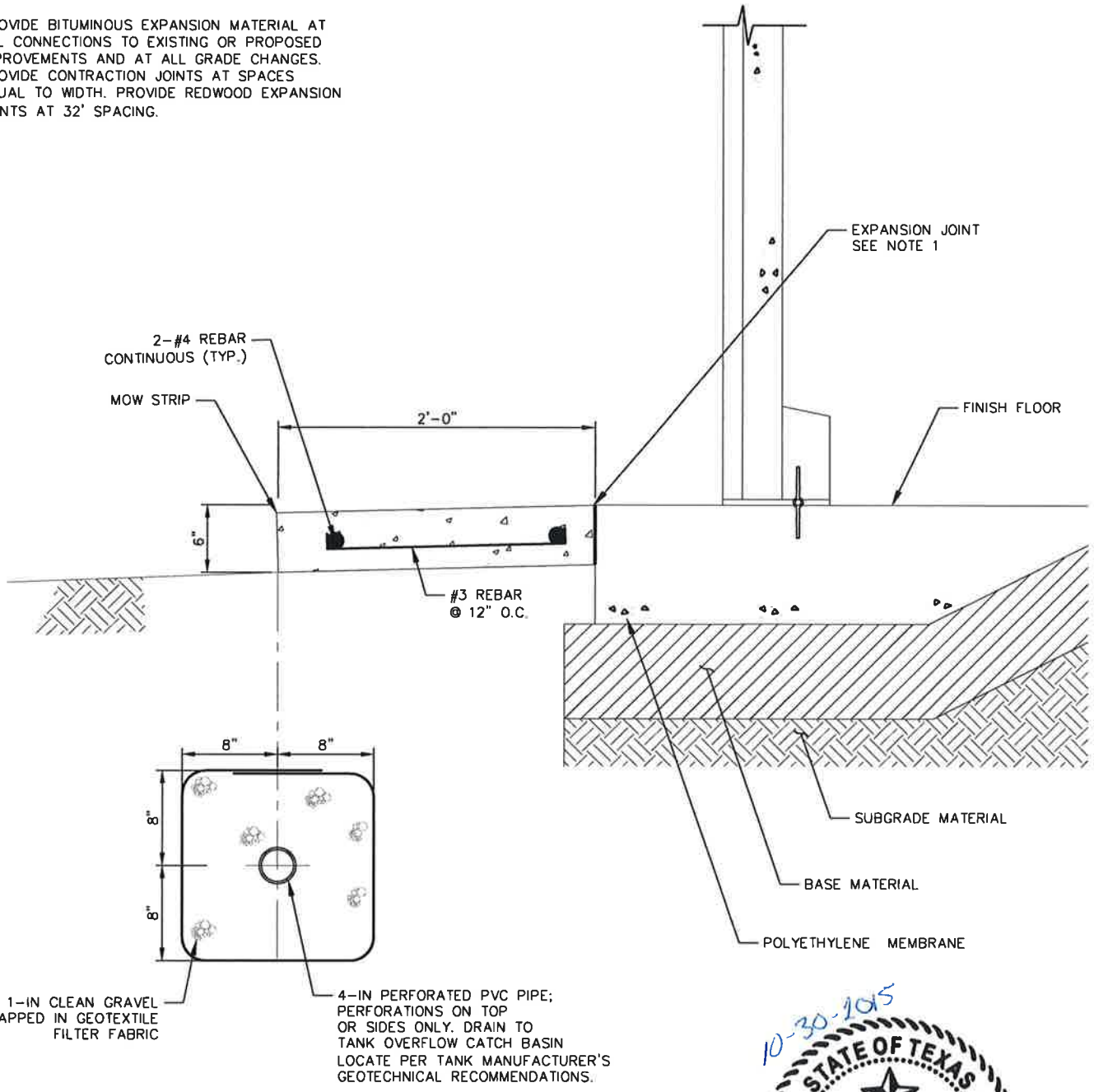
STATE OF TEXAS
BRETT A. LARSON
113028
LICENSED
PROFESSIONAL ENGINEER

GST ROOF ELEVATION PLAN
SCALE: N.T.S.

GB PRJ #: 103187-00001 Designed By: FJC Drawn By: FJC Reviewd By: WCC Date: OCTOBER 2015	**SAN ANTONIO WATER SYSTEM** **DSP CLAYTON TANK REPLACEMENT PROJECT** **GST ROOF AND PILASTER PLAN** **SHEET T-SPS-1**	**EXHIBIT B**	garzabury LLC 922 Isom Road, Suite 100 San Antonio, TX 78216 Tel. (210) 526-0286 Fax (210) 526-0325 TBPE Registration Number F-14629 Garza Bury, LLC © Copyright 2015

NOTES:

1. PROVIDE BITUMINOUS EXPANSION MATERIAL AT ALL CONNECTIONS TO EXISTING OR PROPOSED IMPROVEMENTS AND AT ALL GRADE CHANGES. PROVIDE CONTRACTION JOINTS AT SPACES EQUAL TO WIDTH. PROVIDE REDWOOD EXPANSION JOINTS AT 32' SPACING.



PERIMETER DRAIN DETAIL
SCALE: N.T.S.

10-30-2015
STATE OF TEXAS
BRETT A. LARSON
113028
LICENSED
PROFESSIONAL ENGINEER

GB PRJ #: 103187-00001 Designed By: FJC Drawn By: FJC Reviewd By: WCC Date: OCTOBER 2015	**SAN ANTONIO WATER SYSTEM** **DSP CLAYTON TANK REPLACEMENT PROJECT** **PERIMETER DRAIN** **SHEET T-SPS-4**	**EXHIBIT C**	garzabury LLC 922 Isom Road, Suite 100 San Antonio, TX 78216 Tel. (210) 526-0286 Fax (210) 526-0325 TBPE Registration Number F-14629 Garza Bury, LLC © Copyright 2015

EQUIPMENT / STRUCTURE DESIGNATION

A	ANALYZER
AHU	AIR HANDLING UNIT
BA	BALL VALVE
BCV	BALL CHECK VALVE
BG	BUTTERFLY GATE
BPRV	BACK PRESSURE REGULATING VALVE
BU	BUTTERFLY VALVE
℄	CENTERLINE
CE	CHLORINE EJECTOR
CK	CHECK VALVE
CLD	CHLORINE DETECTOR
CLF	CHLORINATOR
CP	CONTROL PANEL
CRA	CHLORINE RESIDUAL ANALYZER
DAP	DAMPER
DF	DIFFUSER
DV	DIAPHRAGM VALVE
EAP	AIR PACK
EF	EXHAUST FAN
EST	ELEVATED STORAGE TANK
ESV	EMERGENCY SHUT OFF VALVE
EX	EXISTING
FAN	EXHAUST FAN
FCA	FLANGED COUPLING ADAPTER
FCV	FLOW CONTROL VALVE
FE	FLOW ELEMENT
FG	FLAP GATE
FIT	FLOW INDICATING TRANSMITTER
FL	FLOWLINE
FM	FLOW METER
GA	GATE VALVE
GC	GAS DETECTOR
GL	GLOBE VALVE
GST	GROUND STORAGE TANK
HPT	HYDRO-PNEUMATIC TANK
HTR	HEATER
IE	INVERT ELEVATION
KG	KNIFE GATE VALVE
LCV	LEVEL CONTROL VALVE
LE	LEVEL ELEMENT
LI	LEVEL INSTRUMENT
LOU	LOUVER
LS	LEVEL SWITCH
LSM	LEAK SENSOR MONITOR
M	MOTOR
MG	MILLION GALLON
MIX	MIXER
MOV	MOTORIZED VALVE
P	PUMP
PCV	PRESSURE CONTROL VALVE
PDI	PRESSURE DIFFERENTIAL INDICATOR
PI	PRESSURE INDICATOR
PIS	PRESSURE INDICATING SWITCH
PIT	PRESSURE INDICATING TRANSMITTER
PP	POWER PANEL
PMP	PUMP
PNL	PANEL
PRV	PRESSURE RELIEF VALVE & VACUUM
PS	PRESSURE SWITCH
PSL	PRESSURE SWITCH LOW
PV	PLUG VALVE
PWSBP	PLANT WATER SYSTEM BOOSTER PUMP
PWSJP	PLANT WATER SYSTEM JOCKEY PUMP
PWSPT	PLANT WATER SYSTEM PRESSURE TANK
PWSST	PLANT WATER SYSTEM STORAGE TANK
REA	RESIDUAL ANALYZER
RTM	ROTAMETER
SAM	SAMPLER
SCC	SCUM COLLECTOR
SOL	SOLENOID VALVE
SRV	SURGE VALVE
TC	BUTTERFLY (TWIN SEAL/DOUBLE DOOR) CHECK VALVE
TI	TEMPERATURE INDICATOR
TIS	TEMPERATURE INDICATING SWITCH
TIT	TEMPERATURE INDICATING TRANSMITTER
TNK	TANK
TS	TEMPERATURE SWITCH
UH	UNIT HEATER
VI	VACUUM INDICATOR
VRG	VACUUM REGULATOR
VRV	VACUUM REGULATING VALVE

GENERAL ABBREVIATIONS

CB	CHLORINE BUILDING
EL	ELEVATION
FF	FINISHED FLOOR
GST	GROUND STORAGE TANK
HGL	HIGH GRADE LINE
PZ	PRESSURE ZONE
TBD	TO BE DEMOLISHED
TBR	TO BE REMOVED
WSE	WATER SURFACE ELEVATION
YD	YARD

OPERATOR CODE

H	HAND/MANUAL
HY	HYDRAULIC
M	MOTOR
PN	PNEUMATIC
D	DIAPHRAGM

PROCESS FLOW NOMENCLATURE (PRODUCT CODE)

A	AIR
BA	BACKWASH AIR
BWW	BACKWASH WATER
BYP	BYPASS
CLG	CHLORINE GAS UNDER PRESSURE
CLL	CHLORINE LIQUID
CLS	CHLORINE SOLUTION
CLV	CHLORINE GAS UNDER VACUUM
D	DRAIN
FIW	FIRE WATER SYSTEM
NPW	NON-POTABLE WATER/PLANT WATER
OVF	OVERFLOW
PD	PLANT DRAIN
PDR	PROCESS DRAIN
PE	PLANT EFFLUENT
PRD	PROCESS DRAIN
PS	PRIMARY SLUDGE
PW	POTABLE WATER
PWS	PLANT WATER
RTM	ROTAMETER
SD	STORM DRAIN
SMP	SAMPLE POINT
SS	SANITARY SEWER
STS	STORM SEWER
SW	STORM WATER
UT	UTILITY
V	VENT
VTR	VENT THRU ROOF
W	POTABLE WATER

SERVICE CODE

OVF	OVERFLOW
C	COMMUNICATION
D	DRAIN
EP	ELECTRICAL PRIMARY
ES	ELECTRICAL SECONDARY
SD	STORM DRAIN
SI	STORM INLET
PW	POTABLE WATER

PROCESS NUMBER

1	DRAIN
2	OVERFLOW DRAIN
3	POTABLE WATER
4	RAW WATER
5	SAMPLE LINE
6	SANITARY DRAIN & VENT
7	UTILITY WATER
8	CHEMICAL LINE
WAC	WATER COOLER
WC	WASHER/COMPACTOR
WE	WEIGH ELEMENT
WI	WEIGHT INDICATOR
WIT	WEIGHT INDICATING TRANSMITTER

FLUID ABBREVIATION	FUNCTION (THIS LIST INCLUDES SOME LINES NOT USED IN THIS PROJECT)	PIPING MATERIALS (SEE SCHEDULE BELOW) EXPOSED PIPING (SEE NOTE 11) 2 in. DIA. & SMALLER	EXPOSED PIPING 2-1/2in. DIA. & LARGER	BURIED PIPING (SEE NOTE 10) 2 in. DIA. & SMALLER	BURIED PIPING 2-1/2in. DIA. & LARGER	FIELD TEST REQUIREMENTS (SEE NOTES 2, 3 & 4) MINIMUM TEST PRESSURE PSI	TEST MEDIUM
CL	CHLORINE (GAS OR LIQUID STATE)	3	--	--	--	300	DRY AIR
CLS	CHLORINE SOLUTION	7*	--	4**	--	125	WATER
CLV	CHLORINE GAS UNDER VACUUM	3	--	--	--	15 IN. Hg	VACUUM
D	DRAIN	--	--	5	--	NOTE 6	WATER
O	OVERFLOW	--	--	--	6	NOTE 7	--
PW	POTABLE WATER	2,3*,7*	1,2,7*	3,7	1,2,7	125	WATER
UW	UTILITY WATER (NON-POTABLE WATER)	7*	--	--	--	125	WATER

PIPING MATERIAL SCHEDULE (SEE NOTE 4)

GROUP NO.	PIPE (SEE NOTE 11)	FITTINGS
1	WELDED STEEL, AWWA C200, FUSION BONDED EPOXY LINED, EXTERIOR POLYURETHANE (BURIED)/FLUOROPOLYMER (EXPOSED) COATED	WELDED STEEL, AWWA C200, FABRICATED, FLANGED
2	DUCTILE IRON, ANSI A21.51, (AWWA C151) BELL & SPIGOT, MECHANICAL JOINTS, MECHANICAL COUPLINGS, OR CLASS 125 FLANGED (TYPICAL SERVICE – WATER LINES)	DUCTILE IRON OR CAST IRON, ANSI A21.10, OR AWWA C110 BELL& SPIGOT, MECH CPLGS, FLANGED OR MECH JOINTS, 250 PSI, (PRESSURE RATING) 12 INCHES & SMALLER, 150 PSI, (PRESSURE RATING) 14 INCHES & LARGER, WITH CLASS 125 ANSI B16.1 FLANGES.
3	POLYVINYL CHLORIDE, SCHEDULE 80, NORMAL IMPACT, ASTM D1785	POLYVINYL CHLORIDE, SCHEDULE 80, NORMAL IMPACT, SOCKET SOLVENT WELD JOINTS, ASTM D2467
4	DOUBLE CONTAINED CONTINENTAL- RED VALUFLEX/GS RUBBER HOSE	REFERENCE GROUP NO. 3
5	POLYVINYL CHLORIDE PRESSURE RATED PIPE, ASTM D2241 (≤12") ASTM D1784 (14"-36")	POLYVINYL CHLORIDE PRESSURE RATED PIPE, ASTM D2241 (≤12") ASTM D1784 (14"-36")
6	REINFORCED CONCRETE PIPE, ASTM C-14 (< 18") ASTM C-76, CLASS III (≥ 18")	REINFORCED CONCRETE PIPE, ASTM C-14 (< 18") ASTM C-76, CLASS III (≥ 18")
7	CHLORINATED POLYVINYL CHLORIDE (CPVC), SCHEDULE 80, ASTM D1784	CHLORINATED POLYVINYL CHLORIDE, SCHEDULE 80, SOCKET SOLVENT WELD JOINTS, ASTM F439

