



LAKE HAVASU CITY

# LAKE HAVASU CITY ARIZONA

## TANK 2A -06 REHABILITATION/ REPLACEMENT (Project WT 6090)

### COMBINED CONTRACT DOCUMENTS AND SUPPLEMENTAL TECHNICAL SPECIFICATIONS



August, 2016



**LAKE HAVASU CITY  
TANK 2A-06 REHABILITATION/REPLACEMENT  
(Project WT6090)**

**CONTRACT DOCUMENTS  
VOLUME 1**

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## **DIVISION IV – TECHNICAL SPECIFICATIONS**

Standard Technical Specifications for Public Work Construction as furnished by Lake Havasu City, latest edition, are not included in this document. They can be found on Lake Havasu City's website at:

<http://www.lhcaz.gov/community-investment/engineering/engineering-specifications>

Modifications to the Standard Technical Specifications are provided in Section 0800.32.

The following Standard Specifications are used. The Specification Sections marked with \*) have been modified per Specifications Section 0800.32.

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### **DIVISION 9 – FINISHES**

- SECTION 09900\* – PROTECTIVE COATINGS

### **DIVISION 16 – ELECTRICAL**

- SECTION 16010 – GENERAL ELECTRICAL REQUIREMENTS
- SECTION 16111 – CONDUIT, FITTINGS AND ACCESSORIES
- SECTION 16120 – WIRE, CABLE AND ACCESSORIES
- SECTION 16500 – LIGHTING DEVICES, SWITCHES AND RECEPTACLES
- SECTION 16900\* – GENERAL REQUIREMENTS – INSTRUMENTS AND CONTROLS
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## **SUPPLEMENTAL TECHNICAL SPECIFICATIONS**

- SECTION 01110 – SUMMARY OF WORK
- SECTION 01210 – MEASUREMENT AND PAYMENT
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- SECTION 02050 – DEMOLITION AND REMOVALS
- SECTION 02652 – STEEL PIPE AND SPECIALS
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- SECTION 05162 – ALUMINUM GEODESIC DOME ROOF
- SECTION 05510 – METAL FABRICATION
- SECTION 07150 – IMPERMEABLE VAPOR BARRIER
- SECTION 09950 – PROTECTIVE COATINGS FOR STEEL WATER TANK
- SECTION 13110 – CORROSION PROTECTION FOR STEEL TANK INTERNALS AND CML&C STEEL PIPE
- SECTION 13111 – CORROSION PROTECTION SYSTEM – REHABILITATION OF EXISTING TANK 2A-06 (ALTERNATIVE 1)
- SECTION 13211 – TANK DISINFECTION
- SECTION 13212 – REHABILITATION WELDED STEEL TANKS
- SECTION 13311 – WELDED STEEL TANK FOR WATER STORAGE
- SECTION 15910 – CLOG-RESISTANT ATMOSPHERIC TANK VENTS

### **APPENDIX A**

SUBSURFACE INVESTIGATION

### **APPENDIX B**

TANK 2A-06 AS BUILTS DRAWINGS

### **APPENDIX C**

TANK 2A-06 EVALUATION REPORT (BY TANK INDUSTRY CONSULTANTS)

SECTION 00020  
**NOTICE INVITING BIDS**  
Lake Havasu City

**PROJECT NO.:** WT6090  
**PROJECT NAME:** TANK 2A-06 REHAB/REPLACEMENT  
**PRE-BID MEETING** August 17, 2016, 11:00 AM  
**BID DUE DATE:** September 2, 2016  
**BID DUE TIME:** 3:00 p.m., ARIZONA TIME

**PROJECT DESCRIPTION:**

Work of this Contract comprises two alternatives: Alternative 1 – general rehabilitation of the existing Tank 2A-06 including new aluminum roof (Alternative 1A) or steel roof (Alternative 1B), and Alternative 2-removal of existing steel Tank 2A-06 and construction new tank in the same location with new aluminum roof (Alternative 2A) or steel roof (Alternative 2B).

Pre-bid meeting will be held at Lake Havasu City Hall, 2330 McCulloch Blvd. North, at the time and date cited above. Pre-bid meeting is mandatory.

Sealed bids for the project specified will be received by the **City Clerk's Office, 2330 N. McCulloch Boulevard, Lake Havasu City, Arizona, 86403** until the time and date stated. **Bids received by the correct time and date will be opened and read aloud immediately thereafter in Room 109 of Lake Havasu City Hall.**

**Bids must be clearly addressed to the City Clerk's Office, 2330 McCulloch Blvd. N, Lake Havasu City, Arizona, 86403,** and received no later than the exact time and date indicated above. Late bids will not be considered under any circumstances.

Bids must be submitted in a sealed envelope with the Project Number and the bidder's name and address clearly indicated on the envelope. All bids must be completed in ink or typewritten on a form to be obtained from the specifications and a complete Invitation for Bid returned along with the offer no later than the time and date cited above.

Bid documents and specifications are available on Lake Havasu City's website at [www.lhcaz.gov](http://www.lhcaz.gov) or on

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DemandStar at [www.demandstar.com](http://www.demandstar.com). For documents obtained outside of DemandStar please contact Kim Fiumara, [fiumarak@lhcaz.gov](mailto:fiumarak@lhcaz.gov), to be added to the planholders' list.

For technical information, contact Roman Obzejta, Atkins North America Inc, at 858.514.1076.

**BONDS:**

Bid Bond:	<u>10%</u>
Labor and Material Bond:	<u>100%</u>
Faithful Performance Bond:	<u>100%</u>

**Project Completion Date:** 120 calendar days after Notice to Proceed.

Lake Havasu City reserves the right to accept or reject any or all bids or any part thereof and waive informalities deemed in the best interest of the City.

*Pursuant to the Americans with Disabilities Act (ADA), Lake Havasu City endeavors to ensure the accessibility of all of its programs, facilities and services to all persons with disabilities. If you need an accommodation for this meeting, please contact the City Clerk's office at (928) 453-4142 at least 24 hours prior to the meeting so that an accommodation may be arranged.*

Publication Dates: Today's News Herald August 5 & 12, 2016  
Arizona Business Gazette August 11 & 18, 2016

**\*\* END OF SECTION \*\***

SECTION 00100  
**INFORMATION FOR BIDDERS**

**1. RECEIPT AND OPENING OF BIDS**

The City of Lake Havasu City, Arizona, (hereinafter called the "Owner") invites Bids on the form attached hereto. All blanks must be appropriately filled in. The Bidder shall also complete and submit a form listing proposed subcontractors as enclosed herein. Any subcontractors proposed to be used on the project but not listed on this form shall not be considered when evaluating the Contractor's qualifications and ability to perform the work.

Bids for **TANK 2A-06 REHABILITATION/REPLACEMENT, Project No. WT6090** will be received by the **City Clerk's office, 2330 N. McCulloch Boulevard, Lake Havasu City, Arizona 86403 no later than 3:00 P.M., Arizona Time, September 2, 2016**, where said Bids will be publicly opened and read aloud immediately thereafter in the Room 109 of Lake Havasu City Hall.

The Owner may consider informal any Bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all Bids. Any Bid may be withdrawn prior to the above scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No Bidder may withdraw a Bid within ninety (90) days after the actual date of the opening thereof.

**2. PREPARATION OF BID**

Each Bid must be submitted on the prescribed Form. Each Document must be submitted with an original signature of the Bidder, as well as all witnesses indicated therein. All blank spaces for Bid prices must be filled in, in ink or typewritten, in both words and figures.

Each Bid must be submitted in a sealed envelope bearing on the outside the name of the Bidder, the Bidder's address, and the name and number of the project for which the Bid is submitted. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed as specified in the Bid form.

**3. PRE-BID MEETING**

The pre-bid conference will be held for this project at the time and place stipulated in Section 00020 - Notice Inviting Bids, as modified by Addenda.

**4. FACSIMILE BIDS OR MODIFICATIONS**

No facsimile ("FAX") Bids or bid modifications will be accepted. Any modifications to the Bid shall be made by an authorized representative of the bidding company in person.

**5. QUALIFICATIONS OF BIDDER**

The Owner may make such investigations as he deems necessary to determine the qualifications of and the ability of the Bidder to perform the Work, and the Bidder shall furnish the Owner such information and data for this purpose as the Owner may request. The Owner may request that the Bidder provide a list of key people for the project with their related work experience.

The Owner reserves the right to reject any Bid if the evidence submitted by or investigation of such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein in a timely manner. Conditional Bids will not be accepted.

All Bidders and listed subcontractors must be valid Arizona Licensed Contractors at the time of Bidding, approved by the Arizona State Registrar of Contractors to do the type and amount of work specified in these documents. In accordance with the Arizona State Registrar of Contractors, the Bidder must possess a minimum of a Class A Arizona Contractor's License to perform the type and amount of work specified in these documents. **Failure of any bidder to possess all contractors' licenses as listed in the bid packet, at the time of bidding, shall result in the bid being considered non-responsive and not in substantial compliance, and any such bid shall not be considered.** Refer to Section 00420, page 3, item 13.

## **6. ARITHMETIC DISCREPANCIES IN THE BID**

- A. For the purpose of the evaluation of Bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the Bid Schedule as submitted by Bidders:
1. Obviously misplaced decimal points will be corrected;
  2. In case of discrepancy between unit price and extended price, the unit price will govern;
  3. Apparent errors in extension of unit prices will be corrected;
  4. Apparent errors in addition of lump sums and extended prices will be corrected; and
  5. In case of discrepancy between words and figures in unit prices, the amount shown in words shall govern.
- B. For the purpose of Bid evaluation, the Owner will evaluate the bids on the basis of the unit prices, extensions, and totals arrived at by resolution of arithmetic discrepancies as provided above.

## **7. INCOMPLETE BIDS**

Failure to submit a Bid on all items in the Schedule will result in an incomplete Bid and the Bid may be rejected. **UNIT OR LUMP SUM PRICES MUST BE SHOWN FOR EACH BID ITEM WITHIN THE SCHEDULE.**

**NOTE: FAILURE TO INDICATE UNIT OR LUMP SUM PRICES IN THE APPROPRIATE COLUMN, WITH THE EXTENSION OF THE PRICES IN THE FAR RIGHT COLUMN, WILL CAUSE THE BID TO BE "NON-RESPONSIVE".**

**All forms indicated in the Bid Proposal, Section 00300, must be completely filled out, executed, and submitted with the Bid. Failure to do so will render the bid "non-responsive" and the bid will not be accepted.**

## **8. BID SECURITY**

Each Bid must be accompanied by certified check, cashier's check, or a Bid Bond prepared on the form attached hereto or on a similar form acceptable to the Owner, duly executed by the Bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of ten percent (10%) of the Bid. Bid Bonds shall be valid for at least ninety (90) days after the date of the receipt of Bids. Such cash, check or Bid Bond will be returned to all except the three (3) lowest Bidders within fifteen (15) business days after the opening of Bids. The remaining checks, or Bid Bonds will be returned promptly after the Owner and the accepted Bidder have executed the Contract, or if no award has been made within ninety (90) days after the date of the opening of Bids, upon demand of the Bidder at any time thereafter, so long as he has not been notified of the acceptance of his Bid.

## **9. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT**

The successful Bidder, upon his failure or refusal to execute and deliver the Contract, Bonds, and certificates required within ten (10) calendar days from the date of the Notice of Award, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the difference between his bid and the amount of the contract actually entered into with another party should he not enter into a contract at the bid price and provide the required payment and performance bonds and certificates of insurance. Liquidated damages for failure to enter into the contract shall not exceed the amount of the Bid Bond.

## **10. SECURITY FOR FAITHFUL PERFORMANCE AND PAYMENT**

Simultaneously with his delivery of the executed Contract, the Bidder shall furnish **on the forms provided herein**, in 100% of the amount of this Contract, 1) a surety bond as security for faithful performance of this Contract, and 2) a surety bond as security for the payment of all persons performing labor on the project under this Contract and persons furnishing materials in connection with this Contract, and 3) a listing of all subcontractors who will be performing or providing more than one-half percent (0.50%) of the contract work, as specified in the General Conditions included herein. The surety on such bond or

bonds shall be a duly authorized surety company satisfactory to the Owner, listed on the Treasury Department's most current list (Circular 570 as amended), and authorized to transact business in the State of Arizona.