4

NOTES:

1. PROPRIETARY NAMES HAVE BEEN QUOTED FOR IDENTIFICATION PURPOSES ONLY. SUBSTITUTIONS WILL BE PERMITTED SUBJECT TO PROVISIONS OF THE SPECIFICATIONS.
2. LEAKAGE ALLOWANCE SHALL BE AS PER SECTION 15075 – WATER PIPELINE TESTING.
3. FOR FIELD TEST PROCEDURES AND ADDITIONAL TEST REQUIREMENTS, SEE PIPING SECTION OF SPECIFICATIONS.
4. ANY DEVIATION FROM THE PIPING MATERIALS OR FIELD TEST REQUIREMENTS ACCEPTED BY THE ENGINEER OR OWNER SHALL BE SHOWN ON THE RECORD DRAWINGS.
5. PIPING GROUP NUMBER SHOWN THUS * SHALL BE INSULATED AND CONTRACTOR SHALL INSTALL SUCH PIPE DURING AMBIENT TEMPERATURES BETWEEN 65 AND 75 DEGREES FAHRENHEIT. SEE PIPING SECTION OF SPECIFICATIONS FOR INSULATING MATERIALS.
6. STATIC WATER TEST WITH SURFACE 5 FEET ABOVE HIGH POINT OF PIPE.
7. CHANGE IN PIPING MATERIAL GROUP NUMBER IS INDICATED THUS: ——◇——
8. FOR PIPE LINING AND COATING, SEE SPECIFICATIONS.
9. EXPOSED PIPING SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATIONS. COLORS TO BE SELECTED BY OWNER.
10. THE SPECIFIC PIPING MATERIALS CALLED OUT ON THE DRAWINGS ARE THE REQUIRED MATERIALS FOR INDIVIDUAL PIPING SYSTEMS.
11. STANDARD DETAILS FOR PIPE SUPPORTS INDICATE STANDARD MATERIALS OF CONSTRUCTION. IF DRAWINGS INDICATE A DIFFERENT MATERIAL THAN SHOWN IN THE DETAIL, THE CALLED OUT MATERIAL ON THE DRAWING SHALL BE USED.
12. FOR SECONDARY CONTAINMENT PIPING SEE SPECIFICATION SECTION 11261 AND PLANS.

(* SEE NOTE 5)
(** SEE NOTE 12)

IDENTIFICATION SYSTEM

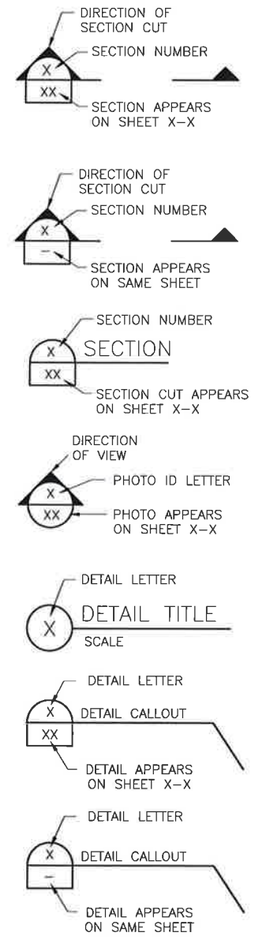
PIPE LEGEND
XX-PW-XX
- PIPE MATERIAL SCHEDULE, GROUP NO.
- PRODUCT CODE
- PIPE DIAMETER, INCHES

MANHOLE SERVICE CODE
MH-ES-101
- SEQUENCE NUMBER
- PROCESS NUMBER
- SERVICE CODE

EQUIPMENT LEGEND
TNK-101
- SEQUENCE NUMBER
- PROCESS NUMBER
- EQUIPMENT CODE

VALVE LEGEND
24-BU-101
- SEQUENCE NUMBER
- PROCESS NUMBER
- VALVE CODE
- VALVE SIZE, INCHES

DRAFTING SYMBOLS



10/30/2015

STATE OF TEXAS
JOHN E LEVITT
47714
REGISTERED PROFESSIONAL ENGINEER

CP&Y, Inc.
TBPE FIRM NO. F-1741

garzabury llc
927 Iron Road, Suite 100
San Antonio, TX 78216
Tel: (210) 828-6286 Fax: (210) 828-0325
TBPE Registration Number: F-14629
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SAWS JOB NO. P-14-6101

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM #4	JEL	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

ABBREVIATIONS, DRAFTING SYMBOLS, LEGEND, & FLUID CODES

DATE:	OCTOBER 2015
DESIGNED BY:	JAM
DRAWN BY:	GWM
REVIEWED BY:	JEL
GB PRJ.#:	103817-00001

SHEET G-4

SHEET 4 OF 99

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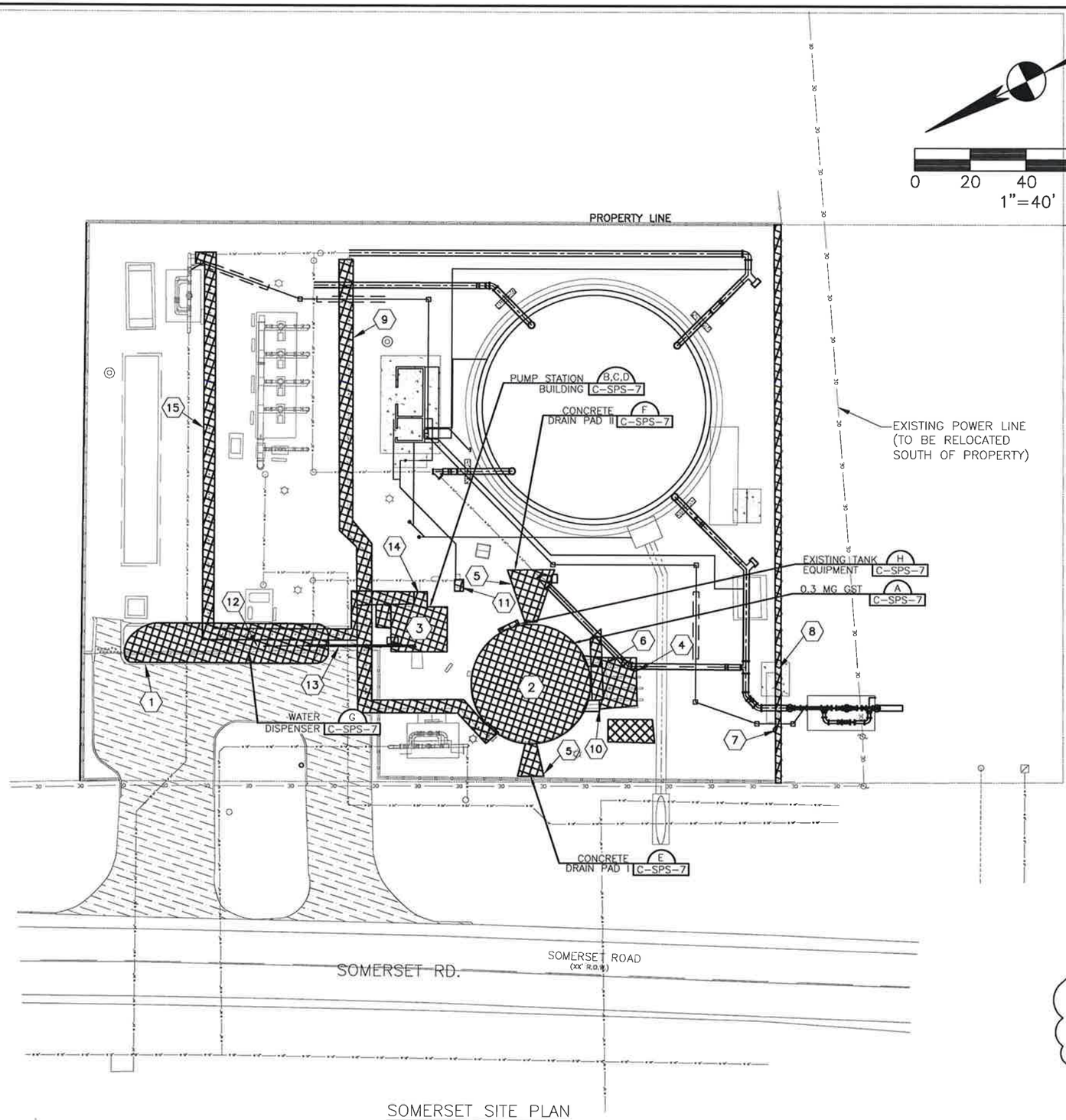

SOMERSET SITE PLAN

0 20 40 60 80
1"=40'

NOTES BY SYMBOL ⟨X⟩

1	CURB (TBD)
2	0.3 MG STEEL GST (TBD)
3	PUMP STATION BUILDING (TBD)
4	CONCRETE PAD (TBD)
5	CONCRETE DRAIN PAD (TBD)
6	WATER VALVES (TBD)
7	POWER POLE (TBD)
8	FENCE (TBD)
9	16–PW–2 (TEMP TANK INLET) (TBD), SEE NOTE 2
10	24–PW–2 (TANK OUTLET) (TBD), SEE NOTE 2
11	STUB–OUT (TBD)
12	WATER DISPENSER (REMOVE AND RECONSTRUCT), SEE NOTE 1
13	GATE ENTRANCE (REMOVE AND REPLACE)
14	CHLORINE BUILDING (TBD)
15	CHLORINE SOLUTION LINE (TBD)

LEGEND

- TO BE DEMOLISHED (TBD)
- EXIST CONCRETE PAVEMENT
- PROP CONCRETE PAVEMENT

NOTES:

1. REFER TO SHEET G–3 FOR GENERAL NOTES #7, #24, #25, AND OTHERS AS APPLICABLE.
2. HATCHING, AS SHOWN ON THIS SHEET, INDICATES PARTIAL DEMOLITION LIMITED TO BOUNDARY OF HATCH. CONTRACTOR SHALL REFER TO SHEETS C–SPS–8 THROUGH C–SPS–12 FOR CONSTRUCTION SEQUENCING AND ROUTING OF YARD PIPING. CONTRACTOR SHALL MAINTAIN OPERATION AND SERVICE OF ALL MAINS, WELLS, AND FACILITIES UNLESS OTHERWISE NOTED, FOR THE ENTIRE DURATION OF CONSTRUCTION, AT NO ADDITIONAL COST TO OWNER. CONTRACTOR SHALL COORDINATE REMOVAL OF EXISTING MAINS WITH OWNER. THE CONTRACTOR SHALL DEMOLISH EXISTING PIPE TO AN ACCEPTABLE PIPE JOINT, AS APPROVED BY OWNER. THE CONTRACTOR SHALL FURNISH AND INSTALL AN APPROPRIATE CAP TO MAINTAIN SERVICE OF THE EXISTING WATER MAIN, OR FOR AN APPROPRIATE TIE–IN OF PROPOSED PIPE, AS NECESSARY. THE CONTRACTOR SHALL FIELD LOCATE THE JOINT PRIOR TO SUBMITTAL PREPARATIONS AND MAKE NECESSARY ADJUSTMENTS TO THE PIPE LENGTH AT NO ADDITIONAL COST TO OWNER.
3. CONTRACTOR SHALL PROTECT EXISTING ELECTRICAL AND COMMUNICATION DUCTBANKS NOT TO BE REPLACED OR DEMOLISHED IN THIS CONTRACT. CONTRACTOR SHALL COORDINATE WITH OWNER FOR THE DEMOLITION OF DUCTBANK OR CONDUIT.
4. CONTRACTOR SHALL FLUSH CHEMICAL PIPING AND FACILITIES AND PROPERLY DISPOSE OF ALL CHEMICALS PRIOR TO DEMOLITION.
5. CONTRACTOR SHALL COMPLETELY DEMOLISH EXISTING FACILITIES AND INFRASTRUCTURE CALLED OUT FOR REMOVAL UNLESS OTHERWISE DIRECTED BY HATCHING ON THIS SHEET.
6. WATER SUPPLY TO CURRENT CHEMICAL SYSTEMS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION, AT NO ADDITIONAL COST TO OWNER.
7. REFER TO C–SPS–13, C–SPS–14, AND SPECIFICATIONS FOR BACKFILL REQUIREMENTS, FINISH GRADE AND NEW CONSTRUCTION.
8. UNLESS OTHERWISE DIRECTED BY OWNER, ALL DEMOLITION MATERIAL SHALL BE TRANSPORTED TO OFF SITE LOCATION, AND DISPOSED OF BY THE CONTRACTOR PER APPLICABLE CODES AND REQUIREMENTS AT NO ADDITIONAL COST TO OWNER.
9. THE OWNER HAS FIRST RIGHT OF SALVAGE FOR THE DEMOLISHED MATERIAL/EQUIPMENT.
10. REFER TO SHEETS C–SPS–8 THROUGH C–SPS–12 FOR CONSTRUCTION AND DEMOLITION SEQUENCING.
11. REFER TO SHEETS S–SPS–7, S–SPS–10, AND S–SPS–11 FOR ADDITIONAL INFORMATION ON THE WATER DISPENSING STATION. 4
12. SOMERSET PROJECT SITE MAY CONTAIN LEAD BASED PAINT FOR THE GROUND STORAGE TANK AND ASBESTOS FOR THE CHLORINE BUILDING WINDOW GLAZE. CONTRACTOR SHALL CONDUCT DEMOLITION AND REMOVAL OF ASBESTOS MATERIAL IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL RULES AND REGULATIONS. REFER TO SECTIONS 02050 AND 02065 OF THE CONTRACT DOCUMENTS.