**11. POWER OF ATTORNEY**

Attorneys-in-fact who sign Bid Bonds or Contract bonds must file with each bond a certified and effectively dated copy of their power-of-attorney.

**12. LAWS AND REGULATIONS**

The Bidder's attention is directed to the fact that all applicable Federal Laws, State Laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

**13. METHOD OF AWARD**

- A. The City will award the Contract on the basis of the Bid or Bids most advantageous to the City. In determining whether a Bid is most advantageous, in addition to price, the City may consider the following:
1. The ability, capacity, and skill of the Bidder to perform the Contract or provide the service indicated;
  2. Whether the Bidder can perform the Contract or provide the service promptly, and within the time specified without delay or interference;
  3. The character, integrity, reputation, judgment, experience, and efficiency of the Bidder;
  4. The quality of performance on previous contracts;
  5. The previous compliance with laws and ordinances by the Bidder;
  6. The financial responsibility of the Bidder to perform under the Contract or provide the service;
  7. The limitations of any license the Bidder may be required to possess;
  8. The quality, availability, and adaptability of the product or service;
  9. The ability of the Bidder to provide future maintenance and/or service;
  10. The number and scope of any conditions attached to the Bid; and;

11. The life cycle, maintenance, and performance of the equipment or product being offered.

**14. OBLIGATION OF THE BIDDER**

At the time of the opening of Bids, each Bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Plans and Contract documents (including all Addenda, if applicable). The failure or omission of the Bidder to examine any form, instrument or document, or site changes due to natural causes, shall in no way relieve any Bidder from any obligation in respect to his Bid. Site changes due to natural causes prior to Bid opening shall not be cause for Bid alteration or withdrawal.

**15. TIME OF COMPLETION AND LIQUIDATED DAMAGES**

The Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" from the Owner, and to complete the work within **120 calendar days** of the date of the Notice to Proceed.

The Bidder further agrees to pay as liquidated damages, the sum indicated in the following Schedule of Liquidated Damages for each consecutive calendar day thereafter, plus any additional costs incurred by the Engineer as provided in Section 17 of the General Conditions, that the Contract remains incomplete. For the purposes of determining the Liquidated Damages for the project, the Original Contract Amount shall be that which is included in the Contract between the Owner and the Contractor for the project.

<b>SCHEDULE OF LIQUIDATED DAMAGES</b>		
Original Contract Amount		Daily Charges
From More Than	To and Including	Calendar Day or Fixed Rate
0	25,000	210
25,000	50,000	250
50,000	100,000	280
100,000	500,000	430
500,000	1,000,000	570
1,000,000	2,000,000	710
From More Than	To and Including	Calendar Day or Fixed Rate
2,000,000	5,000,000	1,070
5,000,000	10,000,000	1,420
10,000,000	---0---	1,780

**16. CONDITIONS OF WORK**

Each Bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his Contract. Insofar as possible, the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.

**17. ADDENDA AND INTERPRETATIONS**

All questions that arise relating to this solicitation shall be directed in writing to:

Kim Fiumara  
fiumarak@lhcaz.gov  
Community Investment Department  
Lake Havasu City  
2330 McCulloch Blvd. North  
Lake Havasu City, AZ 86403

To be considered, written inquiries shall be received by the above-referenced contact by **August 24, 2016, 4:00PM**, Arizona Time. Inquiries received will then be answered in an Addendum. Any and all such interpretations and any supplemental instructions will be in the form of written Addenda to the Specifications which, if issued, will be available to all prospective Bidders, not later than five (5) calendar days prior to the date fixed for the opening of Bids. Failure of any Bidder to incorporate any such Addendum or interpretation shall not relieve such Bidder from any obligation under his/her Bid as submitted. All Addenda so issued shall become part of the Contract documents.

No informal contact initiated by offerors on this solicitation will be allowed with members of City staff from the date of distribution of this solicitation until after the closing date and time for the submissions of quotations. All questions or issues related to this solicitation shall be submitted in writing.

**18. CONFLICT OF INTEREST**

Pursuant to A.R.S. Section 38-511, this Contract is subject to cancellation by Buyer if any person significantly involved initiating, negotiating, securing, drafting or creating the Contract on behalf of Lake Havasu City is, at any time while the Contract is in effect, an employee of any other party to the Contract in any capacity or a consultant to any other party of the Contract with respect to the subject matter of the Contract.

**19. NO COLLUSION**

The bidder will be required to complete, notarize and submit as part of this bid package the "No Collusion Affidavit" form, as attached herein. Failure of the bidder to submit a properly executed affidavit may be grounds for rejection of the bid.

## **20. EMPLOYMENT ELIGIBILITY VERIFICATION**

The bidder will be required to complete, notarize and submit as part of this bid package the "Employer Verification of Employment Eligibility" form, as attached herein. Failure of the bidder to submit a properly executed verification of eligibility form may be grounds for rejection of the bid.

## **21. EXAMINATION OF THE PLANS AND SPECIFICATIONS**

Each Bid shall be made in accordance with the Plans and Specifications which may be examined at the following locations:

- A. Lake Havasu City, 2330 N. McCulloch Boulevard, Lake Havasu City, AZ 86403, 928.855.2116
- B. Dodge Data & Analytics, 3315 Central Avenue, Hot Springs, AR, 71913, 871.375.2946, FAX 501.625.3544, nancy\_mckeehan@mcgraw-hill.com
- C. Colorado River Building Industry Association, 2182 McCulloch Blvd, Suite 3, Lake Havasu City AZ 86403, 928.453.7755, FAX 928.453.3175
- D. Northern AZ Home Builders, 1500 E. Cedar Avenue, Suite 86, Flagstaff AZ 86004, 928.779.3071, FAX 928.779.4211
- E. Performance Graphics Blueprinting, 4140 Lynn Drive, Suite 107, Fort Mohave, AZ, 86426, 928.763.6860, FAX 928.763.6835
- F. Reed Construction Data, 30 Technology Parkway South, Suite 500, Norcross, GA 30092-2912, 800.876.4045, FAX 800.303.8629
- G. ISqFt, 3301 N 24<sup>th</sup> Street, Phoenix, AZ, 85016, 800.364.2059, FAX 800.792.7508, arizonaplanroom@isqft.com
- H. Integrated Digital Technologies, LLC, 4633 E Broadway Blvd., Tucson, AZ 85711, PO Box 13086, Tucson AZ,85732, 520.319.0988, FAX, 520.319.1430, [www.contractorsplanroom.com](http://www.contractorsplanroom.com), content@idtplans.com
- I. Yuma/Southwest Contractors Association, 350 W. 16<sup>th</sup> Street, Suite 207, Yuma, AZ 85364, Phone: 928-539-9035, Fax: 928-539-9036
- J. Arizona Builders Exchange, 1700 N. McClintock Drive, Tempe, AZ, 85281, (480) 227-2620, [www.azbex.com](http://www.azbex.com)

- K. Construction Reports.com, 4110 N Scottsdale Road, Suite 335, Scottsdale, AZ, 85251, (480) 994-0020, FAX 480-994-0030
- L. Construction Reporter, 1609 2<sup>nd</sup> Street NW, Albuquerque, NM, 87102, 505-243-9793, FAX 505-242-4758, [www.constructionreporter.com](http://www.constructionreporter.com)
- M. PlanRoom Central at A&E Reprographics, 1030 Sandretto Drive, Suite F, Prescott, AZ, 86305, 928.442.9116, [planroom1@a-erepro.com](mailto:planroom1@a-erepro.com)

\*\* END OF SECTION \*\*

SECTION 00300  
**BID PROPOSAL**

Lake Havasu City, Arizona

The undersigned, as bidder, declares that we have received and examined the documents entitled "**TANK 2A-06 REHAB/REPLACEMENT**", **Project No. WT6090** and will contract with the Owner, on the form of Contract provided herewith, to do everything required for the fulfillment of the contract for the construction of the **TANK 2A-06 REHAB/REPLACEMENT, Project No. WT6090** at the prices and on the terms and conditions herein contained.

We agree that the Contract Documents include Volumes I and II of the Contract Documents as well as the referenced documents.

**We agree that the following shall form a part of this proposal and are included herein as our submittal:**

<u>Section</u>	<u>Title</u>	<u>Enclosed</u>
<b>00300</b>	<b>Bid Proposal</b>	✓ _____
<b>00310</b>	<b>Bid Schedule</b>	_____
<b>00400</b>	<b>Arizona Statutory Bid Bond</b>	_____
<b>00420</b>	<b>Bidder's Statement of Qualifications</b>	_____
<b>00430</b>	<b>Affidavit of Contractor Certifying That There Was No Collusion In Bidding For Contract</b>	_____
<b>00450</b>	<b>Hazard Communication Program</b>	_____

**We acknowledge that addenda numbers \_\_\_\_\_ through \_\_\_\_\_ have been received and have been examined as part of the Contract Documents.**

We certify that our proposal is genuine, and not sham or collusive, nor made in the interest or behalf of any undisclosed person, organization, or corporation, and that we have not directly or indirectly induced or solicited any other bidder to put in a sham bid, or directly or indirectly induced or solicited any other potential bidder to refrain from bidding, and that we have not in any manner sought by collusion to secure an advantage over any other bidder.

The bidder agrees that this Bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing time for receiving Bids.

Upon receipt of written notice of the acceptance of this bid, Bidder shall execute the formal Contract attached within 10 days and deliver a Performance Bond, Payment Bond, and Certificates of Insurance as required by Paragraph 25 of the General Conditions and the Special Provisions.

We hereby declare that we have visited the site and have carefully examined the Contract Documents relating to the work covered by the above bid or bids.

Enclosed herewith is a certified or cashier's check or bid bond, payable to Lake Havasu City, Arizona, in the amount of ten percent (10%) of the total bid. This check or bond is submitted as a guarantee that we will enter into a Contract, and furnish the required bonds in the event a contract is awarded us. The bid security attached, without endorsement, is to become the property of Lake Havasu City, Arizona, in the event the Contract and Bonds are not executed within the time set forth, as liquidated damages for delay and additional work caused thereby.

We understand that Lake Havasu City, Arizona reserves the right to reject any and/or all bids, or to waive any informalities in any bid, deemed by them to be for the best interests of Lake Havasu City, Arizona.

Dated in \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_.

Respectfully Submitted By:

By: \_\_\_\_\_

Title: \_\_\_\_\_

Name of Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_ FAX: \_\_\_\_\_

Seal - If bid by a Corporation:

Arizona Contractor's License No.: \_\_\_\_\_ Type: \_\_\_\_\_

**\*\* END OF SECTION \*\***

**SECTION 00310**

**BID SCHEDULE**  
**LAKE HAVASU CITY**

PROJECT NAME: **TANK 2A-06 REHABILITATION/REPLACEMENT**  
PROJECT NUMBER: **WT6090**

City Lake Havasu City Council  
Lake Havasu City  
2330 N. McCulloch Boulevard  
Lake Havasu City, AZ 86403

The City Council:

Pursuant to request for bids to be opened on the 2<sup>th</sup> day of September, 2016 at 3:00 P.M., Arizona Time, at Room 109 of Lake Havasu City Hall, for the above project, the Contractor proposes to complete work, including furnishing all labor and materials, per the Specifications and Plans at the Following prices.

This Schedule of Items and Prices shall be completed in ink or typed by the Bidding Contractor. In case of discrepancy between the word and figure amount description, the word description shall control extensions.

Prices must be entered for each item and the appropriate subtotal and total blank shall be filled out. Bid prices shall include sales tax and all other applicable taxes and fees.