10/30/2015

STATE OF TEXAS
JOHN E LEVITT
47714
REGISTERED
PROFESSIONAL ENGINEER

CP&Y, Inc.
TBPE FIRM NO. F-1741

SAWS JOB NO.
P–14–6101

garzabury LP
927 North Road, Suite 100
San Antonio, TX 78216
Tel: (210) 828-0286 Fax: (210) 979-0325
TBPE Registration Number: F-14629
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SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM #4	JEL	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

OVERALL DEMOLITION PLAN & EXISTING YARD PIPING

DATE:	OCTOBER 2015
DESIGNED BY:	JAM
DRAWN BY:	GWM
REVIEWED BY:	JEL
GB PRJ.#:	103817–00001

SHEET
C-SPS-6
SHEET 100 OF 99

Date: Oct 29, 2015, 10:57am User ID: gmilks
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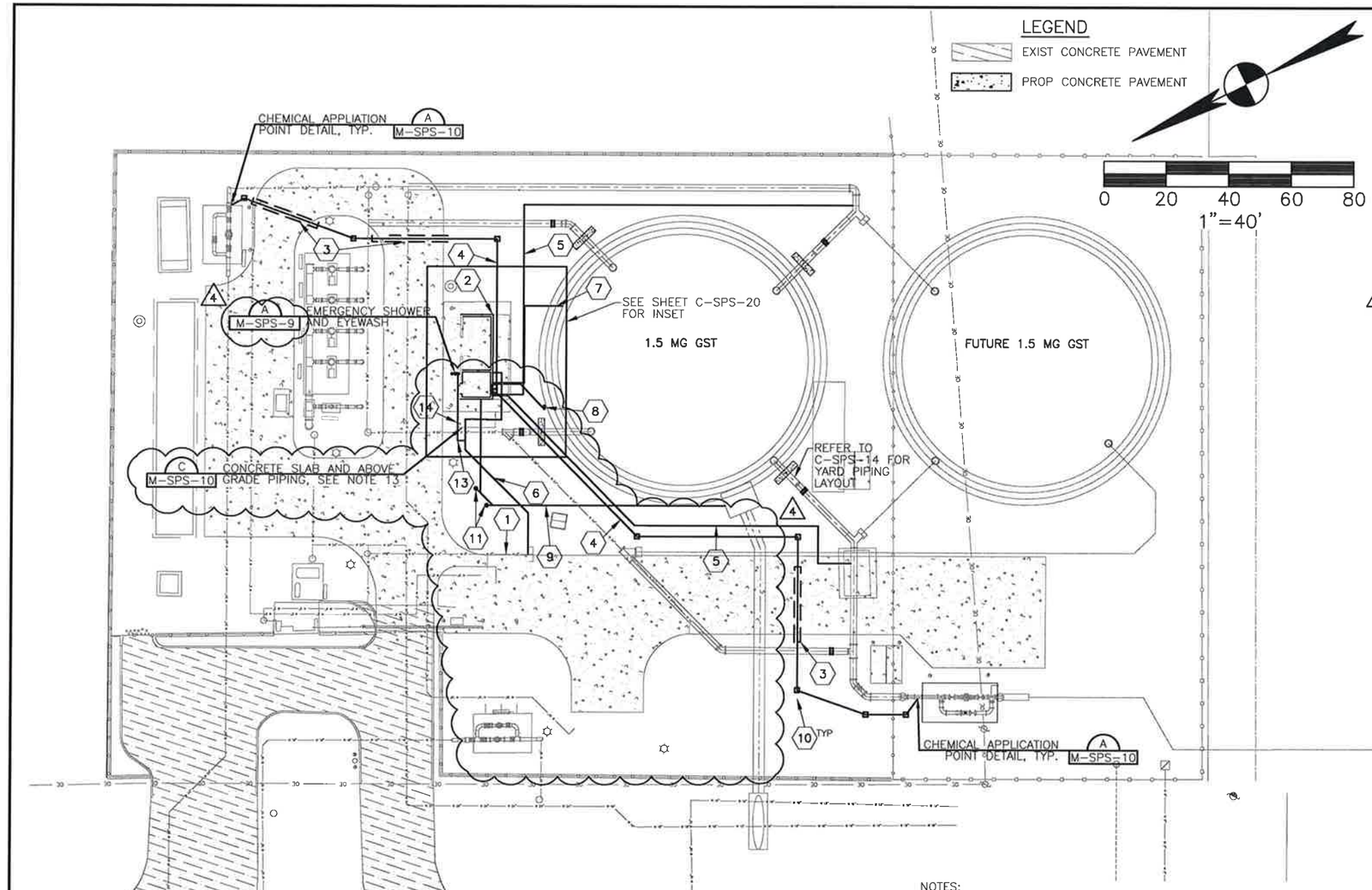

NOTES:

1. REFER TO SHEET G-3 FOR GENERAL NOTES #7, #24, #29 AND OTHERS AS APPLICABLE.
2. CONTRACTOR SHALL FURNISH AND INSTALL SPECIAL ADAPTORS FOR ALL CONNECTIONS BETWEEN DISSIMILAR PIPE, AT NO ADDITIONAL COST TO THE OWNER.
3. FOR PIPING 6" AND SMALLER, NOT ALL APPURTENANCES AND VALVES ARE SHOWN. ROUTING IS SHOWN IN GENERAL ONLY. SUCH PIPING SHALL BE FIELD ROUTED BY THE CONTRACTOR. VERIFY EXACT PIPING CONFIGURATION WITH OWNER'S ON-SITE REPRESENTATIVE PRIOR TO INSTALLATION. CONTRACTOR SHALL FURNISH AND INSTALL UNIONS, BUSHINGS, COUPLINGS AND OTHER FITTINGS AS NECESSARY FOR EASE OF INSTALLATION AND MAINTENANCE OF EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER. REFER TO PROCESS DIAGRAMS FOR MORE INFORMATION.
4. FOR PIPES 6" DIAMETER AND SMALLER, CONTRACTOR SHALL INSTALL 12" PRESSURE RATED PVC CASING WHERE PIPE OR CONDUIT CROSSES UNDERNEATH THE ROADWAY. CASING SHALL EXTEND 12" BEYOND EDGE OF ROADWAY ON EACH SIDE.
5. COMMUNICATION AND UTILITY DUCTBANKS ARE SHOWN ON SHEET E-SPS-4, ELECTRICAL SITE PLAN. CONTRACTOR SHALL PROTECT EXISTING ELECTRICAL DUCTBANKS, CONDUITS, AND COMMUNICATION CONDUITS (NOT TO BE REPLACED OR DEMOLISHED AT THIS TIME PER OWNER'S DIRECTION).

NOTES BY SYMBOL (X)

1	EXIST 6-PW-3
2	CHLORINE BUILDING
3	12" ENCASEMENT, SEE NOTE 4
4	6-CLS-4
5	3/4-PW-3
6	6-PW-7 FROM EXIST CAP
7	¾-PW-3 FROM 1.5 MG GST
8	¾-PW-3, SEE NOTE 12
9	6-D-5, SEE NOTE 15
10	CONCRETE POLYMER PULLBOX, TYP. SEE NOTE 6
11	SAWS STANDARD PIPE DRAIN CLEANOUT, TYP.
12	(NOT USED)
13	2-PW-7 FROM PZ 790 TO EMERGENCY SHOWER AND EYEWASH
14	BACKFLOW PREVENTER ENCLOSURE, SEE NOTE 16

6. PER OWNER DIRECTION CONTRACTOR TO INSTALL DOUBLE CONTAINMENT CHLORINE PIPING 2-INCH RED VALUFLEX/GS RUBBER HOSE MANUFACTURED BY CONTINENTAL WITHIN 6-CLS-4 FOR BELOW GRADE PIPING. PER OWNER DIRECTION, RED RUBBER HOSE SHALL BE INSTALLED CONTINUOUS FROM THE CHLORINE BUILDING TO THE APPLICATION POINT WITH CONNECTIONS ONLY WHERE THERE IS A TRANSITION TO PVC.
7. THE CONTRACTOR SHALL TIE INTO EXISTING PIPE AT AN ACCEPTABLE PIPE JOINT AS APPROVED BY OWNER. THE CONTRACTOR SHALL FIELD LOCATE THE JOINT PRIOR TO SUBMITTAL PREPARATION AND MAKE NECESSARY ADJUSTMENTS TO THE PIPE LENGTH AT NO ADDITIONAL COST TO THE OWNER. ALL WORK NECESSARY TO COMPLETE TIE-IN, TO INCLUDE TEMPORARY UTILITY SUPPORT/ ADJUSTMENT, AND ALL OTHER REQUIRED WORK SHALL BE COMPLETED AT NO ADDITIONAL COST TO OWNER. IF NECESSARY TO COMPLETE TIE-IN, ROADWAY AND SIDEWALK SHALL BE RECONSTRUCTED PER DIVISION 2 OF THE SPECIFICATIONS AT NO ADDITIONAL COST TO OWNER. CONTRACTOR SHALL USE SPECIAL COUPLING ADAPTOR FOR CONNECTIONS REQUIRING PIPING WITH DISSIMILAR MATERIALS. CONTRACTOR SHALL PROVIDE TEST PLUGS, CLOSURE PIECES, AND FLANGED OUTLET TO PRESSURE TEST THE PIPELINE. TIE INTO EXISTING PIPE AND REMOVE TEST PLUG. REFER TO SPECIFICATION DIVISION 15 FOR ADDITIONAL INFORMATION.
8. CONTRACTOR SHALL PROTECT EXISTING ELECTRICAL DUCTBANK ON CONDUIT AND COMMUNICATION CONDUIT NOT TO BE REPLACED OR DEMOLISHED AT THIS TIME PER OWNER'S DIRECTION. REFER TO SHEET E-SPS-4, ELECTRICAL SITE PLAN FOR ROUTING OF COMMUNICATION AND ELECTRICAL DUCTBANKS AND CONDUITS.
9. CONTRACTOR SHALL FLUSH AND PROPERLY DISPOSE OF ALL CHEMICALS PRIOR TO DEMOLITION OF CHEMICAL PIPING AND FACILITIES.
10. WATER SUPPLY TO CURRENT CHEMICAL SYSTEMS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION, AT NO ADDITIONAL COST TO OWNER.
11. CONTRACTOR SHALL PROVIDE AT A MINIMUM THREE FEET OF COVER FOR ALL PROPOSED UTILITY PIPE AND PIPE SLEEVES. PER OWNER DIRECTION, CONTRACTOR SHALL INSTALL CHEMICAL SOLUTION PIPING AT AN 18" BURY DEPTH.
12. CONTRACTOR SHALL INSTALL CAP ON ¾" PW FOR TIE-IN TO FUTURE TANK.
13. CONTRACTOR SHALL CONSTRUCT 12'-0" x 5'-0" SHOWN ON M-SPS-10 CONCRETE SLAB FOR 6-PW-3 SUPPLY TO CHLORINE BUILDING FOR ABOVE GRADE PIPING, SEE SHEET M-SPS-10.
14. PRESSURE PIPE 6" AND SMALLER SHOWN FOR BIDDING PURPOSES ONLY. CONTRACTOR SHALL ADJUST FIELD ROUTING OF PRESSURE PIPE AS NECESSARY AT NO ADDITIONAL COST TO OWNER.
15. FRENCH DRAIN SHALL BE CONTINUOUS IN YARD EXCEPT FOR UNDER CHLORINE AND BLDG FOUNDATION AND CONCRETE SLAB SURROUNDING CHLORINE BLDG. FRENCH DRAIN SHALL DRAIN TO GROUND STORAGE TANK OVERFLOW STRUCTURE AT MINIMUM 0.5% SLOPE. SEE DETAIL F ON SHEET M-SPS-9 FOR ADDITIONAL DETAILS.
16. REFER TO SPECIFICATION SECTION 11261 FOR ADDITIONAL DETAILS ON THE BACKFLOW PREVENTER ENCLOSURE.

10/30/15

STATE OF TEXAS JOHN E LEWITT 47714 REGISTERED PROFESSIONAL ENGINEER

CP&Y, Inc. TBPE FIRM NO. F-1741

garzabury LLP 602 Isom Road, Suite 100 San Antonio, TX 78216 Tel: (210) 828-0286 Fax: (210) 828-0325 TBPE Registration Number F-1459 Garza Bury, LLC © Copyright 2015

SAWS JOB NO. P-14-6101

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
2	ADDENDUM #2	JEL	10/22/15
4	ADDENDUM #4	JEL	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

CHEMICAL YARD PIPING PLAN

DATE: OCTOBER 2015
DESIGNED BY: JAM
DRAWN BY: GWM
REVIEWED BY: JEL
GB PRJ.#:103817-00001

SHEET C-SPS-19
SHEET 230F 99

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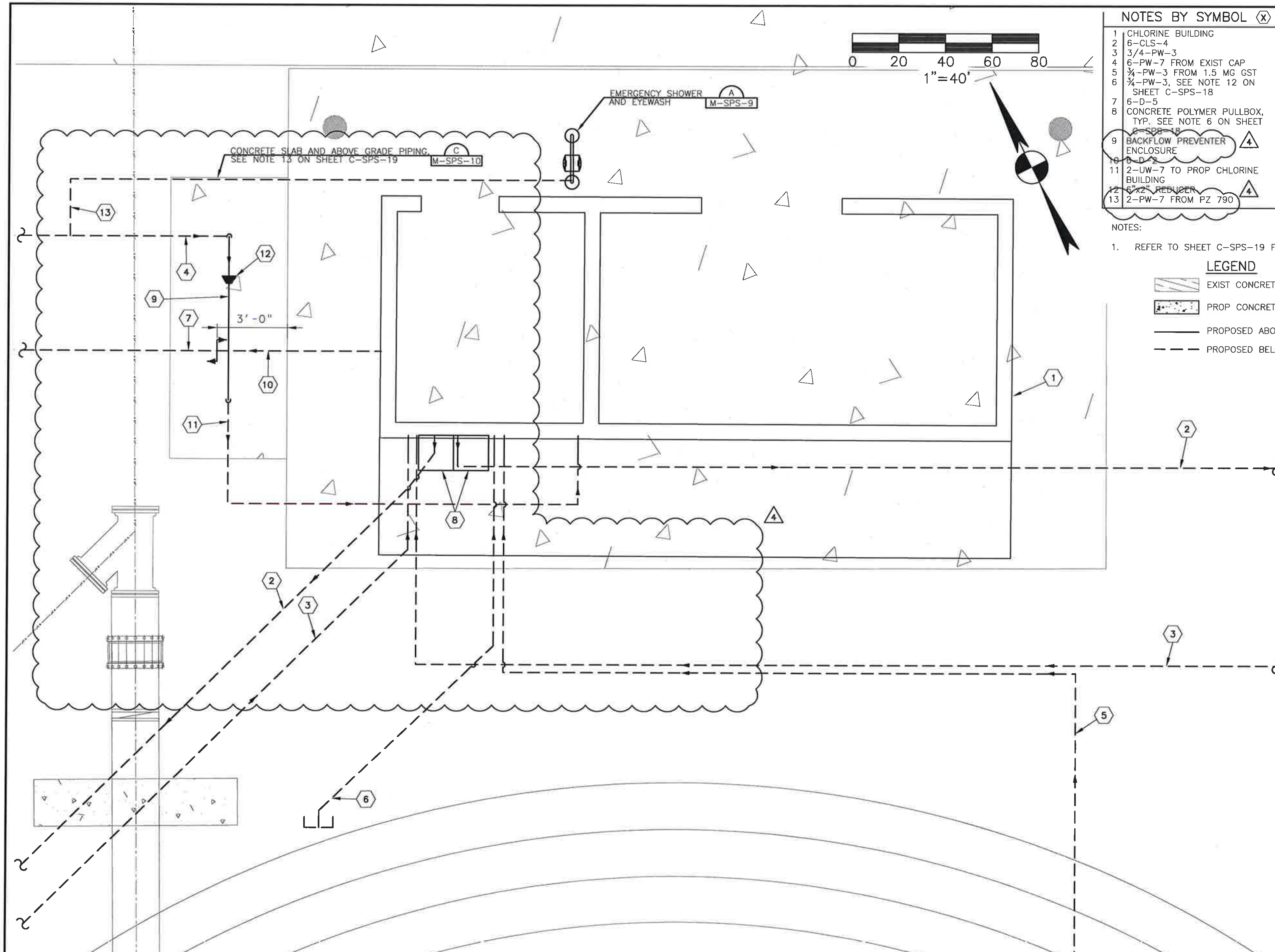

NOTES BY SYMBOL ⟨X⟩

1. CHLORINE BUILDING
2. 6-CLS-4
3. 3/4-PW-3
4. 6-PW-7 FROM EXIST CAP
5. ¾-PW-3 FROM 1.5 MG GST
6. ¾-PW-3, SEE NOTE 12 ON SHEET C-SPS-18
7. 6-D-5
8. CONCRETE POLYMER PULLBOX, TYP. SEE NOTE 6 ON SHEET C-SPS-18
9. BACKFLOW PREVENTER ENCLOSURE ⚠4
10. ~~6-D-2~~
11. 2-UW-7 TO PROP CHLORINE BUILDING
12. ~~6"x2" REDUCER~~ ⚠4
13. 2-PW-7 FROM PZ 790

NOTES:

1. REFER TO SHEET C-SPS-19 FOR NOTES.

LEGEND

- EXIST CONCRETE PAVEMENT
- PROP CONCRETE PAVEMENT
- PROPOSED ABOVE GROUND PIPE
- PROPOSED BELOW GROUND PIPE

SAWS JOB NO. P-14-6101

CP&Y, Inc.
TBPE FIRM NO. F-1741

garzabury
922 Isom Road, Suite 100 San Antonio, TX 78216

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM #4	JEL	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

CHEMICAL YARD PIPING INSET

DATE: OCTOBER 2015
DESIGNED BY: JAM
DRAWN BY: GWM
REVIEWED BY: JEL
GB PRJ.#: 103817-00001

JOHN E LEVITT 47714 REGISTERED PROFESSIONAL ENGINEER, STATE OF TEXAS
10/30/2015

SHEET C-SPS-20
SHEET 24 OF 99

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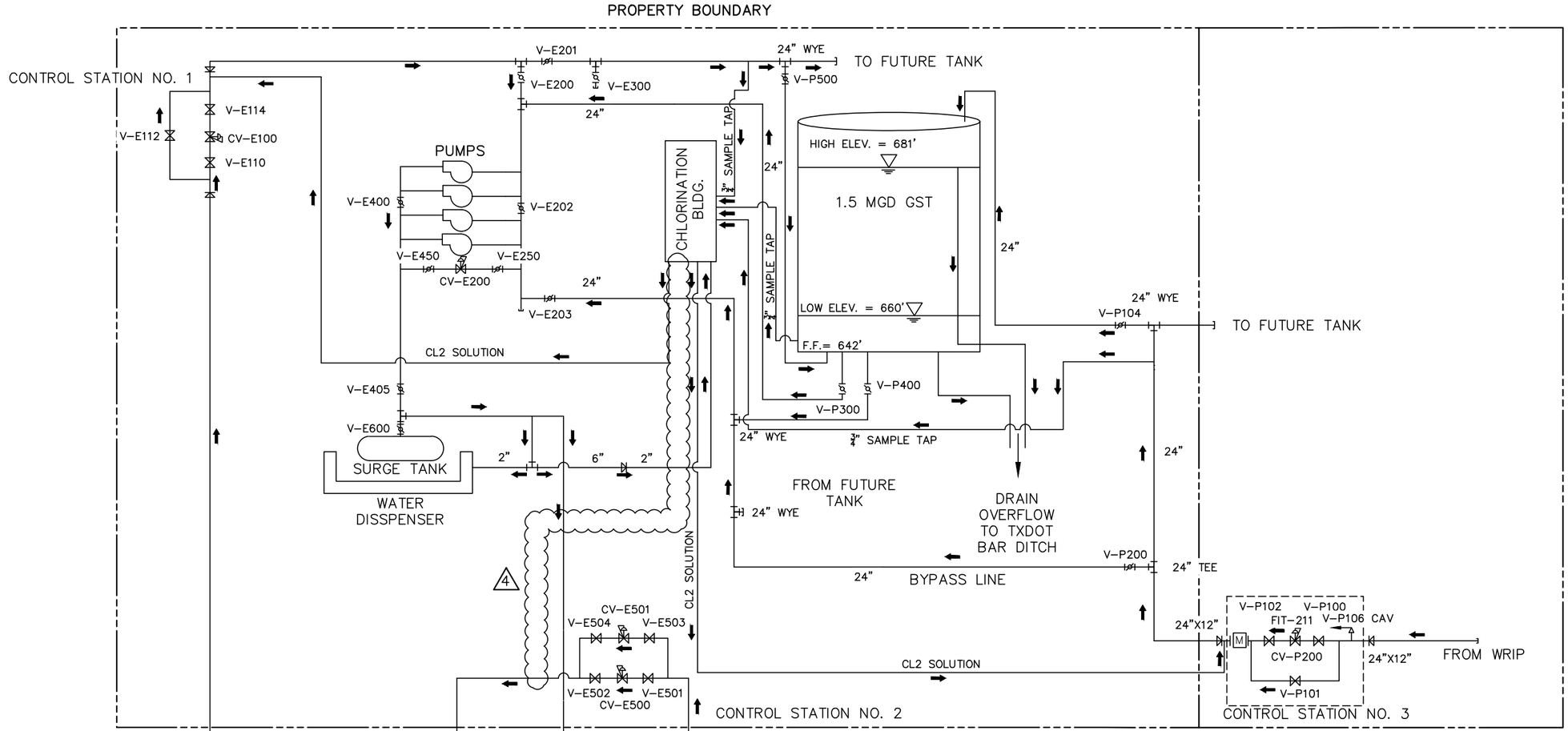

PROPOSED VALVES					
VAVLE ID	SIZE	TYPE	ACTUATOR	OPEN	FUNCTION
V-P100	12	GV	MANUAL	LEFT	CONTROL STATION 3 VALVE
V-P101	12	GV	MANUAL	LEFT	CONTROL STATION 3 VALVE
V-P102	12	GV	MANUAL	LEFT	CONTROL STATION 3 VALVE
V-P103	4	CAV	MANUAL	LEFT	CONTROL STATION 3 COMBINATION AIR/ VACUUM VALVE
V-P104	24	BV	MANUAL	LEFT	TANK INLET ISOLATION VALVE FROM WRIP
V-P200	24	BV	MANUAL	LEFT	ISOLATION VALVE FOR BY-PASS FROM WRIP
CV-P200	12	CV	ELECTRIC	N/A	CONTROL STATION 3 PRESSURE REDUCING VALVE
V-P300	24	BV	MANUAL	LEFT	VALVE TANK OUTLET
V-P400	24	BV	MANUAL	LEFT	VALVE TANK OUTLET
V-P500	24	GV	MANUAL	LEFT	ISOLATION VALVE TO FUTURE TANK

1

V-EXXX – EXISTING VALVE
V-PXXX – PROPOSED VALVE

STATE OF TEXAS
WILLIAM C. CAUSEY, JR.
87662
LICENSED
PROFESSIONAL ENGINEER
10/29/2015

SAWS JOB NO.
P-14-6101

garzabury LLP
922 Isom Road, Suite 100
San Antonio, TX 78216
Tel (210) 524-0288 Fax (210) 524-0325
TBPE Registration Number F-14629

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM NO. 4 REVISED 2-IN LINE	WCC	10.29.2015

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

PROPOSED SYSTEM PMID

DATE: OCTOBER 2015
DESIGNED BY: BAL
DRAWN BY: FJC
REVIEWED BY: WCC
GB PRJ.#:103187-00001

SHEET
M-SPS-3
SHEET47 OF99

Date: Nov 02, 2015, 11:29am User ID: fcantero
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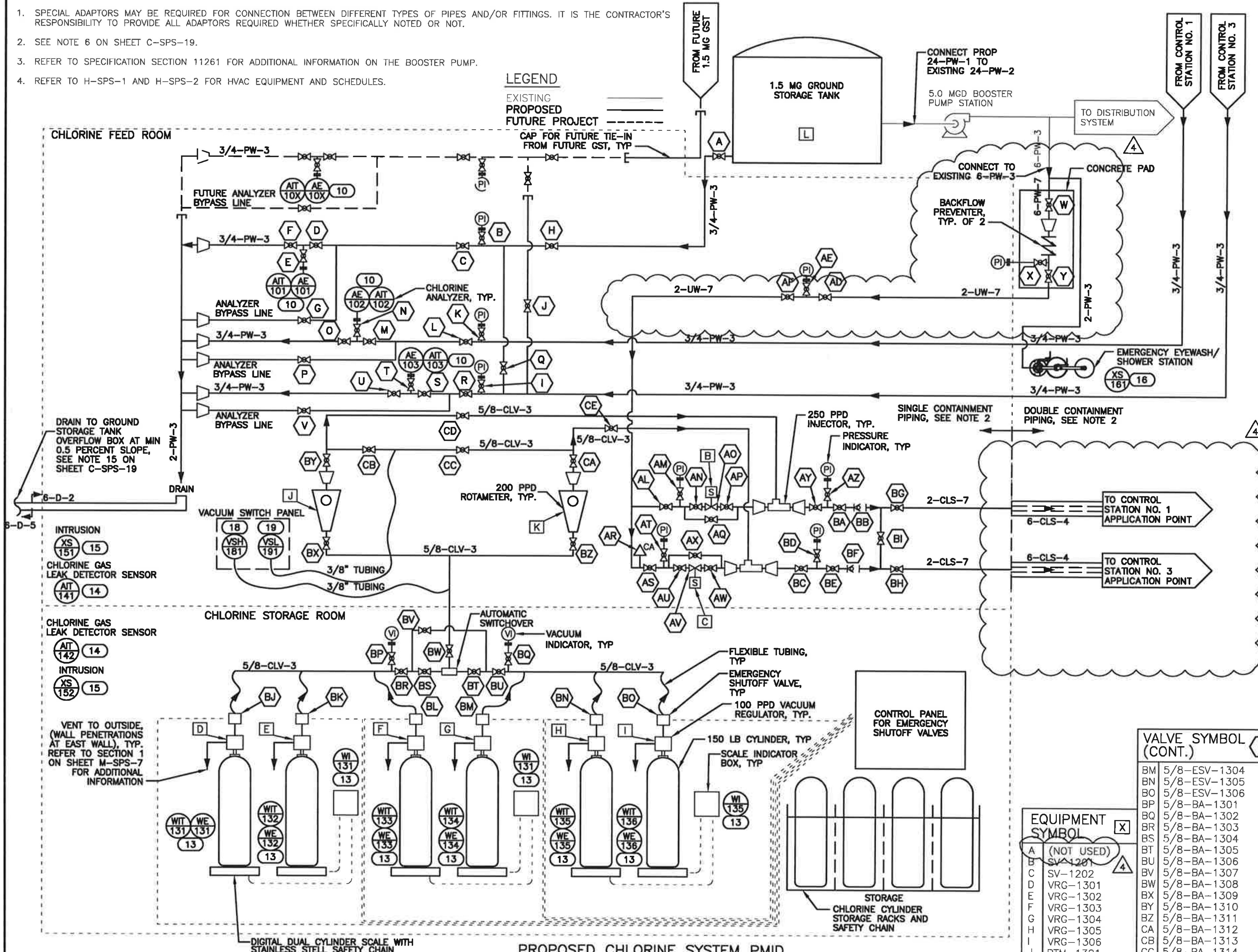
NOTES:

1. SPECIAL ADAPTORS MAY BE REQUIRED FOR CONNECTION BETWEEN DIFFERENT TYPES OF PIPES AND/OR FITTINGS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL ADAPTORS REQUIRED WHETHER SPECIFICALLY NOTED OR NOT.
2. SEE NOTE 6 ON SHEET C-SPS-19.
3. REFER TO SPECIFICATION SECTION 11261 FOR ADDITIONAL INFORMATION ON THE BOOSTER PUMP.
4. REFER TO H-SPS-1 AND H-SPS-2 FOR HVAC EQUIPMENT AND SCHEDULES.

LEGEND

EXISTING
PROPOSED
FUTURE PROJECT



PROPOSED CHLORINE SYSTEM PMID

EQUIPMENT SYMBOL [X]

A	(NOT USED)
B	SV-1201
C	SV-1202
D	VRG-1301
E	VRG-1302
F	VRG-1303
G	VRG-1304
H	VRG-1305
I	VRG-1306
J	RTM-1301
K	RTM-1302
L	TNK-1701

VALVE SYMBOL (X)

A	3/4-BA-1001
B	3/4-BA-1002
C	3/4-BA-1003
D	3/4-BA-1004
E	3/4-BA-1005
F	3/4-BA-1006
G	3/4-BA-1007
H	3/4-BA-1008
I	3/4-BA-1009
J	3/4-BA-1010
K	3/4-BA-1011
L	3/4-BA-1012
M	3/4-BA-1013
N	3/4-BA-1014
O	3/4-BA-1015
P	3/4-BA-1016
Q	3/4-BA-1017
R	3/4-BA-1018
S	3/4-BA-1019
T	3/4-BA-1020
U	3/4-BA-1021
V	3/4-BA-1022
W	6-BA-1101
X	2-BA-1102
Y	2-BA-1103
Z	(NOT USED)
AA	(NOT USED)
AB	(NOT USED)
AC	(NOT USED)
AD	2-BA-1108
AE	2-BA-1109
AF	2-BA-1110
AG	(NOT USED)
AH	(NOT USED)
AI	(NOT USED)
AJ	(NOT USED)
AK	(NOT USED)
AL	2-BA-1201
AM	2-BA-1202
AN	2-BA-1203
AO	2-SOL-1201
AP	2-BA-1204
AQ	2-BA-1205
AR	2-CAV-1201
AS	2-BA-1206
AT	2-BA-1207
AU	2-BA-1208
AV	2-SOL-1202
AW	2-BA-1209
AX	2-BA-1210
AY	2-BA-1211
AZ	2-BA-1212
BA	2-BA-1213
BB	2-BCV-1201
BC	2-BA-1214
BD	2-BA-1215
BE	2-BA-1216
BF	2-BCV-1202
BG	2-BA-1217
BH	2-BA-1218
BI	2-BA-1219
BJ	5/8-ESV-1301
BK	5/8-ESV-1302
BL	5/8-ESV-1303

VALVE SYMBOL (CONT.) (X)