Bidder agrees to perform all the necessary work to complete the **TANK 2A-06 REHABILITATION/REPLACEMENT, Project No. WT6090.**

<b>BID SCHEDULE 1 –TANK REHABILITATION ALTERNATIVE – BASE BID</b>					
<b>(Items 1 to 14)</b>					
<b>No.</b>	<b>DESCRIPTION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>UNIT PRICE <sup>1</sup></b> <b>(Word and Figure Amount)</b>	<b>TOTAL COST <sup>2</sup></b> <b>(Figure Amount)</b>
1	Mobilization/Demobilization, Bonds, Permitting and Insurance	1	LS	\$	\$
2	Demolition of Existing Tank Roof	1	LS	\$	\$
3	Demolition of Existing Tank Floor	1	LS	\$	\$
4	Tank New Floor	1	LS	\$	\$
5	6" Oil Impregnated Sand Base	1	LS	\$	\$
6	Retaining Ring Repair	1	LS	\$	\$
7	16" Inlet/Outlet Piping	1	LS	\$	\$
8	16" Interconnecting Piping	1	LS	\$	\$
9	Overflow Pipe	1	LS	\$	\$
10	Hydrostatic Testing and Disinfection	1	LS	\$	\$
11	Cathodic Protection System for Welded Steel Tank	1	LS	\$	\$
12	Tank Instrumentation and Controls	1	LS	\$	\$
13	Tank Appurtenances	1	LS	\$	\$
14	Force Account	1	LS	\$50,000 (fifty thousand dollars)	\$50,000
<b>SCHEDULE 1 BASE BID TOTAL</b>					

<sup>1</sup> The "Unit Price" column shall indicate unit or lump sum prices for each bid item and shall be indicated in written and numerical form.

<sup>2</sup> The "Item Total Costs" column shall indicate the extension of the unit prices, which is obtained by multiplying the "Quantity" column by the "Unit Price" column

<b>BID SCHEDULE 1A –TANK REHABILITATION ALTERNATIVE 1A – ALUMINUM ROOF</b>					
(Items 1A to 2A)					
No.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE <sup>1</sup> (Word and Figure Amount)	TOTAL COST <sup>2</sup> (Figure Amount)
1A	Aluminum Roof for Existing 1.0 MG Welded Steel Tank 2A (anodized finish or PVDF powder coating finish)	1	LS	(Circle one) Anodized PVDF powder coating	\$
2A	Tank Interior and Exterior Coatings	1	LS		\$
<b>SCHEDULE 1A BID TOTAL</b>					<b>\$</b>

<b>BID SCHEDULE 1B –TANK REHABILITATION ALTERNATIVE 1B – STEEL ROOF</b>					
(Items 1B to 2B)					
No.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE <sup>1</sup> (Word and Figure Amount)	TOTAL COST <sup>2</sup> (Figure Amount)
1B	Steel Roof for Existing 1.0 MG Welded Steel Tank 2A	1	LS		\$
2B	Tank Interior and Exterior Coatings	1	LS		\$
<b>SCHEDULE 1B BID TOTAL</b>					<b>\$</b>

<sup>1</sup> The "Unit Price" column shall indicate unit or lump sum prices for each bid item and shall be indicated in written and numerical form.

<sup>2</sup> The "Item Total Costs" column shall indicate the extension of the unit prices, which is obtained by multiplying the "Quantity" column by the "Unit Price" column.

<b>BID SCHEDULE 2 –TANK REPLACEMENT ALTERNATIVE – BASE BID</b>					
<b>(Items 1 to 11)</b>					
<b>No.</b>	<b>DESCRIPTION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>UNIT PRICE <sup>1</sup></b> <b>(Word and Figure Amount)</b>	<b>TOTAL COST <sup>2</sup></b> <b>(Figure Amount)</b>
1	Mobilization/Demobilization, Bonds, Permitting and Insurance	1	LS	\$	\$
2	Demolition of Existing Tank and Retaining Ring	1	LS	\$	\$
3	Tank Concrete Ring Foundation	1	LS	\$	\$
4	6" Oil Impregnated Sand Base	1	LS	\$	\$
5	16" Inlet/Outlet Piping	1	LS	\$	\$
6	16" Interconnecting Piping	1	LS	\$	\$
7	Overflow Pipe	1	LS	\$	\$
8	Hydrostatic Testing and Disinfection	1	LS	\$	\$
9	Cathodic Protection System for Welded Steel Tank	1	LS	\$	\$
10	Tank Instrumentation and Controls	1	LS	\$	\$
11	Force Account	1	LS	\$50,000 (fifty thousand dollars)	\$50,000
<b>SCHEDULE 2 BASE BID TOTAL</b>					<b>\$</b>

<sup>1</sup> The "Unit Price" column shall indicate unit or lump sum prices for each bid item and shall be indicated in written and numerical form.

<sup>2</sup> The "Item Total Costs" column shall indicate the extension of the unit prices, which is obtained by multiplying the "Quantity" column by the "Unit Price" column.

<b>BID SCHEDULE 2A –TANK REPLACEMENT ALTERNATIVE 2A– NEW TANK WITH ALUMINUM ROOF</b>					
(Items 1A to 2A)					
No.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE <sup>1</sup> (Word and Figure Amount)	TOTAL COST <sup>2</sup> (Figure Amount)
1A	1.0 MG Welded Steel Tank with Aluminum Roof (anodized finish or PVDF powder coating finish)	1	LS	(Circle one) Anodized PVDF powder coating	\$
2A	Tank Interior and Exterior Coatings	1	LS		\$
<b>SCHEDULE 2A BID TOTAL</b>					<b>\$</b>

<b>BID SCHEDULE 2B –TANK REPLACEMENT ALTERNATIVE 2B– NEW TANK WITH STEEL ROOF</b>					
(Items 1B to 2B)					
No.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE <sup>1</sup> (Word and Figure Amount)	TOTAL COST <sup>2</sup> (Figure Amount)
1B	1.0 MG Welded Steel Tank with Steel Roof	1	LS		\$
2B	Tank Interior and Exterior Coatings	1	LS		\$
<b>SCHEDULE 2B BID TOTAL</b>					<b>\$</b>

<sup>1</sup> The "Unit Price" column shall indicate unit or lump sum prices for each bid item and shall be indicated in written and numerical form.

<sup>2</sup> The "Item Total Costs" column shall indicate the extension of the unit prices, which is obtained by multiplying the "Quantity" column by the "Unit Price" column

<b>BASE BID WITH ALTERNATIVE BID SCHEDULE TOTALS</b>			
<b>No.</b>	<b>DESCRIPTION</b>		<b>Total \$</b>
<b>1</b>	<b>Alternative 1A – Tank Rehabilitation with new Aluminum Roof</b>	<b>Base Bid Schedule 1 + Bid Schedule 1A</b>	<b>\$</b>
<b>2</b>	<b>Alternative 1B – Tank Rehabilitation with new Steel Roof</b>	<b>Base Bid Schedule 1 + Bid Schedule 1B</b>	<b>\$</b>
<b>3</b>	<b>Alternative 2A – Tank Replacement with new Aluminum Roof</b>	<b>Base Bid Schedule 2 + Bid Schedule 2A</b>	<b>\$</b>
<b>4</b>	<b>Alternative 2B – Tank Replacement with new Steel Roof</b>	<b>Base Bid Schedule 2 + Bid Schedule 2B</b>	<b>\$</b>

The City determine which bid schedule to select based on bids received. The City, at its sole discretion, will determine which improvements are the best value. The lowest responsive and responsible bidder for the selected bid schedule will be notified by City.

The unit prices for **TANK 2A REHABILITATION/REPLACEMENT, Project No. WT6090**, shall include all labor, materials, water disposal, bailing, shoring, removal, disposal, overhead, profit, insurance, and all other related costs and work to cover the finished work of the several kinds called for. Changes in the Contract shall be processed in accordance with Paragraph 16 of the General Conditions.

Bidder understands that the Owner reserves the right to reject any or all Bids, or portions thereof, and to waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing time for receiving Bids.

Upon receipt of written notice of the acceptance of this Bid, Bidder shall execute the formal Contract attached within 10 days and deliver a Performance Bond, Payment Bond, and Certificates of Insurance as required by Paragraph 25 of the General Conditions and the Special Provisions.

The Bid security attached in the sum of \$\_\_\_\_\_ is to become the property of the Owner in the event the Contract and Bond(s) are not executed and provided within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Bidder hereby acknowledges receipt of the following Addenda: \_\_\_\_\_

RESPECTFULLY SUBMITTED BY:

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

FIRM: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

PHONE: \_\_\_\_\_ FAX \_\_\_\_\_

Seal - if Bid by a corporation

AZ Contractor's License No: \_\_\_\_\_ Type \_\_\_\_\_

**\*\* END OF SECTION \*\***

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SECTION 00400  
**ARIZONA STATUTORY BID BOND**

PURSUANT TO TITLES 28, 34 AND 41, ARIZONA REVISED STATUTES  
(Penalty of this bond must not be less than 10% of the bid amount)

KNOW ALL MEN BY THESE PRESENTS:

That, \_\_\_\_\_ (hereinafter "Principal"), as Principal, and \_\_\_\_\_, (hereinafter "Surety"), a corporation organized and existing under the laws of the State of \_\_\_\_\_, with its principal offices in the City of \_\_\_\_\_, holding a certificate of authority to transact surety business in Arizona issued by the Director of the Department of Insurance pursuant to Title 20, Chapter 2, Article 1, as Surety, are held and firmly bound unto Lake Havasu City, Arizona, (hereinafter "Obligee"), as Obligee, in the amount of Ten Percent (10%) of the amount of the bid of Principal, submitted by Principal to the Obligee for the work described below, for the payment of which sum, the Principal and Surety bind themselves, and their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for  
**TANK 2A-06 REHAB/REPLACEMENT, Project No. WT6090**

NOW, THEREFORE, if the Obligee shall accept the proposal of the Principal and the Principal shall enter into a contract with the Obligee in accordance with the terms of the proposal and give the bonds and certificates of insurance as specified in the standard specifications with good and sufficient surety for the faithful performance of the contract and for the prompt payment of labor and materials furnished in the prosecution of the contract, or in the event of the failure of the Principal to enter into the contract and give the bonds and certificates of insurance, if the Principal pays to the Obligee the difference not to exceed the penalty of the bond between the amount specified in the proposal and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by the proposal then this obligation is void. Otherwise it remains in full force and effect provided, however, that this bond is executed pursuant to the provisions of Section 34-201, Arizona Revised Statutes, and all liabilities on this bond shall be determined in accordance with the provisions of that section to the extent as if it were copied at length herein.

Witness our hands this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

---

PRINCIPAL

SEAL

SURETY

SEAL

By: \_\_\_\_\_ By: \_\_\_\_\_  
Attorney-in-Fact

Its: \_\_\_\_\_  
Agency of Record

\_\_\_\_\_  
Agency Address

\*\* END OF SECTION \*\*

SECTION 00420  
BIDDER'S STATEMENT OF QUALIFICATIONS

The Undersigned certifies the truth and correctness of all statements and of all answers to questions made hereinafter.

SUBMITTED TO: Lake Havasu City, Arizona  
2330 N. McCulloch Boulevard  
Lake Havasu City, AZ 86403

SUBMITTED BY: NAME: \_\_\_\_\_  Corporation  Partnership  
ADDRESS: \_\_\_\_\_  Individual  Joint Venture  
PRINCIPAL OFFICE: \_\_\_\_\_  Other

(NOTE: Attach separate sheets as required)

1. How many years has your organization been in business as a Contractor?
2. How many years has your organization been in business under its present business name?  
\_\_\_\_\_

3. If a Corporation, answer the following:  
Date of Incorporation: \_\_\_\_\_  
State of Incorporation: \_\_\_\_\_  
President: \_\_\_\_\_  
Vice President(s): \_\_\_\_\_  
Secretary: \_\_\_\_\_  
Treasurer: \_\_\_\_\_

4. If a Partnership, answer the following:  
Date of organization: \_\_\_\_\_  
Type of Partnership: \_\_\_\_\_  
(General/Limited/Assoc.)  
Name and Address of all partners.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. If other than a Corporation or Partnership, describe Organization and name Principals:  
\_\_\_\_\_

6. What percent of the work do you normally perform with your own forces?

List trades:

\_\_\_\_\_

\_\_\_\_\_

7. Have you ever failed to complete any work awarded to you? If so, indicate when, where and why:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. Has any Officer or Partner of your Organization ever been an Officer or Partner of another Organization that failed to complete a construction contract? \_\_\_\_\_ If so, state circumstances:

\_\_\_\_\_

\_\_\_\_\_

9. List major construction projects your Organization has under contract on this date:

<b>Project Name</b>	<b>Name, Address &amp; Telephone Number of Owner</b>	<b>Engineer</b>	<b>Contract Amount</b>	<b>Contract Date</b>	<b>Percent Complete</b>	<b>Scheduled Completion</b>

10. List similar construction projects your Organization has completed in the past five years:

<b>Project Name</b>	<b>Owner</b>	<b>Engineer</b>	<b>Contract Amount</b>	<b>Date Awarded</b>	<b>Date Completed</b>	<b>Percent with Own Forces</b>

11. List the construction experience of the principal individuals in your Organization:

Individual's Name	Construction Experience - Years	Within Your Organization		
		Present Position & Years Experience	Dollar Volume Responsibility	Previous Position & Years Experience

12. List states and categories in which your Organization is legally qualified to do business:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

13. List all Arizona Contractor licenses currently held by your Organization; the status of each license; and provide a photocopy of each license with your bid proposal.

	<u>License Class / #</u>	<u>Status</u>
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

Please attach a list of additional Arizona Contractor licenses, if any.

14. Bank References:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

15. Trade References:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

16. Name of Bonding and Insurance Companies and Name and Address of Agents: Maximum Bonding Capacity \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

17. The Undersigned agrees to furnish, upon request by the Owner, within seven days after the Bid Opening, a current Statement of Financial Conditions, including Contractor's latest regular dated financial statement or balance sheet which must contain the following items:

Current Assets: (Cash, joint venture accounts, accounts receivable, notes receivable, accrued interest on notes, deposits, and materials and prepaid expenses), net fixed assets and other assets.

Current Liabilities: (Accounts payable, notes payable, accrued interest on notes, provision for income taxes, advances received from owners, accrued salaries, accrued payroll taxes), other liabilities, and capital (capital stock, authorized and outstanding shares par values, earned surplus).

Date of statement or balance sheet: \_\_\_\_\_

Name of firm preparing statement: \_\_\_\_\_

By: \_\_\_\_\_  
 (Agent and Capacity)

18. List of Subcontractors. In accordance with paragraph 1.0 of Instructions to Bidders, the following is a breakdown of all subcontractors anticipated to be used for completing this project and their approximate percentage of work to be performed.

The Bidder certifies that all Subcontractors listed are eligible to perform Work on public works projects pursuant to ARS 34-241.

<u>Subcontractor</u>	<u>Description of Work</u>	<u>% of Total Project</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

\_\_\_\_\_

Total % of all Subcontractor's work on project

Total % for Prime Contractor

\_\_\_\_\_  
\_\_\_\_\_

19. Dated at \_\_\_\_\_ this \_ day of \_\_\_\_\_, \_\_\_\_\_

Name of Organization: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

**\*\* END OF SECTION \*\***

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SECTION 00450  
HAZARD COMMUNICATION PROGRAM  
Lake Havasu City

**HAZARD COMMUNICATION PROGRAM FOR \_\_\_\_\_**  
*(Name of Company)*

The purpose of this program is to ensure that potential hazards and hazard control measures for chemicals used by this company are understood by company employees.

The written program is available for employee review at any time. It is located \_\_\_\_\_ . A copy of the program will be provided to any employee or employee representative, upon request.

**CONTAINER LABELING:**

\_\_\_\_\_ will verify that all containers received for use by this company will: (name/title of individual)

- \* be clearly labeled as to the contents, matching identification on MSDS;
- \* note the appropriate hazard warnings;
- \* List the name and address of the manufacturer.

No containers will be released for use until the above data is verified.

**MATERIAL SAFETY DATA SHEETS:**

Copies of MSDS's for all hazardous chemicals to which employees may be exposed will be kept

\_\_\_\_\_  
\_\_\_\_\_ will be responsible for ensuring that:  
(name/title of individual)

- \* MSDS's for the new chemicals are available;
- \* MSDS's will be available for review to all employees during each work shift;
- \* Copies will be available on request.

**EMPLOYEE TRAINING AND INFORMATION:**

Each employee will be provided the following information and training before working in areas where hazardous chemicals exist. In addition, if a new hazardous material is introduced into the workplace, affected employees will be given new information and training concerning that material.

**A. Minimum Information Provided:**

- (1) All operations and locations in the work area where hazardous chemicals are

present.

## **GENERAL INDUSTRY**

### **A. Minimum Information Provided:**

- (1) The location and availability of the written hazard communication program, including list(s) of hazardous chemicals used and related material safety data sheets;
- (2) The method the company will use to inform employees of potential hazards of non-routine tasks (jobs that are not routine for an individual because of infrequency, location or type.)

### **B. Minimum Training Provided:**

- (1) Methods and observations used to detect the presence or release of a hazardous chemical in the work area (such as company monitoring programs, continuous monitoring device, visual appearance, odor or to other characteristics of hazardous chemicals;
- (2) The physical and health hazards of chemicals in the assigned work area;
- (3) The measures to take to protect against such hazards, including specific company procedures concerning work practices, emergencies and care and use of protective equipment.
- (4) Details of the company hazard communication program, including explanation of the labeling system, the material safety data sheets, and how to obtain and use the appropriate hazard information.

(OPTIONAL) Upon completion of the training, each employee will sign a form acknowledging receipt of the written hazard communication program and related training.

### **HAZARDOUS NON-ROUTINE TASKS:** (If applicable.)

If company employees are required to do hazardous non-routine tasks, such as welding in confined spaces, or cleaning of tanks, the employer must address how the employees doing the work will be informed about the specific hazards to which they will be exposed, what personal protective equipment will be provided and who will be responsible to oversee the operation or operations. If the company does not have any hazardous non-routine tasks, line through this section and state "NO HAZARDOUS NON-ROUTINE TASKS".

### **CHEMICALS IN UNLABELED PIPES:** (If applicable.)

If the company has chemicals in unlabeled pipes, the company must inform the employees of the hazards associated with those chemicals. If the company does not

have any chemicals in unlabeled pipes, line through this section and state "NO CHEMICALS IN UNLABELED PIPES".

**INFORMING CONTRACTORS:**

Providing contractors and their employees with the following information is the responsibility of \_\_\_\_\_.  
(Name/title of individual)

- (1) Hazardous chemicals to which they may be exposed while on the job site;
- (2) Measures the employees may take to lessen the possibility of exposure;
- (3) Steps the company has taken to lessen the risks;
- (4) Where the MSDS's are for chemicals to which they may be exposed;
- (5) Procedures to follow if they are exposed.

**CONTRACTORS INFORMING EMPLOYERS:**

Contractors entering this workplace with hazardous materials will supply this employer with MSDS's covering those particular products the contractor may expose this company's employees to while working at this site.

LIST OF HAZARDOUS CHEMICALS IN THIS WORKPLACE

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CONTRACTOR:**

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

END OF SECTION

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# SECTION 00460 EMPLOYMENT ELIGIBILITY VERIFICATION FORM

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## **INSTRUCTIONS FOR COMPLETION OF EMPLOYMENT ELIGIBILITY VERIFICATION FORM**

### **WHO MUST COMPLETE THIS FORM:**

In accordance with Lake Havasu City Code Chapter 3.30, Employment of Unauthorized Aliens, all contractors and subcontractors furnishing labor, time, or effort for construction or maintenance of any structure, building, transportation facility, or improvements of real property must complete this form.

Contractors or subcontractors, as described above, must certify that they have complied, in good faith, with the applicable requirements of the Federal Immigration Control and Reform Act with respect to the hiring of covered employees. This certification must be executed by an authorized representative.

### **WHEN THIS FORM MUST BE COMPLETED:**

This form must be completed by all contractors and subcontractors and submitted to the City department awarding the contract, license agreement, or lease no later than notification of successful direct selection, bid, request for proposals, request for qualification, or any similar competitive or noncompetitive procurement or bidding process.

### **This form can be found at:**

<http://www.lhcaz.gov/docs/default-source/department-documents/employerverificationofemploymenteligibility.pdf>

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SECTION 00500  
CONTRACT

THIS CONTRACT is entered into by and between LAKE HAVASU CITY, ARIZONA, a municipal corporation (hereinafter "OWNER"), and a(n) STATE corporation, **Federal I.D. # \_\_\_\_\_**, (hereinafter "CONTRACTOR").

WHEREAS, OWNER has developed plans for and desires to commence the Project Name, Project No. (hereinafter "PROJECT"); and

WHEREAS, CONTRACTOR represents that it possesses the experience, competence, equipment and financing to properly complete the PROJECT, and has formally proposed to do so, and to furnish all necessary labor, materials, and equipment and services therefore in accordance with said plans, and subject to the terms and conditions hereof.

NOW, THEREFORE, in consideration of these promises and the mutual covenants herein, it is hereby agreed as follows:

1. CONTRACTOR shall commence and complete the construction of the Project Name, Project No. ;
2. CONTRACTOR shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT.
3. CONTRACTOR shall commence the PROJECT in accordance with the CONTRACT DOCUMENTS within TEN (10) calendar days after the date of the Notice to Proceed. Final completion of the PROJECT shall occur within XXX calendar days of the date of the Notice to Proceed. The period for completion may be extended through the authorized and approved change order process.
4. Liquidated Damages: OWNER and CONTRACTOR recognize that time is of the essence of this CONTRACT and that OWNER will suffer financial loss if the PROJECT is not completed within the time specified in paragraph 3 above, plus any extensions thereof allowed in accordance with the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual losses or damages (including special, indirect, consequential, incidental and any other losses or damages) suffered by OWNER if a complete acceptable PROJECT is not delivered on time.

Accordingly, and instead of requiring proof of such losses or damages, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay the OWNER \$ for each calendar day that expires after the time specified in paragraph 3 for delivery of acceptable Bid Items, plus any costs incurred by the Engineer as provided in Section 17 of the General Conditions.

5. CONTRACTOR agrees to complete the PROJECT in accordance with all of the

terms and conditions of the CONTRACT DOCUMENTS for the sum of \$\_\_\_\_\_ as shown in the Bid Schedule.

6. CONTRACTOR shall submit a completed Section 00450 entitled Hazard Communication Program with the executed copy of this CONTRACT.

7. The term "CONTRACT DOCUMENTS" means and includes the following:

- 00020 Notice Inviting Bids
- 00100 Information for Bidders
- 00300 Bid Proposal
- 00310 Bid Price Schedule
- 00400 Bid Bond
- 00420 Bidder's Statement of Qualifications
- 00430 Bidder's Affidavit of No Collusion
- 00450 Hazard Communication Program
- 00460 Employment Eligibility Verification
- 00500 CONTRACT
- 00500A Indemnification and Insurance Requirements
- 00500B Contractor Claim Handling Procedure
- 00510 Arizona Statutory Performance Bond
- 00520 Arizona Statutory Payment Bond
- 00670 Notice of Award
- 00680 Notice to Proceed
- 00685 Certificate of Substantial Completion
- 00690 Certificate of Final Completion
- 00700 General Conditions
- 00800 Special Provisions
- Technical Specifications and Details
- Construction Contract Drawings
- Change Orders
- Lien Releases (Conditional and Final)
- Addenda

8. OWNER shall pay CONTRACTOR in the manner and at such times as set forth in the General Conditions and in such amounts as required by the CONTRACT DOCUMENTS.

9. In the event CONTRACTOR fails to perform any portion of the PROJECT or satisfy any term or condition of the CONTRACT DOCUMENTS, OWNER may at its sole discretion file notice and/or claim of such failure with CONTRACTOR'S surety.

10. Israel. [CONTRACTOR] certifies that it is not currently engaged in, and agrees for the duration of this [Contract] that it will not engage in, a boycott of Israel, as that term is defined in A.R.S. § 35-393.

11. Export Administration Act. The CONTRACTOR warrants compliance with the Export Administration Act.

12. Recyclable Products. The CONTRACTOR shall use recyclable products and products which contain recycled content to the maximum extent economically feasible in the performance of the work set forth in the CONTRACT.

13. Asbestos License. The CONTRACTOR shall possess an asbestos abatement license if required under A.R.S. Title 32 or 49.

14. Assignment. No right or interest in this CONTRACT shall be assigned by CONTRACTOR without prior, written permission of the OWNER signed by the City Manager; and no delegation of any duty of CONTRACTOR shall be made without prior written permission of the OWNER signed by the City Manager. Any attempted assignment or delegation by CONTRACTOR in violation of this provision shall be a breach of this CONTRACT by CONTRACTOR.