BM	5/8-ESV-1304
BN	5/8-ESV-1305
BO	5/8-ESV-1306
BP	5/8-BA-1301
BQ	5/8-BA-1302
BR	5/8-BA-1303
BS	5/8-BA-1304
BT	5/8-BA-1305
BU	5/8-BA-1306
BV	5/8-BA-1307
BW	5/8-BA-1308
BX	5/8-BA-1309
BY	5/8-BA-1310
BZ	5/8-BA-1311
CA	5/8-BA-1312
CB	5/8-BA-1313
CC	5/8-BA-1314
CD	5/8-BA-1315
CE	5/8-BA-1316

10/30/2015

STATE OF TEXAS — GUANG ZHU — 90810 — LICENSED PROFESSIONAL ENGINEER

SAWS JOB NO. P-14-6101

CP&Y, Inc. TBPE FIRM NO. F-1741

garzabury LLC — 922 Isom Road, Suite 100, San Antonio, TX 78216, Tel. (210) 526-0326 Fax (210) 526-0325, TBPE Registration Number F-14629, Garza Bury, LLC © Copyright 2015

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM #4	GZ	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

PROPOSED CHLORINE SYSTEM PMID

DATE: OCTOBER 2015
DESIGNED BY: JAM
DRAWN BY: GWM
REVIEWED BY: GZ
GB PRJ.#:103817-00001

SHEET M-SPS-6

SHEET 50 OF 99

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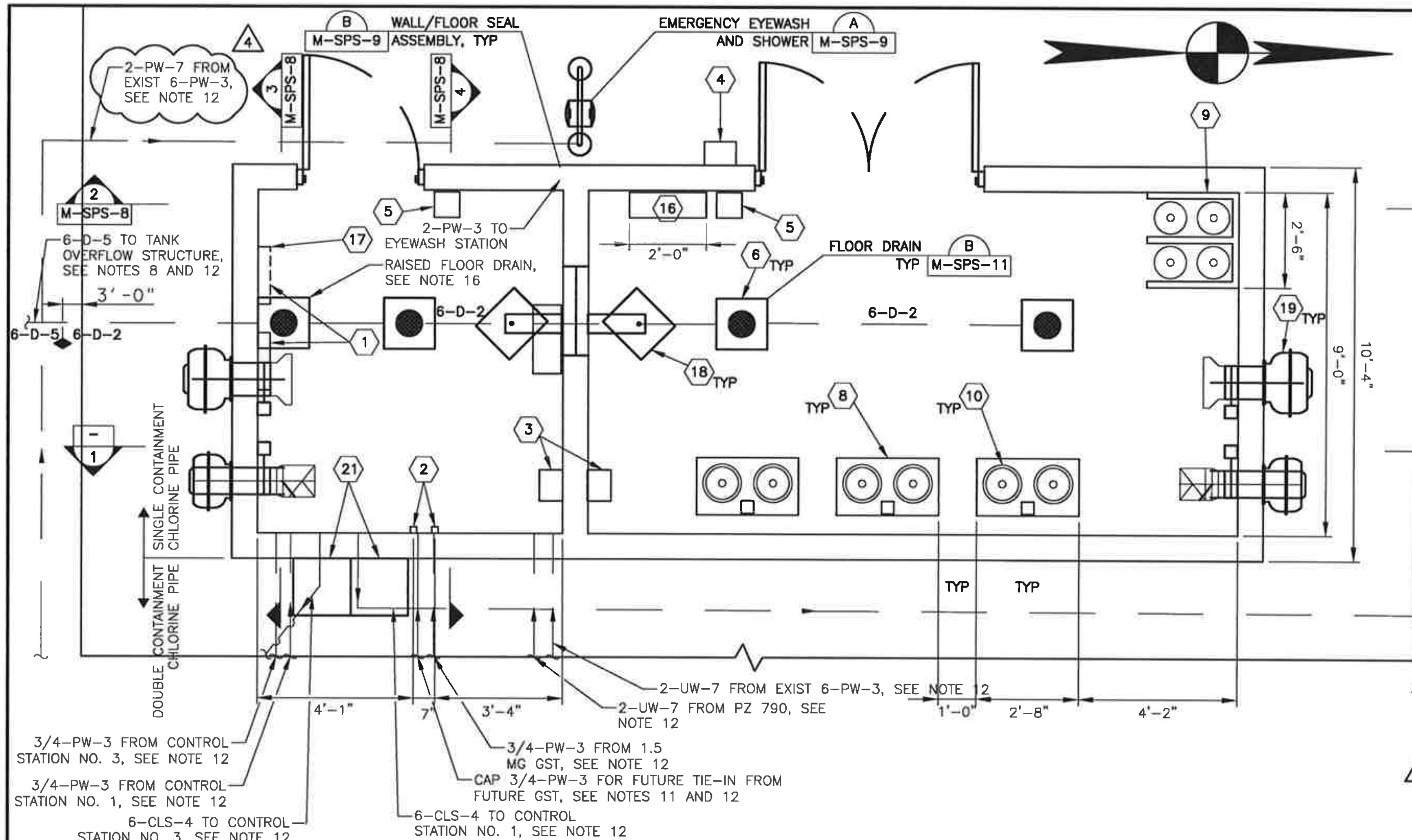
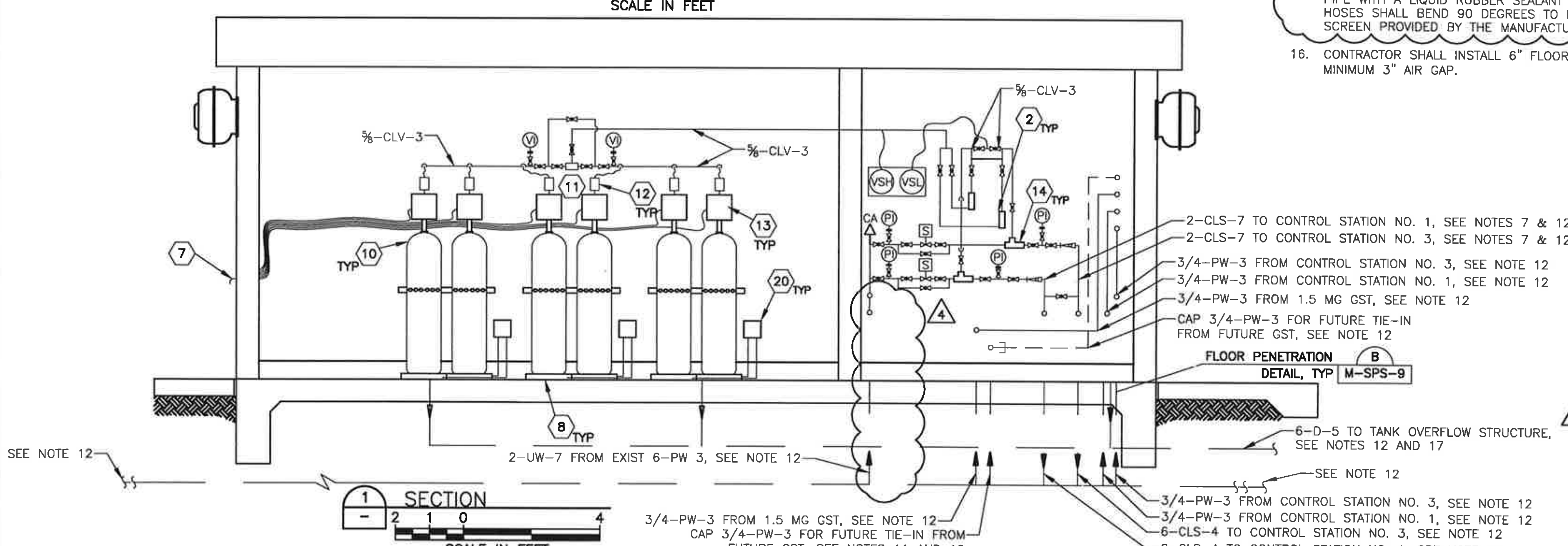


PLAN – CHLORINE BUILDING

SCALE IN FEET



1 SECTION

SCALE IN FEET

NOTES:

1. SPECIAL ADAPTORS MAY BE REQUIRED FOR CONNECTION BETWEEN DIFFERENT TYPES OF PIPE AND/OR FITTINGS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL ADAPTORS REQUIRED WHETHER SPECIFICALLY NOTED OR NOT.
2. FOR PIPING 6" AND SMALLER, FURNISH AND INSTALL UNIONS, BUSHINGS, COUPLINGS AND OTHER FITTINGS AS NECESSARY FOR EASE OF INSTALLATION AND MAINTENANCE OF EQUIPMENT.
3. FOR CLARITY, NOT ALL VALVES AND APPURTENANCES ARE SHOWN. REFER TO PROCESS DIAGRAMS FOR ADDITIONAL INFORMATION ON VALVES, APPURTENANCES AND TAGGING INFORMATION.
4. CONTRACTOR SHALL INSTALL CHLORINE ANALYZERS, REGULATORS, ROTAMETERS AND ACCESSORIES PER MANUFACTURER'S RECOMMENDATIONS.
5. ROUTING IS SHOWN IN GENERAL ONLY FOR PIPES 6" DIAMETER AND SMALLER, SUCH PIPING SHALL BE FIELD ROUTED, VERIFY EXACT PIPING CONFIGURATION WITH OWNER'S ON-SITE REPRESENTATIVE PRIOR TO INSTALLATION.
6. PIPE SUPPORTS ARE NOT SHOWN FOR CLARITY. EXACT NUMBER AND SPACING OF SUPPORTS TO BE DETERMINED BY CONTRACTOR IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. REFER TO SPECIFICATION SECTION 15140 FOR PIPE SUPPORT/HANGER SPACING. PROVIDE AT LEAST ONE SUPPORT FOR EACH LENGTH OF PIPE AT EACH CHANGE OF DIRECTION AND AT EACH VALVE. SUPPORT AND HANGER TYPES SHOWN INDICATE SUITABLE CHOICES.
7. SEE NOTE 6 ON SHEET C-SPS-19.
8. SEE NOTE 15 ON SHEET C-SPS-19.
9. ALL DIMENSIONS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL ADJUST ROUTING OF PIPE AND LOCATIONS OF EQUIPMENT AS NECESSARY FOR MOUNTING OF PIPE SUPPORT AND EQUIPMENT TO BE 3" MINIMUM FROM EDGE OF CMU BLOCK.
10. CONTRACTOR SHALL INSTALL CHLORINE LEAK DETECTOR AND SENSORS AND REMOTE CONTROL PANEL PER MANUFACTURER RECOMMENDATIONS.
11. CONTRACTOR SHALL INSTALL CAP ON 3/4" PW FOR FUTURE TANK SAMPLE LINE.
12. REFER TO SHEET C-SPS-19 FOR CONTINUATION OF CHEMICAL YARD PIPING. ALL PIPING SHALL BE CONCRETE ENCASED BELOW SLAB
13. (NOT USED)
14. REFER TO H-SPS-1 AND H-SPS-2 FOR HVAC EQUIPMENT AND SCHEDULES.
15. CONTRACTOR SHALL INSTALL SIX (6) VENT LINES, 3/8" TUBING FOR THE VACUUM REGULATOR ROUTED TO VENT OUTSIDE THROUGH AN INDIVIDUAL WALL PENETRATION FOR EACH VENT LINE. UPON EXITING THE BUILDING, THE VENT LINE SHALL BEND TO OPEN TOWARDS FLOOR WITH A FIBERGLASS SCREEN PER THE RECOMMENDATION OF THE MANUFACTURER. CONTRACTOR SHALL MAINTAIN A SEPARATE HOSE FOR EACH VENT LINE. THE CONTRACTOR MAY TIE THE HOSES TOGETHER AND PUT THROUGH ONE HOLE IN THE MASONRY WALL. THE VENT LINE SHALL NOT BE A HIGHER ELEVATION THAN THE VACUUM REGULATOR AT ANY POINT ALONG THE VENT LINE. THE HOLE(S) SHALL BE TYPICAL PER THE WALL/FLOOR SEAL ASSEMBLY DETAIL B ON SHEET M-SPS-9 WITH THE HOSES TIED TOGETHER AND ROUTED THROUGH THE PIPE. THE PIPE PER THE WALL/FLOOR ASSEMBLY DETAIL SHALL HAVE A CAP ON BOTH ENDS AND DRILLED HOLES FOR THE HOSE OPENINGS. THE CONTRACTOR SHALL FILL THE PIPE WITH A LIQUID RUBBER SEALANT TO SEAL THE GAP BETWEEN THE HOSE AND THE PIPE. THE HOSES SHALL BEND 90 DEGREES TO FACE THE SLAB OR AFTER EXITING THE BUILDING. THE BUG SCREEN PROVIDED BY THE MANUFACTURER SHALL BE INSTALLED AT THE END OF EACH HOSE.
16. CONTRACTOR SHALL INSTALL 6" FLOOR DRAIN RAISED 3" TO CATCH SAMPLE ANALYZER RUNOFF WITH A MINIMUM 3" AIR GAP.