[SIGNATURES ON FOLLOWING PAGE]

SAMPLE

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this CONTRACT in two (2) copies, each of which shall be deemed an original. The last date of signature shall be the effective date of this CONTRACT.

OWNER:

Lake Havasu City, Arizona

By: \_\_\_\_\_

Date: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

APPROVED AS TO FORM:

Lake Havasu City Attorney's Office

By: \_\_\_\_\_

Date: \_\_\_\_\_

CITY ENGINEER:

By: \_\_\_\_\_

Date: \_\_\_\_\_

ADMINISTRATIVE SERVICES:

By: \_\_\_\_\_

Date: \_\_\_\_\_

**CONTRACTOR:**

By: \_\_\_\_\_

Date: \_\_\_\_\_

Name/Title: \_\_\_\_\_

Address: \_\_\_\_\_

ATTEST:

BY: \_\_\_\_\_

Name/Title: \_\_\_\_\_

**\*\* END OF SECTION \*\***

LAKE HAVASU CITY CONSTRUCTION CONTRACT  
INDEMNIFICATION AND INSURANCE REQUIREMENTS  
(long form)

**I. INDEMNIFICATION**

Contractor shall indemnify and hold harmless City, its officers, employees and volunteers from and against any and all liabilities, damages, losses, and costs, including reasonable attorney's fees, but only to the extent caused by the negligence, recklessness, or intentional wrongful conduct of Contractor or other persons employed or used by the Contractor in the performance of this Contract. It is agreed that Contractor will be responsible for primary loss investigation, defense, and judgment costs where this indemnification is applicable.

**II. INSURANCE REQUIREMENTS**

A. CONTRACTOR and its subcontractors shall procure and maintain until all of their obligations have been discharged, including any warranty periods under this CONTRACT, are satisfied, insurance against claims for injury to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the CONTRACTOR, its agents, representatives, employees or subcontractors.

B. The insurance requirements herein are minimum requirements for this CONTRACT and in no way limit the indemnity covenants contained in this CONTRACT. City in no way warrants that the minimum limits contained herein are sufficient to protect the CONTRACTOR from liabilities that might arise out of the performance of the work under this CONTRACT by the CONTRACTOR, its agents, representatives, employees or subcontractors, and CONTRACTOR is free to purchase additional insurance.

C. MINIMUM SCOPE AND LIMITS OF INSURANCE: CONTRACTOR shall provide coverage with limits of liability not less than those stated below.

1. **Commercial General Liability – Occurrence Form**

Policy shall include bodily injury, property damage, personal injury and broad form contractual liability coverage.

- |   |              |
|---|--------------|
| a. General Aggregate                                | \$10,000,000 |
| b. Products – Completed Operations Aggregate        | \$10,000,000 |
| c. Personal and Advertising Injury                  | \$1,000,000  |
| d. Blanket Contractual Liability – Written and Oral | \$1,000,000  |
| e. Fire Legal Liability                             | \$50,000     |
| f. Each Occurrence                                  | \$5,000,000  |

i. The policy shall be endorsed to include the following additional insured language: "**Lake Havasu City, its**

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***departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees shall be named as additional insureds with respect to liability arising out of the activities performed by or on behalf of the CONTRACTOR."***

- ii. Policy shall contain a waiver of subrogation against Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees for losses arising from work performed by or on behalf of the CONTRACTOR.
- iii. Completed operations coverage shall remain effective for at least two years following expiration of CONTRACT.

**2. Business Automobile Liability**

a. Bodily Injury and Property Damage for any owned, hired, and/or non-owned vehicles used in the performance of this CONTRACT.

Combined Single Limit (CSL) \$1,000,000

- i. The policy shall be endorsed to include the following additional insured language: "Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees shall be named as additional insureds with respect to liability arising out of the activities performed by or on behalf of the CONTRACTOR, involving automobiles owned, leased, hired or borrowed by the CONTRACTOR."
- ii. Policy shall contain a waiver of subrogation against Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees for losses arising from work performed by or on behalf of the CONTRACTOR.

**3. Workers' Compensation and Employers' Liability**

a. Workers' Compensation	Statutory
b. Employers' Liability Each Accident	\$ 500,000
Disease – Each Employee	\$ 500,000
Disease – Policy Limit	\$1,000,000

- i. Policy shall contain a waiver of subrogation against Lake Havasu City, its departments, agencies, boards,

commissions, and its officers, officials, agents, volunteers and employees for losses arising from work performed by or on behalf of the CONTRACTOR.

- ii. This requirement shall not apply if exempt under A.R.S. Section 23-901.

**4. Professional Liability (Errors and Omissions Liability) (if applicable)**

- a. Each Claim \$1,000,000
- b. Annual Aggregate \$2,000,000

- i. In the event that the professional liability insurance required by this CONTRACT is written on a claims-made basis, CONTRACTOR warrants that any retroactive date under the policy shall precede the effective date of this CONTRACT; and that either continuous coverage will be maintained or an extended discovery period will be exercised for a period of two (2) years beginning at the time work under this CONTRACT is completed.
- ii. The policy shall cover professional misconduct or lack of ordinary skill for those positions defined in the Scope of Work of this CONTRACT.

**5. Builders' Risk (Property) Insurance (Vertical Construction Only)**

a. CONTRACTOR shall purchase and maintain, on a replacement cost basis Builders' Risk insurance in the amount of the initial CONTRACT amount as well as subsequent modifications thereto, including modifications through Change Order, for the entire work at the site. Such Builders' Risk insurance shall be maintained until final payment has been made or until no person or entity other than CITY has an insurable interest in the property required to be covered, whichever is earlier. This insurance shall include interests of CITY, CONTRACTOR and any tier of CONTRACTOR's subcontractors in the work during the life of the CONTRACT and course of construction, and shall continue until the work is completed and accepted by CITY. For new construction projects, CONTRACTOR agrees to assume full responsibility for loss or damage to the work being performed and to the buildings or structures under construction. For renovation construction projects, CONTRACTOR agrees to assume responsibility for loss or damage to the work being performed at least up to the full CONTRACT amount, unless otherwise required by the Contract documents or amendments thereto.

b. Builders' Risk insurance shall be on an all-risk policy form and shall also cover false work and temporary buildings or structures and shall

insure against risk of direct physical loss or damage from external causes including debris removal, demolition occasioned by enforcement of any applicable legal requirements and shall cover reasonable compensation for architects' and engineers' services and expenses, and other "soft costs," required as a result of such insured loss.

c. Builders' Risk insurance must provide coverage from the time any covered property falls within CONTRACTOR's control and/or responsibility and continue without interruption during construction or renovation or installation, including any time during which covered property is being transported to the construction or installation site, and while on the construction or installation site awaiting installation. The policy will provide coverage while the covered premises or any part thereof is occupied. Builders' Risk insurance shall be primary and not contributory.

d. If the CONTRACT requires testing of equipment or materials or other similar operations, at the option of CITY, CONTRACTOR will be responsible for providing property insurance for these exposures under a Boiler Machinery insurance policy.

## **6. Contractor's Personal Property**

CONTRACTOR and each of its subcontractors and suppliers shall be solely responsible for any loss or damage to its or their personal property and that of their employees and workers, including, without limitation, property or materials created or provided pursuant to this CONTRACT, any subcontract or otherwise, its or their tools, equipment, clothing, fencing, forms, mobile construction equipment, scaffolding, automobiles, trucks, trailers or semi-trailers including any machinery or apparatus attached thereto, temporary structures and uninstalled materials, whether owned, used, leased, hired or rented by CONTRACTOR or any subcontractor, consultant or supplier or employee or worker (collectively, "Personal Property"). CONTRACTOR and its subcontractors, consultants and suppliers, at its or their option and own expense, may purchase and maintain insurance for such Personal Property and any deductible or self-insured retention in relation thereto shall be its or their sole responsibility. Any such insurance shall be CONTRACTOR's and the subcontractors', suppliers' volunteers and employees' and workers' sole source of recovery in the event of loss or damage to its or their Personal Property. Any such insurance purchased and maintained by CONTRACTOR and any subcontractor, consultant or supplier shall include a waiver of subrogation as to Owner. CONTRACTOR waives all rights of recovery, whether under subrogation or otherwise, against all such parties for loss or damage covered by CONTRACTOR's property

insurance. CONTRACTOR shall require the same waivers from all subcontractors and suppliers and from the insurers issuing property insurance policies relating to the Work or the Project purchased and maintained by all subcontractors and suppliers. The waivers of subrogation referred to in this subparagraph shall be effective as to any individual or entity even if such individual or entity (a) would otherwise have a duty of indemnification, contractual or otherwise, (b) did not pay the insurance premium, directly or indirectly, and (c) whether or not such individual or entity has an insurable interest in the property which is the subject of the loss or damage.

## **7. Theft, Damage, or Destruction of Work**

In the event of theft, damage or destruction of the Work, CONTRACTOR will re-supply or rebuild its Work without additional compensation and will look to its own resources or insurance coverages to pay for such re-supply or rebuilding. CONTRACTOR will promptly perform, re-supply or rebuild, regardless of the pendency of any claim by CONTRACTOR against any other party, including Owner, that such party is liable for damages, theft or destruction of CONTRACTOR's Work. This subparagraph shall apply except to the extent that the cost of re-supply or rebuilding is paid by Owner's builder's risk insurance; in such event, Owner waives (to the fullest extent permitted by the builder's risk policy) all rights of subrogation against CONTRACTOR and each of its subcontractors to the extent of such payment by Owner's builder's risk insurer.

- D. ADDITIONAL INSURANCE REQUIREMENTS: The policies shall include, or be endorsed to include, the following provisions:
1. Lake Havasu City, its departments, agencies, boards, commissions and its officers, officials, agents, volunteers and employees wherever additional insured status is required. Such additional insured shall be covered to the full limits of liability purchased by the CONTRACTOR, even if those limits of liability are in excess of those required by this CONTRACT.
  2. The Contractor's insurance coverage shall be primary insurance with respect to all other available sources.
  3. Coverage provided by the Contractor shall not be limited to the liability assumed under the indemnification provisions of this CONTRACT.
- E. NOTICE OF CANCELLATION: Each insurance policy required by the insurance provisions of this CONTRACT shall not be suspended, voided, cancelled, reduced in coverage or in limits without ten (10) business days

written notice to City. Such notice shall be mailed directly to Lake Havasu City, Community Investment Department, Procurement Division, 2330 McCulloch Blvd. North, Lake Havasu City, AZ 86403 and shall be sent by certified mail, return receipt requested.

- F. ACCEPTABILITY OF INSURERS: Insurance is to be placed with duly licensed or approved non-admitted insurers in the state of Arizona with an "A.M. Best" rating of not less than A- VII. CITY in no way warrants that the above-required minimum insurer rating is sufficient to protect the CONTRACTOR from potential insurer insolvency.
- G. VERIFICATION OF COVERAGE:
1. CONTRACTOR shall furnish CITY with certificates of insurance as required by this CONTRACT. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf and the Project/contract number and project description shall be noted on the certificate of insurance.
  2. All certificates and endorsements are to be received and approved by CITY at least ten (10) days before work commences. Each insurance policy required by this CONTRACT must be in effect at or prior to commencement of work under this CONTRACT and remain in effect for the duration of the Project. Failure to maintain the insurance policies as required by this CONTRACT, or to provide evidence of renewal, is a material breach of contract.
  3. All renewal certificates required by this CONTRACT shall be sent directly to Lake Havasu City, Community Investment Department, Procurement Division, 2330 McCulloch Blvd. North, Lake Havasu City, AZ 86403. The Project/contract number and project description shall be noted on the certificate of insurance. CITY reserves the right to require complete, certified copies of all insurance policies required by this CONTRACT at any time.
- H. SUBCONTRACTORS: CONTRACTOR's certificate(s) shall include all subcontractors as insureds under its policies **or** CONTRACTOR shall furnish to CITY separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to the minimum requirements identified above.
- I. APPROVAL: Any modification or variation from the insurance requirements in this CONTRACT must have prior approval from the CITY's Risk Management Division, whose decision shall be final. Such action will not require a formal CONTRACT amendment, but may be made by administrative action.