NOTES BY SYMBOL (X)

1	CHLORINE ANALYZERS, SEE NOTE 13
2	200 PPD ROTAMETER
3	GAS SENSOR
4	CHLORINE LEAK INDICATOR
5	FIRE EXTINGUISHER
6	FLOOR DRAIN
7	VENTS, SEE NOTE 15
8	DUAL CHLORINE SCALE
9	CHLORINE CYLINDER RACKS
10	150 LB CHLORINE CYLINDER
11	AUTOMATIC SWITCHOVER VALVE
12	100 PPD VACUUM REGULATOR
13	EMERGENCY SHUTOFF VALVE
14	250 PPD CHLORINE INJECTOR
15	(NOT USED)
16	REMOTE CONTROL PANEL
17	FUTURE CHLORINE ANALYZER
18	UNIT HEATER, SEE NOTE 14
19	HVAC FAN, SEE NOTE 14
20	WEIGHT INDICATOR
21	CONCRETE POLYMER PULL BOX, SEE NOTE 6 ON SHEET C-SPS-19

10/30/2015

STATE OF TEXAS
GUANG ZHU
90810
LICENSED
PROFESSIONAL ENGINEER

CP&Y, Inc.
TBPE FIRM NO. F-1741

garzabury llc
822 Isom Road, Suite 100
San Antonio, TX 78216
Tel. (210) 526-0285 Fax (210) 526-0325
TBPE Registration Number F-14629
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SAWS JOB NO. P-14-6101

SAN ANTONIO WATER SYSTEM

Revision	Approved	Date
4 ADDENDUM #4	GZ	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

PROPOSED CHLORINE BUILDING PLAN

DATE: OCTOBER 2015
DESIGNED BY: JAM
DRAWN BY: GWM
REVIEWED BY: GZ
GB PRJ.#:103817-00001

SHEET M-SPS-7

SHEET 51 OF 99

Date: Oct 29, 2015, 11:28am User ID: gmilks
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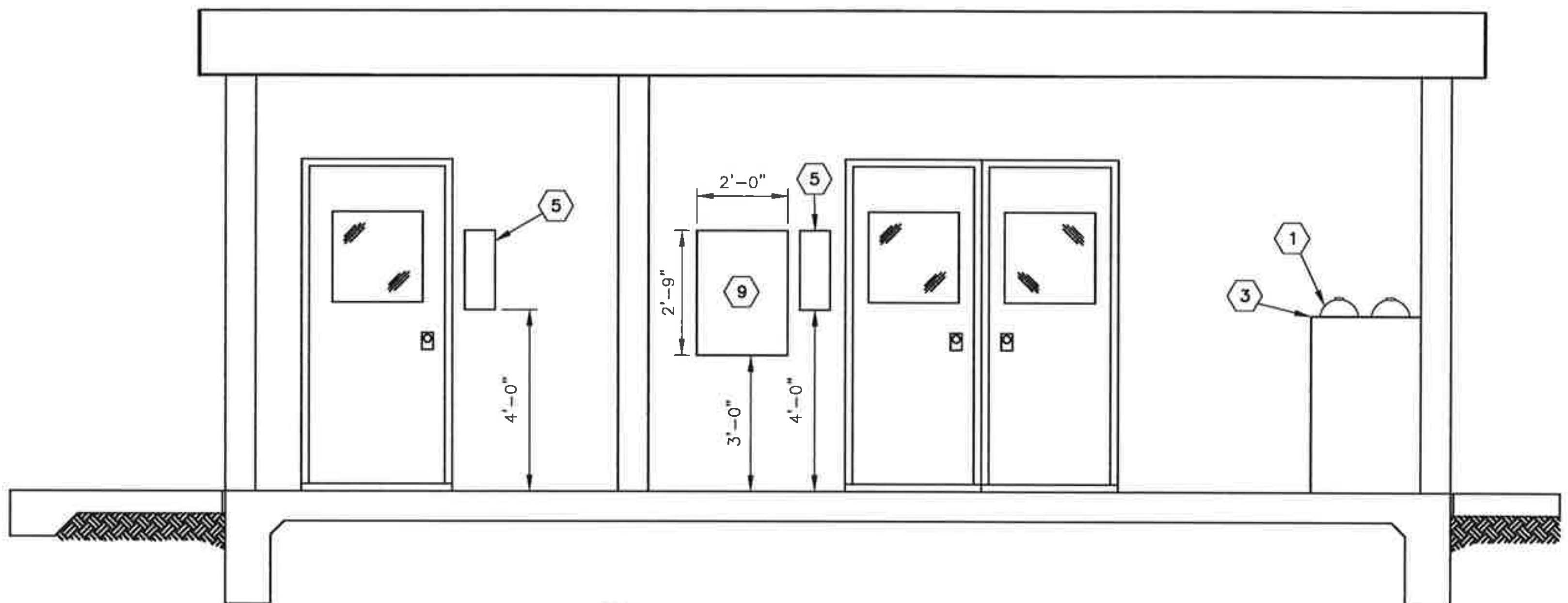
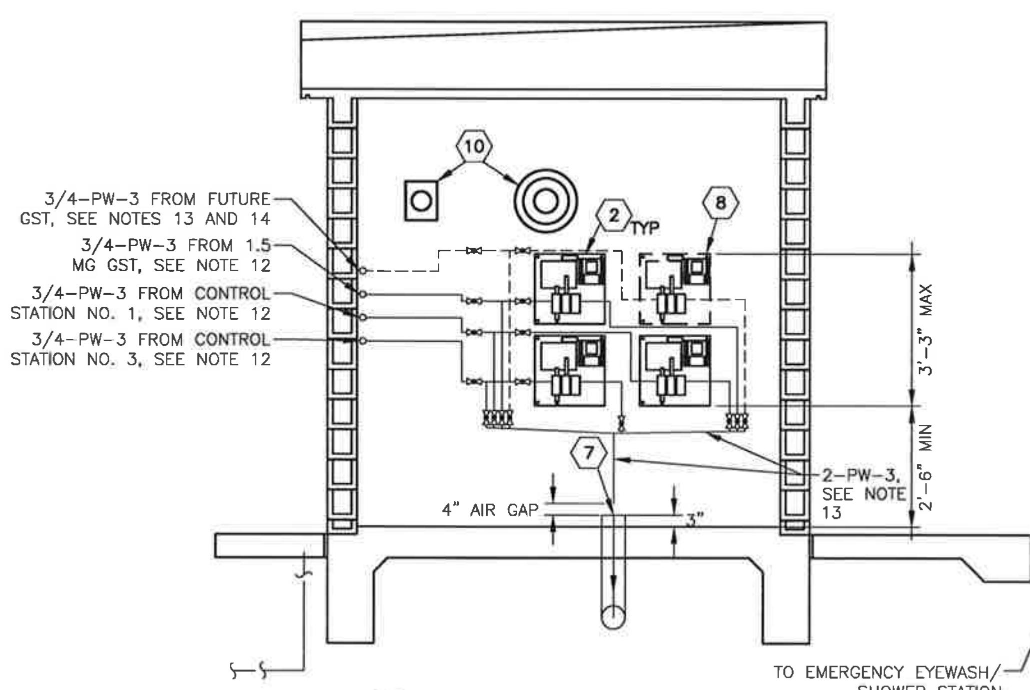


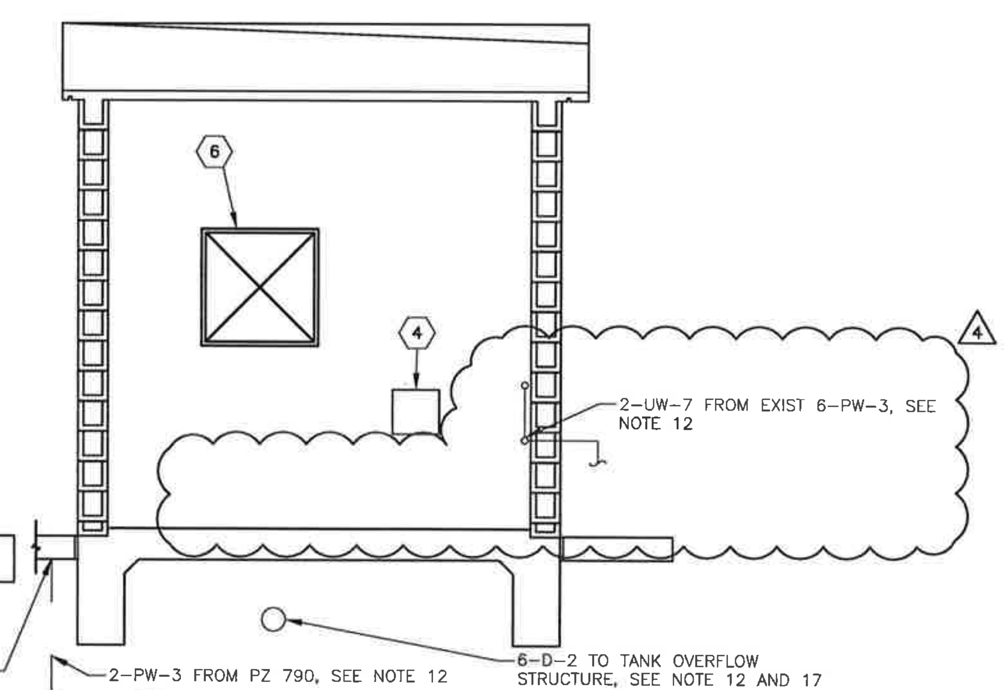
2 SECTION M-SPS-7
2 1 0 4
SCALE IN FEET

NOTES:

1. SPECIAL ADAPTORS MAY BE REQUIRED FOR CONNECTION BETWEEN DIFFERENT TYPES OF PIPE AND/OR FITTINGS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL ADAPTORS REQUIRED WHETHER SPECIFICALLY NOTED OR NOT.
2. FOR PIPING 6" AND SMALLER, FURNISH AND INSTALL UNIONS, BUSHINGS, COUPLINGS AND OTHER FITTINGS AS NECESSARY FOR EASE OF INSTALLATION AND MAINTENANCE OF EQUIPMENT.
3. FOR CLARITY, NOT ALL VALVES AND APPURTENANCES ARE SHOWN. REFER TO PROCESS DIAGRAMS FOR ADDITIONAL INFORMATION ON VALVES, APPURTENANCES AND TAGGING INFORMATION.
4. CONTRACTOR SHALL INSTALL CHLORINE ANALYZERS, REGULATORS, ROTAMETERS AND ACCESSORIES PER MANUFACTURER'S RECOMMENDATIONS.
5. ROUTING IS SHOWN IN GENERAL ONLY FOR PIPES 6" DIAMETER AND SMALLER, SUCH PIPING SHALL BE FIELD ROUTED, VERIFY EXACT PIPING CONFIGURATION WITH OWNER'S ON-SITE REPRESENTATIVE PRIOR TO INSTALLATION.
6. PIPE SUPPORTS ARE NOT SHOWN FOR CLARITY. EXACT NUMBER AND SPACING OF SUPPORTS TO BE DETERMINED BY CONTRACTOR IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. REFER TO SPECIFICATION SECTION 15140 FOR PIPE SUPPORT/HANGER SPACING. PROVIDE AT LEAST ONE SUPPORT FOR EACH LENGTH OF PIPE AT EACH CHANGE OF DIRECTION AND AT EACH VALVE. SUPPORT AND HANGER TYPES SHOWN INDICATE SUITABLE CHOICES.
7. SEE NOTE 6 ON SHEET C-SPS-19.
8. SEE NOTE 15 ON SHEET C-SPS-19.
9. ALL DIMENSIONS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL ADJUST ROUTING OF PIPE AND LOCATIONS OF EQUIPMENT AS NECESSARY FOR MOUNTING OF PIPE SUPPORT AND EQUIPMENT TO BE 3" MINIMUM FROM EDGE OF CMU BLOCK.
10. CONTRACTOR SHALL INSTALL CHLORINE LEAK DETECTOR AND SENSORS AND REMOTE CONTROL PANEL PER MANUFACTURER RECOMMENDATIONS.
11. CONTRACTOR SHALL INSTALL CAP ON ¾" PW FOR FUTURE TANK SAMPLE LINE.
12. REFER TO SHEET C-SPS-19 FOR CONTINUATION OF CHEMICAL YARD PIPING. ALL PIPING SHALL BE CONCRETE ENCASED BELOW SLAB.
13. CONTRACTOR SHALL INSTALL A 2-PW-3 HEADER AT A 2% MINIMUM SLOPE TO CATCH RUNOFF FROM CHLORINE ANALYZERS AND FEED TO 6-D-5.
14. CHLORINE ANALYZER FOR ¾-PW-3 FROM FUTURE GST. (4)
15. (NOT USED)
16. REFER TO SHEETS H-SPS-1 AND H-SPS-2 FOR HVAC EQUIPMENT AND SCHEDULES.
17. SEE NOTE 16 ON SHEET M-SPS-7.



3 SECTION M-SPS-7
2 1 0 4
SCALE IN FEET



4 SECTION M-SPS-7
2 1 0 4
SCALE IN FEET

NOTES BY SYMBOL (X)

1	150 LB CHLORINE CYLINDER
2	CHLORINE ANALYZERS
3	CHLORINE CYLINDER RACKS AND SAFETY CHAIN
4	GAS SENSOR
5	FIRE EXTINGUISHER, SEE SPECIFICATION SECTION 11261
6	WINDOW
7	(NOT USED)
8	FUTURE CHLORINE ANALYZER, SEE NOTE 14
9	REMOTE CONTROL PANEL
10	HVAC INTAKE AND FAN, SEE NOTE 16
11	RAISED FLOOR DRAIN, SEE NOTE 17

(4)

10/30/2015
STATE OF TEXAS
GUANG ZHU
90810
LICENSED
PROFESSIONAL ENGINEER

SAWS JOB NO.
P-14-6101

CP&Y, Inc.
TBPE FIRM NO. F-1741

garzabury LLC
823 Isom Road, Suite 100
San Antonio, TX 78216
Tel. (210) 526-0286 Fax (210) 526-0325
TBPE Registration Number F-14629
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SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM #4	GZ	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

PROPOSED CHLORINE BUILDING SECTIONS

DATE: OCTOBER 2015
DESIGNED BY: JAM
DRAWN BY: GWM
REVIEWED BY: GZ
GB PRJ.# 103817-00001

SHEET
M-SPS-8
SHEET 52 OF 99

Date: Oct 29, 2015, 11:19am User ID: gmilks
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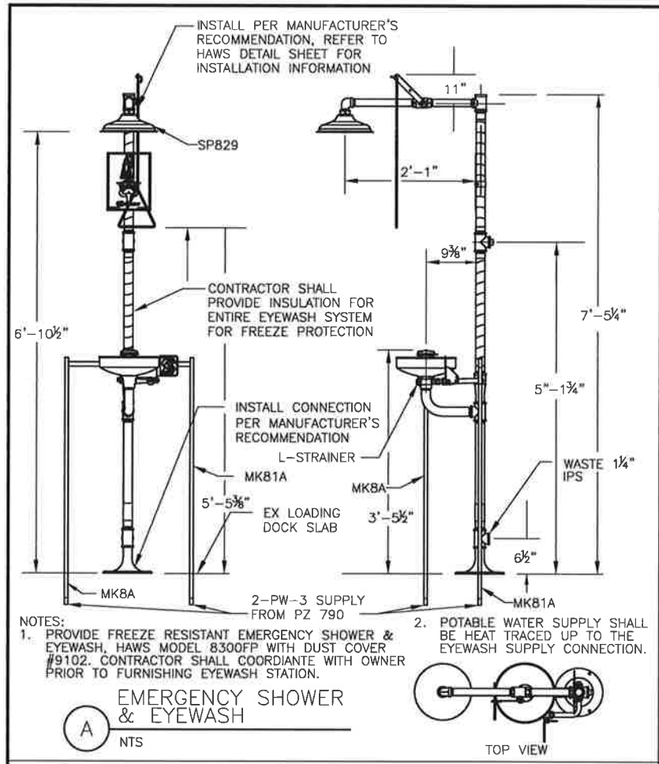
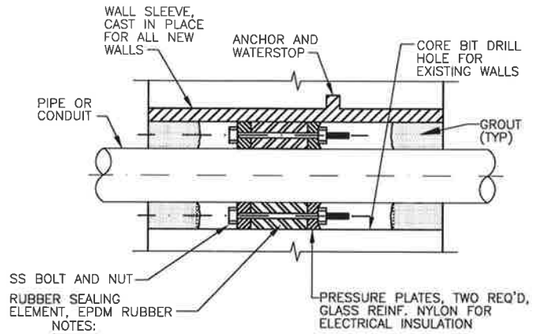


NOTES:
1. PROVIDE FREEZE RESISTANT EMERGENCY SHOWER & EYEWASH, HAWS MODEL 8300FP WITH DUST COVER #9102. CONTRACTOR SHALL COORDIANTE WITH OWNER PRIOR TO FURNISHING EYEWASH STATION.
2. POTABLE WATER SUPPLY SHALL BE HEAT TRACED UP TO THE EYEWASH SUPPLY CONNECTION.