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- J. EXCEPTIONS: In the event the CONTRACTOR or sub-contractor(s) is/are a public entity, then the Insurance Requirements shall not apply. Such public entity shall provide a Certificate of Self-Insurance.

## **CONTRACTOR Claim Handling Procedure**

1. Claimant is to submit in writing to the OWNER or their REPRESENTATIVE the details of the claim to include the where, when, and how of the claim, and an estimate of damage, if applicable.
2. OWNER or their REPRESENTATIVE will forward the claim directly to the CONTRACTOR for handling. The CONTRACTOR is to respond to the claimant, in writing, within 30 calendar days of receipt with copies to:

Lake Havasu City Risk Management  
Lake Havasu City Operations Department  
OWNER'S REPRESENTATIVE, if applicable

If the CONTRACTOR denies the claim, the reasons for such denial must be included in the response to the claimant.

SECTION 00510  
ARIZONA STATUTORY PERFORMANCE BOND

PURSUANT TO TITLES 28, 34, AND 41, ARIZONA REVISED STATUTES  
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL MEN BY THESE PRESENTS THAT: \_\_\_\_\_  
(hereinafter "Principal"), as Principal, and \_\_\_\_\_  
(hereinafter "Surety"), a corporation organized and existing under the laws of the State of \_\_\_\_\_  
with its principal office in the City of \_\_\_\_\_, holding a certificate of authority  
to transact surety business in Arizona issued by the Director of Insurance pursuant to Title 20,  
Chapter 2, Article 1, as Surety, are held and firmly bound unto Lake Havasu City, Arizona  
(hereinafter "Obligee") in the amount of \_\_\_\_\_ (Dollars) (\$ \_\_\_\_\_), for the payment  
whereof, Principal and Surety bind themselves, and their heirs, administrators, executors,  
successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee,  
dated the \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, to furnish all of the material, supplies, tools, equipment,  
labor and other services necessary for the construction and completion of

which contract is hereby referred to and made a part hereof as fully and to the same extent as  
if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THE OBLIGATION IS SUCH, that if the Principal  
faithfully performs and fulfills all of the undertakings, covenants, terms, conditions and  
agreements of the contract during the original term of the contract and any extension of the  
contract, with or without notice of the Surety, and during the life of any guarantee required  
under the contract, and also performs and fulfills all of the undertakings, covenants, terms,  
conditions and agreements of all duly authorized modifications of the contract that may  
hereafter be made, notice of which modifications to the Surety being hereby waived, the above  
obligation is void. Otherwise it remains in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34,  
Chapter 2, Article 2, Arizona Revised Statutes, and all liabilities on this bond shall be determined  
in accordance with the provisions of Title 34, Chapter 2, Article 2, Arizona Revised Statutes, to  
the same extent as if it were copied at length in this agreement.

The prevailing party in a suit on this bond shall recover as part of the judgment  
reasonable attorney fees that may be fixed by a judge of the court.

Witness our hands this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
PRINCIPAL SEAL

\_\_\_\_\_  
AGENCY OF RECORD BY: \_\_\_\_\_

\_\_\_\_\_  
AGENCY ADDRESS SURETY SEAL

BY: \_\_\_\_\_

\*\* END OF SECTION \*\*

SECTION 00520  
ARIZONA STATUTORY PAYMENT BOND  
PURSUANT TO TITLES 28, 34, AND 41, ARIZONA REVISED STATUTES  
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL MEN BY THESE PRESENTS THAT: \_\_\_\_\_

(hereinafter "Principal"), as Principal, and \_\_\_\_\_ (hereinafter Surety), a corporation organized and existing under the laws of the State of \_\_\_\_\_ with its principal office in the City of \_\_\_\_\_, holding a certificate of authority to transact surety business in Arizona issued by the Director of the Department of Insurance pursuant to Title 20, Chapter 2, Article 1, as Surety, are held and firmly bound unto Lake Havasu City, Arizona (hereinafter "Obligee") in the amount of (Dollars) (\$), for the payment whereof, Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the \_\_\_\_\_ of \_\_\_\_\_, \_\_\_\_\_, to furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFOR, THE CONDITION OF THE OBLIGATION IS SUCH, that if the Principal promptly pays all monies due to all persons supplying labor or materials to the Principal or the Principal's subcontractors in the prosecution of the work provided for in the contract, this obligation is void. Otherwise it remains in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34, Chapter 2, Article 2, Arizona Revised Statutes, and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitations of Title 34, Chapter 2, Article 2, Arizona Revised Statutes, to the same extent as if it were copied at length in this agreement.

The prevailing party in a suit on this bond shall recover as part of the judgment reasonable attorney fees that may be fixed by a judge of the court.

Witness our hands this \_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
PRINCIPAL SEAL

\_\_\_\_\_  
BY: \_\_\_\_\_  
AGENCY OF RECORD

\_\_\_\_\_  
AGENCY ADDRESS SURETY SEAL

BY: \_\_\_\_\_

\*\* END OF SECTION \*\*

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SECTION 00670  
**NOTICE OF AWARD**

**TO:**

**DATE:**

**PROJECT DESCRIPTION: TANK 2A-06 REHABILITATION/REPLACEMENT, WT 6090**

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for BIDS dated \_\_\_\_\_, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$, to include (LIST BID ITEMS AWARDED).

You are required by the Information for Bidders to execute the Contract and furnish the required CONTRACTOR'S Performance Bond, Payment Bond, and Certificates of Liability, Vehicular, and Workmen's Compensation Insurance within ten (10) calendar days from the postmark date when this notice was sent by U.S. Mail.

If you fail to execute said Contract and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this \_\_\_\_ day of \_\_\_\_\_, 2016.

Lake Havasu City, Arizona

BY: \_\_\_\_\_

NAME: Kimberly Fiumara

TITLE: Purchasing & Grants Supervisor

**Acceptance of Notice**

(NOTE: The contractor shall return a signed copy of this notice to the owner.)

Receipt of this NOTICE OF AWARD is hereby acknowledged by:

Contractor

This the \_\_\_\_ day of \_\_\_\_\_, 2015.

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

\*\* END OF SECTION \*\*

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SECTION 00680

**DATE:**

**NOTICE TO PROCEED**

**TO:**

**RE:**

You are hereby notified to commence WORK in accordance with the Contract dated MONTH, DAY, 2016, within ten (10) calendar days of the date of this Notice To Proceed, and you are to complete the WORK within 120 Calendar Days. The date for completion of the WORK is therefore MONTH, DAY, 2016.

OWNER:     Lake Havasu City, Arizona    

By: \_\_\_\_\_

Name:     Kimberly Fiumara    

Title:     Purchasing & Grants Supervisor    

ACCEPTANCE OF NOTICE

(NOTE: The Contractor shall return a signed copy of this Notice to the Owner)

Receipt of the above NOTICE TO PROCEED is hereby acknowledged

this the \_\_ day of \_\_\_\_\_, \_\_\_\_\_.

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

**\*\* END OF SECTION \*\***

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**SECTION 00685  
CERTIFICATE OF SUBSTANTIAL COMPLETION**

I hereby state that the degree of completion of:

**LAKE HAVASU CITY PROJECT No. WT6090  
TANK 2A-06 REHAB/REPLACEMENT**

Provides the full-time use of the project, or defined portion of the project, for the purposes for which it was intended and is the commencement of the Guarantee Period.

"Substantial Completion" shall not be considered as final acceptance.

**Lake Havasu City, Arizona**

Date: \_\_\_\_\_

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

**ACCEPTANCE OF NOTICE**

(NOTE: The Contractor shall return a signed copy of this Notice to the Owner)

Receipt of the above **CERTIFICATE OF SUBSTANTIAL COMPLETION** is hereby acknowledged this the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

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SECTION 00690  
**CERTIFICATE OF COMPLETION**

I hereby state that all goods and/or services required by:

**LAKE HAVASU CITY PROJECT No. WT6090  
TANK 2A-06 REHAB/REPLACEMENT**

have been delivered in substantial conformance with the contract, and all activities required by the Contractor under the contract have been completed as of \_\_\_\_\_.

Date

**Lake Havasu City, Arizona**

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

**ACCEPTANCE OF NOTICE**

(NOTE: The Contractor shall return a signed copy of this Notice to the Owner)

\*\* END OF SECTION \*\*

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SECTION 00700  
**GENERAL CONDITIONS**

This section of the Contract Documents is pre-printed. Any modifications to the following Articles, as may be required for this Project, are made in the Special Provisions.

**1.0 DEFINITIONS**

Wherever in the Contract Document the following terms are used, the intent and meaning shall be interpreted as follows:

**1.1 Addenda**

Written or graphic instruments issued prior to the opening of Bids which modify or interpret the Contract Documents, Drawings and Specifications, by additions, deletions, clarifications or corrections.

**1.2 As Approved**

The words "as approved," unless otherwise qualified, shall be understood to be followed by the words "by the Owner."

**1.3 As Shown, and as Indicated**

The words "as shown" and "as indicated" shall be understood to be followed by the words "on the Drawings" or "in the Specifications."

**1.4 Award**

The acceptance, by the Owner, of the successful Bidder's proposal.

**1.5 Bid**

The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

**1.6 Bidder**

Any individual, firm partnership or corporation, or combination thereof submitting a proposal for the Work contemplated, acting directly or through a duly authorized representative.

**1.7 Bonds**

Bid, Performance, and Payment Bonds and other instruments of security, furnished by the Contractor and its surety in accordance with the Contract Documents.

## **1.8** Calendar Day

Every day shown on the calendar, measured from midnight to the next midnight.

## **1.9** Change Order

A written order to the Contractor, signed by the Owner, covering changes in the Plans, Specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the Work affected by such changes.

If the Change Order increases the existing Contract Amount, the Builder's Risk Insurance limit must be increased to the adjusted Contract Amount.

## **1.10** Contract

The "Contract" is the written Contract covering the performance of the Work and the furnishing of labor, materials, incidental services, tools, and equipment in the construction of the Work. It includes Supplemental Contracts amending or extending the Work contemplated in the manner hereinafter described and which may be required to complete the Work in a substantial and acceptable manner to the Owner. The Contract may include Contract Change Orders.

## **1.11** Contract Documents

The "Contract Documents" consist of the Bidding Requirements, Contract Forms, Conditions of the Contract including General and/or Supplemental General Conditions, Special Provisions, the Technical Specifications, and the Drawings, including all Addenda and modifications thereafter incorporated into the Documents before execution and including all other requirements incorporated by specific reference thereto.

## **1.12** Contract Price

The total monies payable by Owner to the Contractor under the terms and conditions of the Contract Documents.

## **1.13** Contract Time

The number of calendar days stated in the Contract Documents for the completion of the Work.

## **1.14** Contractor

The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the Work contracted for and the payment of all legal debts pertaining to the Work who acts directly or through lawful agents or employees to complete the Contract Work.

## **1.15** Days

Unless otherwise specifically stated, the term "days" will be understood to mean calendar days.

### **1.16** Drawings

The term "Drawings," also described as "Plans," refers to the official drawings, profiles, cross sections, elevations, details, and other working drawings, and supplementary drawings, or reproductions thereof, which show the locations, character, dimensions, and details of the Work to be performed. Drawings may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.

### **1.17** Engineer

The individual, partnership, firm, or corporation duly authorized by the Owner (sponsor) to be responsible for the Engineering of the contract Work and acting directly or through an authorized representative.

### **1.18** Field Order

A written order effecting a change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time, issued by the Engineer to the Contractor during construction.

### **1.19** Final Acceptance

Upon due notice from the Contractor of presumptive completion of the entire project, the Owner will make an inspection. If all construction provided for and contemplated by the contract is found completed to the Owner's satisfaction and all requirements of the contract have been met, that inspection shall constitute the final inspection and the Owner will make the final acceptance and issue the Certificate of Completion.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory or that all requirements of the contract have not been met, the Owner will give the Contractor the necessary instructions for correction or completion, and the Contractor shall immediately comply with and execute the instructions. Upon correction of the work, completion of contract requirements, and notification to Owner, another inspection will be made which shall constitute the final inspection provided the work has been satisfactorily completed and all requirements of the contract met. In such event, the Owner will make the final acceptance and issue the Certificate of Completion.

### **1.20** Inspector

An authorized representative of the Owner assigned to make all necessary inspections and/or tests of the Work performed or being performed, or of the materials furnished or being furnished by the Contractor.

### **1.21** Methodology and Quality of Workmanship

The manner and sequence of construction which considered to be the acceptable standard in which to perform the Work.

### **1.22** Notice

The term "notice" or the requirement to notify, as used in the Contract Documents or applicable State or Federal statutes, shall signify a written communication delivered in person or by certified or registered mail to the individual, or to a member of the firm, or to an officer of the corporation for whom it is intended. Certified or registered mail shall be addressed to the last business address known to him who gives the notice.

### **1.23** Notice of Award

The written notice of the acceptance of the Bid from the Owner to the successful Bidder.

### **1.24** Notice to Proceed

Written communication issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

### **1.25** Or Equal

The phrase "or equal" shall be understood to indicate that the "equal" product is the same or better than the product names in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the project design requirements will be made by the Owner.

### **1.26** Owner

The term "Owner" shall be understood to be Lake Havasu City, Arizona.

### **1.27** Payment Bond

The approved form of security furnished by the Contractor and its surety as a guaranty that it will pay in full all bills and accounts for materials and labor used in the construction of Work.

### **1.28** Performance Bond

The approved form of security furnished by the Contractor and its surety as a guarantee that the Contractor will complete the Work in accordance with the terms of the Contract and guarantee the Work for a period of one (1) year after the date of Certificate of Substantial Completion.

### **1.29** Plans

Plans shall have the same meaning as "Drawings," see Section 1.16.

**1.30 Project**

The undertaking to be performed as provided in the Contract Documents, see Section 1.11.

**1.31 Proposal**

The offer of the Bidder for the Work when made out and submitted on the prescribed proposal form, properly signed and guaranteed.

**1.32 Proposal Guarantee**

The cash, or cashier's check or certified check, or bidder's bond accompanying the Proposal submitted by the Bidder, as a guarantee that the Bidder will enter into a contract with the Owner for the construction or doing of the Work, if it is awarded to it, and will provide the contract bonds and insurance required.

**1.33 Shop Drawings**

All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

**1.34 Specifications**

The directions, provisions and requirements pertaining to the method and manner of performing the Work or to the quantities and qualities of the materials to be furnished under the Contract, together with all other directions, provisions and requirements, plus such amendments, deletions from or additions which may be provided for by Supplemental Contract or Change Orders.

**1.35 Subcontractor**

A Subcontractor is a person or entity who has a direct or indirect contract with a Contractor to perform any of the Work at the site. For convenience, the term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender but includes the plural and feminine gender and includes a Sub-Subcontractor or an authorized representative thereof. The term Subcontractor does not include any separate Contractor or its Subcontractors.

### **1.36** Substantial Completion

"Substantial Completion" shall be that degree of completion of the project or a defined portion of the project, sufficient to provide the Owner, at its discretion, the full-time use of the project or defined portion of the project for the purposes for which it was intended. "Substantial Completion" shall not be considered as final acceptance.

### **1.37** Supplemental General Conditions

Modifications to General Conditions required by a Federal Agency for participation in the Project and approved by the agency for participation in the Project and approved by the agency in writing prior to inclusion in the Contract Documents and such requirements that may be imposed by applicable state laws. The term also includes modifications or additions to the General Conditions required by the Owner or Engineer.

### **1.38** Supplier

Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

### **1.39** Surety

The corporation, partnership, or individual, other than the Contractor, executing Payment, or Performance Bonds which are furnished to the Owner by the Contractor.

### **1.40** Work

The word "Work" within these Contract Documents shall include all material, labor, tools, utilities, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete and satisfactory system or structure.

### **1.41** Working Day

A working day shall be any day, other than a legal holiday, Saturday or Sunday, on which the normal working forces of the Contractor may proceed with regular work.

## **2.0** NOTICE TO PROCEED

**2.1** After the Owner has issued the Notice Of Award, the Contractor shall provide the Performance Bond, the Payment Bond, the Certificate Of Insurance, the Work Schedule, the monthly cash flow, and a signed Contract within ten (10) calendar days. The Owner's attorney will review each document and, if they are found to be acceptable, the Owner will sign and execute the Contract. Within a period of sixty (60) calendar days after executing the Contract,

the Owner will issue the Notice To Proceed. Within ten (10) calendar days of the postmark date of the Notice To Proceed, the Work shall commence. The Contractor shall not commence any Work until such time that the Notice To Proceed has been issued.

### **3.0 ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS**

**3.1** The Engineer may furnish additional instructions to the Contractor by means of Drawings or otherwise, during the progress of the Work as necessary to make clear or to define in greater detail the intent of the Specifications and Contract Drawings.

The additional drawings and instruction thus supplied will become a part of the Contract Documents. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

### **4.0 SCHEDULES, REPORTS AND RECORDS**

**4.1** The Contractor shall submit to the Owner payrolls, reports, estimates, records and other data where applicable as are required by the Contract Documents for the Work to be performed.

**4.2** The Contractor, after the Contract award and prior to the Pre-Construction Conference, shall prepare for submittal to the Engineer for review, a detailed progress schedule. The progress schedule shall be brought up to date and submitted to the Engineer prior to each progress payment request, and at such other time intervals as the Engineer may request.

#### **A. Progress Schedule**

The schedule shall be a time-scaled critical path progress schedule showing in detail the proposed sequence of activity. The critical path analysis shall consist of a graphic network diagram and shall clearly show start and completion dates and percentage of work completed.

**4.3** The Contractor shall also forward to the Engineer, prior to each progress payment request, an itemized report of the delivery status of major and critical items of purchased equipment and material, including Shop Drawings and the status of shop and field fabricated work. These progress reports shall indicate the date of the purchase order, the current percentage of completion, estimated delivery, and cause of delay, if any.

**4.4** If the completion of any part of the Work or the delivery of materials is behind the approved schedule, the Contractor shall submit in writing a plan acceptable to the Engineer for bringing the Work up to schedule.

**4.5** The Owner shall have the right to withhold progress payments for the Work if the Contractor fails to update and submit the progress schedule and reports as specified, and such withholding shall not constitute grounds for additional claims by the Contractor against the Owner.

**4.6** The Contractor shall submit an estimated monthly cash flow, based upon the progress schedule with the bonds, schedules, and Certificate Of Insurance.

## **5.0 DRAWINGS AND SPECIFICATONS**

**5.1** The intent of the Drawings and Specifications is that the Contractor shall furnish all labor, materials, tools, equipment, utilities, and transportation necessary for the proper execution of the Work in accordance with the Contract Documents and all incidental work necessary to complete the Project in an acceptable quality and manner, ready for use, occupancy or operation by the Owner.

**5.2** In case of conflict between the Drawings and Specifications, the Specifications shall govern. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings.

**5.3** Any discrepancies found between the Drawings and Specifications and site conditions or any inconsistencies or ambiguities in the Drawings or Specifications shall be immediately reported verbally and within 24 hours of such a discovery, in writing to the Engineer, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk, and the Contractor shall assume full responsibility therefor and shall bear all costs attributable thereto, if not acceptable to the Owner.

## **6.0 SHOP DRAWINGS**

**6.1** The Contractor shall provide seven (7) copies of the Shop Drawings as specified or as may be necessary for the prosecution of the Work as required by the Contract Documents. All drawings and schedules shall be submitted sufficiently in advance to allow the Engineer not less than 20 regular working days for checking the submittal. The Engineer's approval of any Shop Drawings shall not release the Contractor from responsibility for deviations from the Contract Documents.

**6.2** When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification by means of a signed Stamp, that he has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents. Shop Drawings, which in the opinion of the Engineer are incomplete or unchecked by the Contractor, will be returned to the Contractor for resubmission in the proper form.

If Shop Drawings or submittals are rejected by the Engineer, all costs incurred by the Engineer Or The Owner for reviewing the resubmittals shall be charged to the Contractor, and the Owner has the right to deduct such costs from any monies owed the Contractor by the Owner.

**6.3** When Shop Drawings have been reviewed by the Engineer, two sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are necessary, the Shop Drawing may be rejected and one set will be returned to the Contractor with such changes or corrections indicated, and the Contractor shall correct and resubmit the Shop Drawings. No changes shall be made by the Contractor to resubmitted Shop Drawings other than those changes indicated by the Engineer, unless such changes are clearly described in a letter

accompanying the resubmitted Shop Drawings.

**6.4** The review of such Shop Drawings and catalog cuts by the Engineer shall not relieve the Contractor from responsibility for corrections of dimensions, fabrication details, and space requirements, or for deviations from the Contract Drawings or Specifications, unless the Contractor has called attention to such deviations in writing by a letter accompanying the Shop Drawings and the Engineer approves the change or deviation in writing at the time of submission; nor shall review by the Engineer relieve the Contractor from the responsibility for errors in the Shop Drawings. When the Contractor does call such deviations to the attention of the Engineer, the Contractor shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.

**6.5** Portions of the Work requiring a Shop Drawing or sample submission shall not begin until the Shop Drawing or submission has been approved by the Engineer. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

## **7.0 RECORD DRAWINGS**

**7.1** During construction, the Contractor shall keep an accurate record of the following:

- A. Deviations between the Work as shown on the Plans and the Work as actually installed.
- B. The specific locations of piping, valves, electric conduits, duct work, equipment, and other such work which was not located on the Plans. The Record Drawings shall show distances to these locations from known points on the Plans.
- C. Equipment schedules indicating manufacturer's names and model numbers. When all revisions showing work as installed are made, the corrected set of plans shall be delivered to the Engineer before the final pay request is processed. These plans shall be clearly marked "Record Drawings."

**7.2** Nothing contained in this section shall be construed as authorizing any deviation in the Work as shown on the Contract Drawings without a written Change Order or written authority to the Contractor from the Engineer.

## **8.0 MATERIALS, SERVICES, AND FACILITIES**

**8.1** It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the Work within the specified time.

**8.2** The Contractor shall furnish the Owner a list of materials and the source of supply of each

of the materials on the list. The source of supply of each of the materials shall be approved by the Owner before the delivery of said materials is started. Only materials conforming to these Specifications and approved by the Owner shall be used in the Work. All materials proposed for use may be inspected or tested at any time during their preparation and use. After trial, if it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved material from other approved sources. No material which, after approval, has in any way become unfit for use shall be used in the Work.

**8.3** The Contractor warrants to the Owner and Engineer that the materials and equipment furnished under the Contract will be new and of a quality equal to that specified or approved and, that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. Mechanical and electrical equipment shall be the products of manufacturers of established good reputations and regularly engaged in the fabrication of such equipment. Unless otherwise noted, any equipment offered shall be current models which have been in successful regular operation under comparable conditions for a period of at least two years. This time requirement, however, does not apply to minor details nor to thoroughly demonstrated improvements in design or in material of construction. Work shall be done and completed in a thorough and workmanlike manner and if required by Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment used.

**8.4** All materials which the Engineer or its authorized Inspector has determined do not conform to the requirements of the Plans and Specifications will be rejected. They shall be removed immediately from the vicinity of the Work by the Contractor at his own expense, unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used in the Work, unless approval in writing has been given by the Engineer. Upon failure of the Contractor to comply promptly with any order of the Engineer made under the provisions in this section, the Engineer shall have authority to cause the removal and replacement of rejected material and to deduct the cost thereof from any monies due or to become due the Contractor.

**8.5** If any part or portions of the Work done or material furnished under this Contract shall prove defective or non-conforming with the Drawings and Specifications, and if the imperfection in the same shall not be of sufficient magnitude or importance as to make the Work dangerous or unsuitable, or if the removal of such Work will create conditions which are dangerous or undesirable, the Engineer shall have the right and authority to retain such Work but shall make such deductions in the final payment therefor as may be just and reasonable. Such adjustment shall be effected whether or not final payment has been made.

**8.6** Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection.

**8.7** Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

**8.8** Materials, supplies or equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other Contract by which an interest is retained by the seller.

## **9.0 INSPECTION AND TESTING**

**9.1** All material and equipment used in the construction of the Project shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Contract Documents.