A EMERGENCY SHOWER & EYEWASH
NTS



NOTES:
1. INSIDE DIAMETER OF EACH WALL OPENING SHALL BE OF THE SIZE RECOMMENDED BY THE MANUFACTURER TO FIT THE PIPE OR CONDUIT AND THE WALL SEAL ASSEMBLY TO ASSURE WATERTIGHT JOINT.
2. PIPE TO WALL PENETRATION CLOSURES SHALL BE OF THE MODULAR TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO FILL THE ANNULAR SPACE BETWEEN THE PIPE AND WALL OPENING. A PRESSURE PLATE SHALL BE PROVIDED UNDER EACH BOLT HEAD AND NUT, WITH THE SEAL CONSTRUCTED TO PROVIDE ELECTRICAL INSULATION BETWEEN PIPE AND WALL.
3. WALL SEAL ASSEMBLY SHALL BE "LINK SEAL" AS MANUFACTURED BY ENPRO INDUSTRIES, CHARLOTTE, NORTH CAROLINA, OR EQUAL.
4. PROVIDE 3 HOUR FIRE RATED MODULAR, INTERLOCKING MECHANICAL SEAL EQUAL TO "LINK SEAL" MODEL FD/FS IN FIRE RATED STRUCTURES.
5. PROVIDE ESCUTCHEONS IN FINISHED SPACES.
6. FOR TERMINATION OF DOUBLE CONTAINED PIPE, CONTRACTOR SHALL TERMINATE CONTAINMENT PIPING AT INTERIOR WALL AND PROVIDE WATERSTOP AND SEALING ELEMENT BETWEEN CONTAINMENT PIPING AND INNER PIPE.

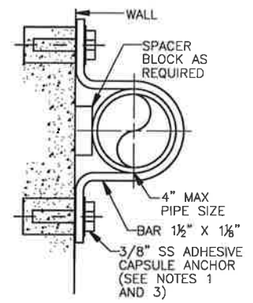
B WALL/FLOOR SEAL ASSEMBLY
NTS

NOTES:

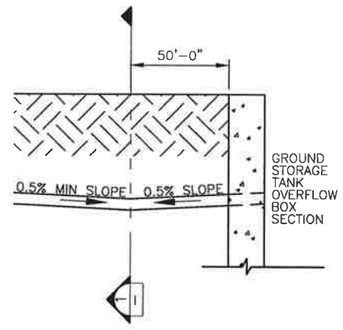
PIPE CLAMP, WASHER AND SHIELD SHALL BE TYPE 316 STAINLESS STEEL.

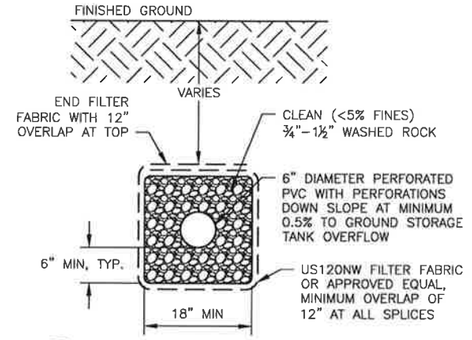
WHEN USED WITH PVC OR FIBERGLASS PIPE, PROVIDE STAINLESS STEEL SHIELD AROUND PIPE AT CLAMP WITH LOOSE FIT. WRAP COPPER TUBES WITH 2" WIDE STRIP OF RUBBER FABRIC.

FOR CMU WALL, LOCATE ANCHORS AT FILLED CELLS.



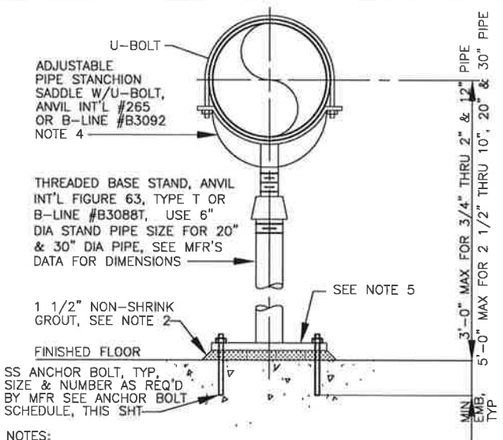
C PIPE SUPPORT
NTS





1 TYPICAL FRENCH DRAIN SECTION
NTS

F FRENCH DRAIN
NTS



NOTES:
1. PROVIDE HALF ROUND RIGID INSULATION AND INSULATION PROTECTION SHIELD, SIMILAR TO ANVIL INTERNATIONAL #167, WHERE PIPING IS INSULATED.
2. WHERE PIPING IS ADJACENT TO MECHANICAL EQUIPMENT, REPLACE GROUT WITH NEOPRENE WAFFLE ISOLATION PAD, SIMILAR TO MASON TYPE "W" OR KORPAD 40.
3. SUPPORT SPACING:
   - 20" & 30" PIPE @ 10'-0" MAX
   - 2½" THRU 12" PIPE @ 10'-0" MAX
   - ¾" THRU 2" PIPE @ 5'-0" MAX
4. PIPE SUPPORT MODEL NUMBER SHOWN HERE FOR TYPE OF SUPPORT. SUPPORT WILL HAVE TO BE SPECIAL ORDER FOR STAINLESS STEEL SUPPORT. ALL MATERIALS TO BE 316 SS.
5. BASE PLATE THICKNESS IS ¾" FOR 20" AND 30" PIPE.

D PIPE SUPPORT
NTS

NOTE:
REFER TO SPECIFICATION SECTION 15140 FOR SPACING REQUIREMENTS FOR ALL SUPPORTS AND HANGERS, UNLESS NOTED OTHERWISE.

GENERAL PIPE SUPPORT NOTES:
1. ALL BOLTS AND NUTS SHALL BE TYPE 316 SS. THE DIFFERENCE OF BRINELL HARDNESS BETWEEN THE NUTS AND THEIR CORRESPONSING BOLTS SHALL BE NO LESS THAN 100.
2. ALL SUPPORT MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 15140 – SUPPORTS AND HANGERS. THE WIDE FLANGE STRUCTURAL BEAMS SHALL BE GALVANIZED STEEL. DETAILS PROVIDE MODEL NUMBERS THAT REPRESENT A TYPICAL CONFIGURATION, HOWEVER, WHERE TYPE 316 SS ARE REQUIRED PER SPECIFICATION, PROVIDE TYPE 316 SS PIPE SUPPORTS.
3. WHEN SUPPORT IS USED WITH COPPER, PVC OR FRP PIPE, WRAP PIPE WITH 1/4" NEOPRENE SHEET. IF PIPE IS SUBMERGED, REPLACE NEOPRENE SHEET WITH 1/4" FLUOROLON PTFE 1000 (TEFLON) BY AP TECHNOLOGIES.
4. WHEN SUPPORT IS USED WITH PVC OR FIBERGLASS PIPE, PROVIDE LOOSE FITTING STEEL SHIELD AROUND PIPE AT U-BOLT/CLIP.
5. ALL SUPPORTS SHOWN ARE FOR USE WITH CONCRETE WALL/FLOOR SLAB CONSTRUCTION. CONTRACTOR SHALL VERIFY THAT WALL/FLOOR SLAB THICKNESS IS ADEQUATE TO ACCOMMODATE MINIMUM ANCHOR BOLT EMBEDMENT.
6. FOR CMU WALLS, USE THE BELOW TABLE WITH HILTI HIT-HY 150 ADHESIVE ANCHOR.
7. WHEN BASE MATERIAL TEMPERATURE DROPS BELOW 40° F, USE HILTI HIT-ICE/HIT-HY 150 ADHESIVE.
8. CONTRACTOR SHALL VERIFY THE EXISTING FLOOR SLAB OR WALL THICKNESS IS ADEQUATE TO ACCOMODATE MINIMUM EMBEDMENT LENGTH PRIOR TO DRILLING.

ANCHOR BOLT SCHEDULE		
ABØ (INCHES)	MIN EMB (INCHES)	ANCHOR TYPE
1/4	4	"HILTI" SS KWIK BOLT II
3/8	3 1/2	"HILTI" SS (HAS ROD) W/HVA ADHESIVE ANCHOR
1/2	6 3/8	"HILTI" SS (HAS ROD) W/HVA ADHESIVE ANCHOR
5/8	5	"HILTI" SS (HAS ROD) W/HVA ADHESIVE ANCHOR
3/4	6 5/8	"HILTI" SS (HAS ROD) W/HVA ADHESIVE ANCHOR
7/8	6 5/8	"HILTI" SS (HAS ROD) W/HVA ADHESIVE ANCHOR
1	8 1/4	"HILTI" SS (HAS ROD) W/HVA ADHESIVE ANCHOR

E GENERAL PIPE SUPPORT INFORMATION
NTS

REMOVED DETAIL G 4

10/30/2015

STATE OF TEXAS
GUANG ZHU
90810
LICENSED PROFESSIONAL ENGINEER

CP&Y, Inc.
TBPE FIRM NO. F-1741

garzabury LP
807 Jorm Road, Suite 100
San Antonio, TX 78216
Tel: (210) 526-0288 Fax: (210) 526-0325
TBPE Registration Number: F-14029
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SAWS JOB NO. P-14-6101

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM #4	GZ	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

STANDARD MECHANICAL DETAILS I

DATE:	OCTOBER 2015
DESIGNED BY:	JAM
DRAWN BY:	GWM
REVIEWED BY:	GZ
GB PRJ.#:	103817-00001

SHEET
M-SPS-9
SHEET 53 OF 99

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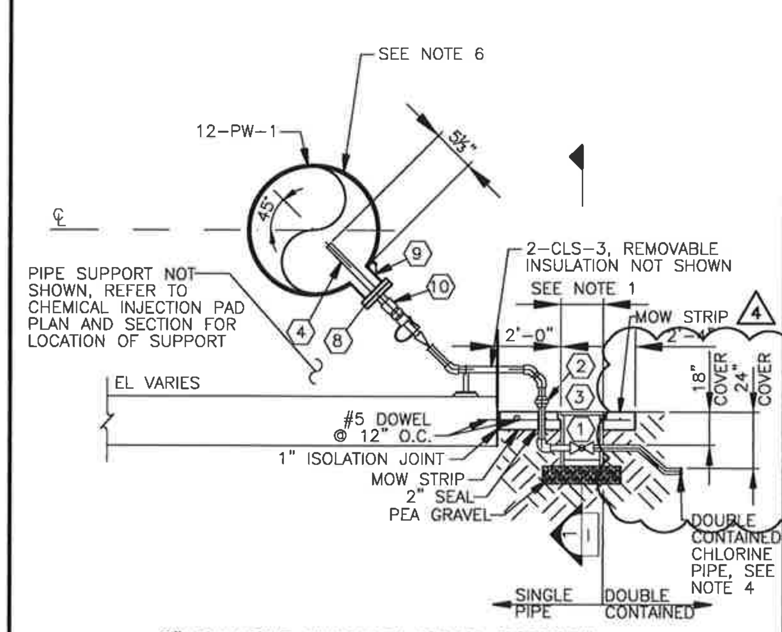
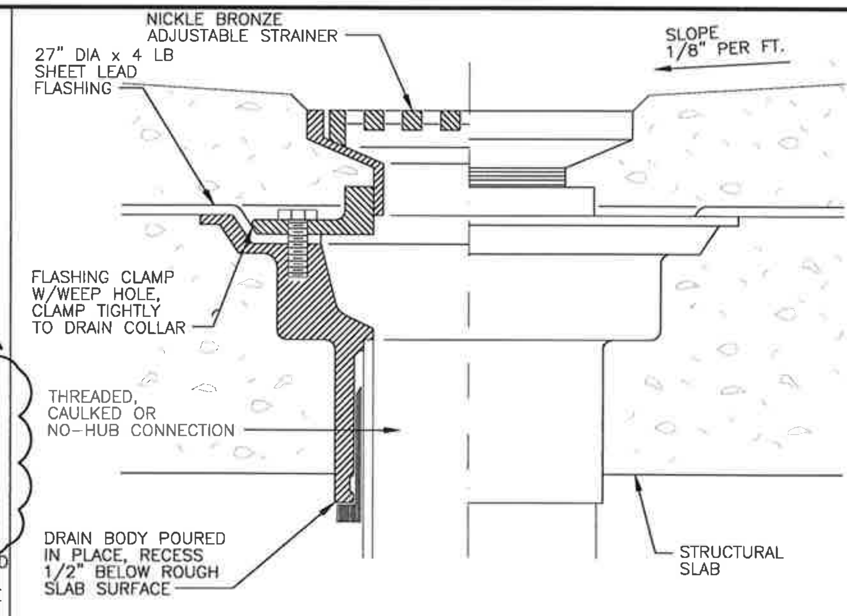


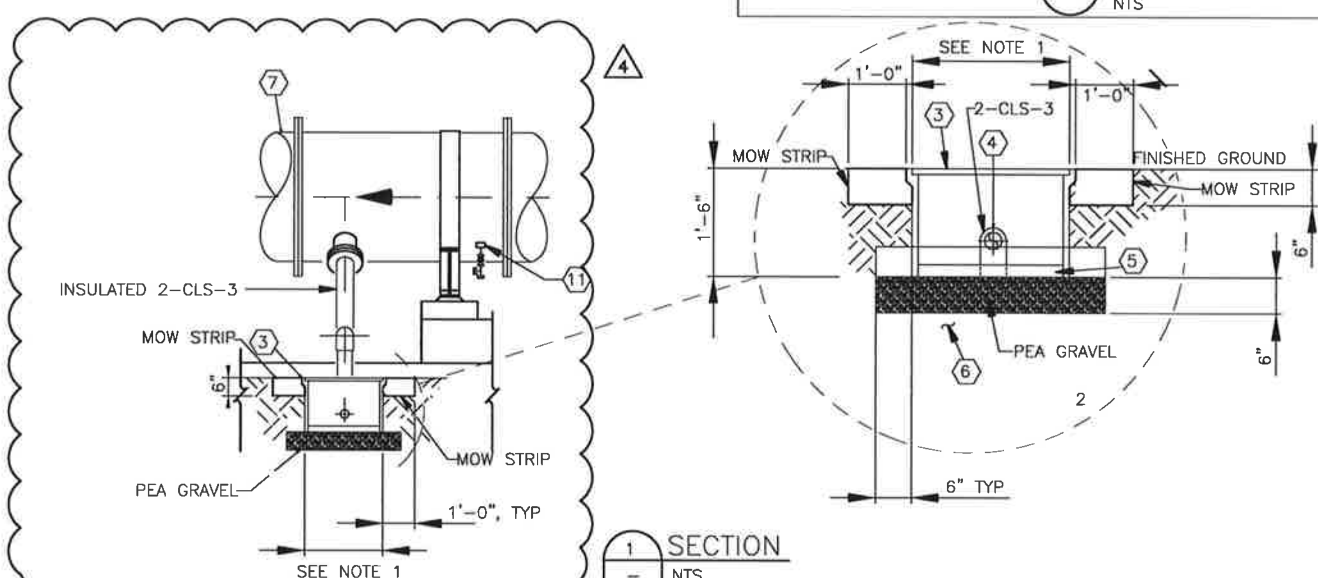
2" CHLORINE INJECTION PIPING ASSEMBLY



NOTE:

1. PROVIDE DEEP-SEAL P-TRAPS AT ALL FLOOR DRAINS WITH DIRECT CONNECTION TO THE WASTEWATER SYSTEM.

B FLOOR DRAIN
NTS



1 SECTION
– NTS

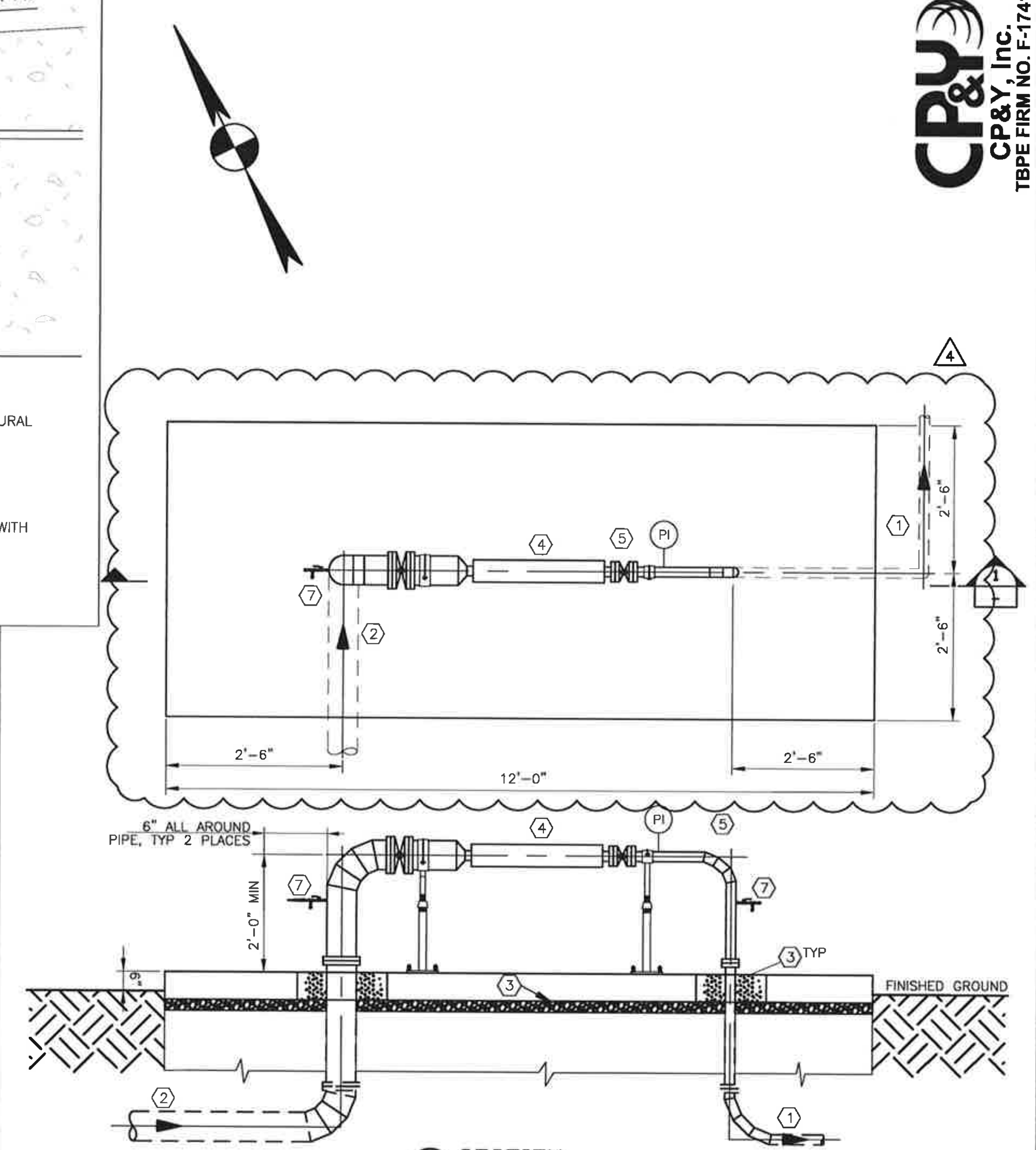
A CHEMICAL APPLICATION POINT DETAIL
NTS

NOTES:

1. PROVIDE POLYMER CONCRETE CAST SPLICE VALVE BOX OR EQUAL, BY NEW BASIS WITH 2 MOUSE HOLE OPENINGS, EACH SIDE TO RECEIVE SOLUTION PIPING. SEAL OPENINGS WITH NON-SHRINK GROUT. PER OWNER DIRECTION POLYMER CONCRETE PULL BOX SHALL BE SIZED TO ALLOW FOR AN OWNER DIRECTED BURY DEPTH OF 18 INCHES FOR THE CHLORINE SOLUTION LINE UNDER THE CONCRETE POLYMER PULL BOXES. CONTRACTOR SHALL TRANSITION FROM A 24" COVER IN THE YARD TO AN 18" COVER PRIOR TO ENTERING THE PULL BOX AND TRANSITION BACK TO A 24" COVER AFTER EXITING THE PULL BOX.
2. PROVIDE REMOVABLE 6" SCH 80 PVC PIPE TO COVER CHEMICAL PIPE AND INSULATION. PVC COVERING SHALL BE GLUED TOGETHER THEN SPLIT (SAWED) & INSTALLED WITH 6 STAINLESS STEEL HOSE CLAMPS.
3. SEE NOTE 6 ON SHEET C-SPS-19.
4. PVC BALL VALVE SCHEDULE SHALL MATCH THE SCHEDULE OF THE CONNECTED PIPE. SPECIAL ADAPTORS MAY BE REQUIRED TO TRANSITION FROM DOUBLE CONTAINED PIPE/TUBING TO PVC BALL VALVE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL ADAPTORS AND FITTINGS NECESSARY FOR THE TRANSITION, WHETHER SPECIFICALLY NOTED OR NOT.
5. FOR PVC PIPING, FURNISH AND INSTALL UNIONS, BUSHINGS, COUPLINGS AND OTHER FITTINGS AS NECESSARY FOR EASE OF INSTALLATION AND MAINTENANCE OF EQUIPMENT.
6. CONTRACTOR SHALL ROTATE THE EXISTING SPOOL PIECE AT CONTROL STATION NO. 1 THAT HAS THE CORPORATION STOP OUTLET TO THE 315° POSITION.

NOTES BY SYMBOL ⟨X⟩

1	PVC BALL VALVE W/INTEGRAL UNIONS, TYP, SEE NOTES 4 AND 5
2	UNION
3	CONCRETE POLYMER PULL BOX, SEE NOTE 1
4	SCH 80 PVC SOLUTION TUBE EXTENSION SAME SIZE AS SOLUTION PIPE AS SUPPLIED BY ENVIROPUMP, SAN ANTONIO, TEXAS
5	~~MOUSE HOLE OPENING~~
6	2" NON-SHRINK GROUT
7	COMPACTED SUBGRADE
8	12-PW-1, REFER TO SPEC SECTION 15072
9	BLIND FLANGE W/ TAPPED OUTLET, ONE SIZE LARGER THAN SOLUTION LINE
10	4" FLANGED OUTLET
11	2" CORPORATION COCK W/2" INLET & OUTLET SAMPLE TAP



1 SECTION
– NTS

C CONCRETE SLAB AND ABOVE GRADE PIPING
NTS

NOTE:

1. CONTRACTOR SHALL SUBMIT BACKFLOW PREVENTER TO ENGINEER AND OWNER FOR REVIEW IN ACCORDANCE WITH SPECIFICATION SECTION 11261.

NOTES BY SYMBOL ⟨X⟩

1	2-UW-7 TO PROP CHLORINE BUILDING, REFER TO SHEET C-SPS-19 FOR ADDITIONAL INFORMATION
2	6-PW-7 FROM EXIST 6-PW-3, REFER TO SHEET C-SPS-19 AND TANK SHEETS FOR ADDITIONAL INFORMATION
3	FILL W/ ¼" PEA GRAVEL (TYP)
4	BACKFLOW PREVENTER, SEE NOTE 1
5	PRESSURE INDICATOR
6	2-PW-7 FROM PZ 790, REFER TO SHEET C-SPS-19 FOR ADDITIONAL INFORMATION
7	1/2" SAMPLE TAP

10/30/2015

STATE OF TEXAS
GUANG ZHU
90810
LICENSED PROFESSIONAL ENGINEER

SAWS JOB NO.
P-14-6101

CP&Y, Inc.
TBPE FIRM NO. F-1741

garzabury

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM #4	GZ	10/30/15

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

STANDARD MECHANICAL DETAILS II

DATE: OCTOBER 2015
DESIGNED BY: JAM
DRAWN BY: GWM
REVIEWED BY: GZ
GB PRJ.#103817-00001

SHEET
M-SPS-10
SHEET 54 OF 99

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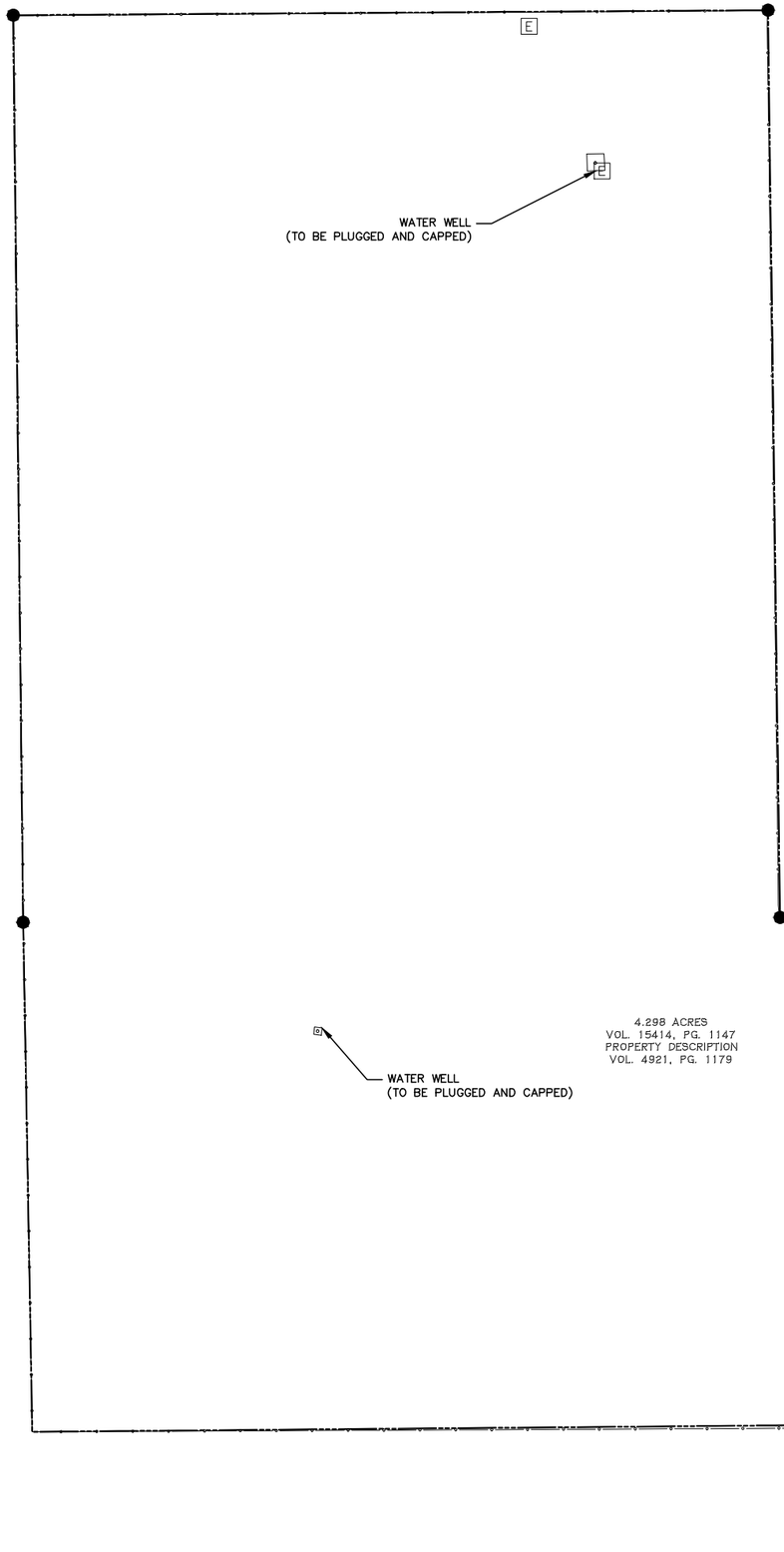

LEGEND

- RIGHT-OF-WAY
- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- EXISTING CHAINLINK FENCE
- PROPOSED CHANINLINK FENCE
- BURIED TELEPHONE
- OVERHEAD ELECTRIC
- EXISTING LIGHT POLE
- EXISTING CONCRETE PAVEMENT

0 25 50 75 100
1"=50'

NOTE:

1. PER DEMOLITION PLAN, SALVAGE GATES FROM EXISTING SITE ENTRANCE AND INSTALL AT RELOCATED SITE ENTRANCE IN WORKING CONDITION, N.S.P.I.

STATE OF TEXAS
WILLIAM C. CAUSEY, JR.
87662
LICENSED
PROFESSIONAL ENGINEER
10/29/2015

SAWS JOB NO.
P-14-6101

garzabury LLC
922 Isom Road, Suite 100
San Antonio, TX 78216
Tel (210) 526-0288 Fax (210) 526-0325
TBPE Registration Number F-14629

SAN ANTONIO WATER SYSTEM

No.	Revision	Approved	Date
4	ADDENDUM NO. 4, CLAYTON FENCE	WCC	10.29.2015

SAN ANTONIO WATER SYSTEM
DSP CLAYTON TANK REPLACEMENT PROJECT

CLAYTON PROPOSED SITE PLAN

DATE: OCTOBER 2015
DESIGNED BY: BAL
DRAWN BY: FJC
REVIEWED BY: WCC
GB PRJ.#:103187-00001

SHEET
C-CPS-2
SHEET 91 OF 99

Date: Nov 02, 2015, 3:22pm User ID: fcantero
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