**9.2** The Owner shall provide all inspection and testing services not required by the Contract Documents.

**9.3** The Contractor shall provide at its expense the testing and inspection services required by the Contract Documents.

**9.4** If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested, or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness, the minimum of which shall be forty-eight (48) hours. The Contractor will then furnish the Engineer the required certificates of inspection, testing or approval.

**9.5** Inspections, tests or approvals by the Engineer or others shall not relieve the Contractor from its obligations to perform the Work in accordance with the requirements of the Contract Documents.

**9.6** The Engineer and its representatives will at all times have access to the Work. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all Work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection, or testing thereof.

**9.7** If any Work is covered contrary to the written instructions of the Engineer or prior to inspection, if must, if requested by the Engineer, be uncovered for his observation and replaced at the Contractor's expense.

**9.8** If the Engineer considers it necessary or advisable that Work that has already been approved be inspected or tested by the Engineer or others, the Contractor, at the Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such Work is not found to be defective, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

## **10.0 SUBSTITUTIONS**

**10.1** Whenever a material, article or piece of equipment is identified on the Drawings or Specifications by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. Any cost differential shall be deductible from the Contract Price and the Contract Documents shall be appropriately modified by Change Order. The Contractor warrants that if substitutes are approved, no major changes in the function or general design of the Project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time. Any substitutions not properly approved and authorized by the Engineer may be considered defective and the Engineer may require the Contractor to remove the substituted material, article or piece of equipment and the Contractor shall bear any and all costs associated with the removal of the substituted item, including all engineering, inspection, testing or surveying costs incurred by the Owner or the Engineer.

**10.2** Determination of equality in reference to the project design requirements will be made by the Owner. "Equal" products shall not be purchased or installed by the Contractor without the Owner's written approval. Contractor shall have fourteen (14) days after issuance of Notice to Proceed for submission of data substantiating a request for substitution of an "or equal" item.

## **11.0 PATENTS**

**11.1** The Contractor shall pay all applicable royalties and license fees. The Contractor shall defend all suits or claims for infringement of any patent rights and indemnify and hold the Owner and Engineer harmless from loss on account thereof, except that the Owner shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, however if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, it shall be responsible for such loss unless it promptly gives such information to the Engineer.

## **12.0 SURVEYS, PERMITS, REGULATIONS**

**12.1** The Owner shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the Work together with a suitable number of bench marks adjacent to the Work as shown in the Contract Documents. The Contractor shall satisfy itself as to the accuracy of all measurements before constructing any permanent structure and shall not take advantage of any errors which may have been made in laying out the Work. From the information provided by the Owner, unless otherwise specified in the Contract Documents, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batter

boards, stakes for pile locations and other working points, lines, elevations and cut sheets.

**12.2** Such stakes and markings as the Engineer may set for either its own or the Contractor's guidance shall be scrupulously preserved by the Contractor. In the event the Contractor, or its employees, destroy or otherwise remove or obliterate such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Owner.

**12.3** Permits and licenses of a temporary nature necessary for the prosecution of the Work shall be secured and paid for by the Contractor unless otherwise stated in the Supplemental General Conditions. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified. If the Contractor perceives that the Contract Documents are at variance therewith, he shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted as provided in Section 16. Changes In The Work. If the Contractor performs and works knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

### **13.0 PROTECTION OF WORK, PROPERTY AND PERSONS**

**13.1** The Contractor shall have sole responsibility for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to, all employees on the Work and other persons who may be affected thereby, all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and other items not designated for removal, relocation or replacement in the course of construction.

**13.2** The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The Contractor shall erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. The Contractor shall notify Owners of adjacent utilities when prosecution of the Work may affect them. The Contractor shall remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the Contract Documents or to the acts or omissions of the Owner or the Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

**13.3** In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Owner, shall act to prevent threatened damage, injury or loss. He shall give the Engineer

prompt Written Notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be negotiated and issued covering the changes and deviations involved, as provided in Section 16.0, Changes in the Work.

**13.4** The Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents and the safety of all those at the site. The person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Engineer. The Engineer will not be responsible for safety precautions and programs in connection with the Work or for the Contractor's failure to properly perform its responsibilities with respect to initiating, maintaining and supervising all safety precautions and programs.

#### **14.0 PUBLIC SAFETY**

**14.1** Whenever the Contractor's operations create a condition hazardous to traffic or to the public, it shall furnish at its own expense, and without cost to the Owner, such flagmen and guards as are necessary to give adequate warning to the public of any dangerous conditions to be encountered and he shall furnish, erect, and maintain such fences, barricades, lights, signs, and other devices as are necessary to prevent accidents and avoid damage or injury to the public.

**14.2** Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures as above provided, the Engineer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor at its own expense without cost to the Owner. Should the Engineer point out the inadequacy of warning and protective measures, such action on the part of the Engineer shall not relieve the Contractor from responsibility for public safety or abrogate his obligation to furnish and pay for these devices.

**14.3** Should the Contractor fail to, be neglectful, or be negligent in furnishing or maintaining warning and protective facilities as required herein, the Owner may furnish or maintain such facilities and charge Contractor therefor by deducting the cost thereof from periodic progress payments due the Contractor as such costs are incurred by Owner.

**14.4** No material or equipment shall be stored where it will interfere with the free and safe passage of public traffic, and at the end of each day's Work and at other times when construction operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from that portion of the right-of-way open for use by public traffic.

#### **15.0 SUPERVISION BY CONTRACTOR**

**15.1** The Contractor shall supervise and direct the Work, using its best skill and attention. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall employ and maintain on the Work a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site, and who shall have been approved by the Engineer, which approval shall not be unreasonably withheld. The supervisor shall have full authority to act on

behalf of the Contractor and all communications given to and by the supervisor shall be as binding as if given to and by the Contractor. The supervisor shall be present on the site at all times. The Contractor shall be responsible to the Owner for the acts and omissions of the employees, subcontractors, and the agents and employees, and other persons performing any other Work under the Contract with the Contractor.

## **16.0 CHANGES IN THE WORK**

**16.1** The Owner may at any time, as the need arises, order changes within the scope of the Work without invalidating the Contract. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the Work, an equitable adjustment shall be authorized by Change Order.

**16.2** The Engineer, also, may at any time, by issuing a Field Order, make changes in the details of the Work. The Contractor shall proceed with the performance of any changes in the Work so ordered by the Engineer unless the Contractor believes that such Field Order entitles him to a change in Contract Price or Time, or both, in which event he shall give the Engineer Written Notice thereof within seven (7) days after the receipt of the ordered change. Thereafter the Contractor shall document the basis for the change in Contract Price or Time within fourteen (14) days. The Contractor shall not execute such changes pending the receipt of an executed Change Order or further instruction from the Owner.

**16.3** If the Contractor wishes to make a claim for an increase in the Contract sum, it shall give the Engineer written notice thereof within fourteen (14) days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property, in which case Contractor shall proceed in accordance with the provisions of the Contract. No such claim shall be valid unless so made. If the Owner and Contractor cannot agree on the amount of adjustment in the Contract sum, it shall be determined by the Engineer. Any change in the Contract sum resulting from such claim shall be authorized in a Change Order.

**16.4** The value of any Work covered by a Change Order shall be determined by one or more of the following methods in the order of precedence listed below:

- A. Unit prices previously approved.
- B. An agreed lump sum.
- C. Cost plus percentage.

## **17.0 TIME FOR COMPLETION AND LIQUIDATED DAMAGES**

**17.1** The date of beginning and the time for completion of the Work are essential conditions of the Contract Documents and the Work embraced shall be commenced on a date specified in the Notice To Proceed.

**17.2** The Contractor shall proceed with the Work at such rate of progress to insure full completion within the Contract Time. It is expressly understood and agreed, by and between the

Contractor and the Owner, that the Contract Time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Work.

**17.3** The Contractor shall only work an eight (8) hour day consisting of Monday through Friday, between 6:00 a.m. to 6:00 p.m., and do not include local municipal holidays. If the Contractor desires to carry on Work more than eight (8) hours each day, or work at night or outside the regular hours, it shall give timely notice (72 hours) to the Engineer and receive the Owner's written approval to allow satisfactory arrangements to be made for inspecting the Work in progress. Should the prosecution of the Work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations. The Contractor shall be responsible for any extra compensation due or costs incurred as a result of Contractor's desire to carry out Work beyond an eight (8) hour day, or at night or outside regular hours, including but not limited to, any additional costs or compensation due the Engineer And Owner or its employees or agents as a result of having to be present at the site. The costs or extra compensation necessitated by the Contractor's Work beyond an eight (8) hour day, or at night or outside regular business hours may be deducted or withheld from progress payment or any other payments due to Contractor.

**17.4** If for any reason a suspension of the work should occur; the Contractor, at its own expense, shall do all the Work necessary to provide a safe, smooth and unobstructed passageway through construction for use by public traffic or to provide for the proper and efficient operation of sewer, drainage and other facilities within the site of the Work, during the period of such suspension. In the event that the Contractor fails to perform the Work specified in this Subsection, the Owner will perform such Work and the cost thereof will be deducted from periodic progress payments due the Contractor.

**17.5** During inclement weather and other conditions, the Contractor shall pursue only such portions of the Work as shall not be damaged thereby. No portions of the Work which satisfactory quality or efficiency will be affected by an unfavorable condition shall be constructed while these conditions remain, unless by special means or precautions, approved by the Engineer, the Contractor is able to overcome them.

**17.6** Delays in delivery of equipment or material purchased by the Contractor or its Subcontractor, including Engineer-selected equipment, shall not be considered as a just cause for delay as this is not beyond the control of the Contractor. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting, delivery, and installation of all equipment and materials.

**17.7** In case of failure on the part of the Contractor to complete the Work within the time affixed in the Contract, or such extension thereof as may be allowed by Engineer or Owner, the Contract shall by that fact be terminated by written notice. The Owner shall not thereafter pay or allow the Contractor any further compensation for any Work done by it under said Contract, and the Contractor and its sureties shall be liable to the Owner for all loss or damage which it may suffer by reason of his failure to complete the Contract within such time. Failure to prosecute the Work diligently shall be grounds for termination by the Owner pursuant to this paragraph.

In the event the Contract should be terminated, the Owner shall have the right to take over the Work and to proceed with the same until it is completed, either by performing said Work itself directly or by contracting it out to some other person or persons, and in such event the Owner may take possession of and utilize, in completing the Work, such materials, appliances and plant as may be on the site of the Work and necessary for its completion. Nothing herein contained shall be deemed to limit the right of the Owner in the event of any breach of Contract by the Contractor; but all rights herein given to the Owner are and shall be deemed to be additional to any other rights or remedies which the Owner shall have under any provision of law.

**17.8** Should the Contractor fail to complete the Work, or any part thereof, in the time agreed upon in the Contract or within such extra time as may have been allowed for delays by extensions granted as provided in the Contract, the Contractor shall reimburse the Owner for the additional expense and damage for each calendar day that the Contract remains uncompleted after the Contract completion date. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the Work is the per diem rate, as stipulated in Section 15, Information For Bidders, plus any costs incurred by the Engineer including, but not limited to: the Engineer's costs for additional inspection, testing or surveying as a result of the Contractor's failure to complete the Work in the time agreed upon. The said amounts are agreed upon as liquidated damages for the loss to the Owner on account of expense due to the employment of Engineers, inspectors, and other employees after the expiration of the time of completion, and on account of the value of the operation of the Works dependent thereon. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the Contractor. The Owner shall have the right to deduct such damages from any amount due, or that may become due the Contractor, or the amount of such damages shall be due and collectible from the Contractor or its Surety.

**17.9** The Contractor shall not be charged with liquidated damages or any excess costs when the delay in completion of the Work is due to any of the reasons set forth below provided the Contractor has given Written Notice of the delay within three (3) days of the occurrence of the cause of the delay to the Owner or Engineer. In the event notice is not given as provided, liquidated damages may be assessed.

A. To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to: acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a separate contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather.

## **18.0 CORRECTION OF WORK**

**18.1** The Contractor shall promptly correct all work rejected by the engineer as defective or as failing to conform to the contract documents, whether observed before or after substantial completion and whether or not fabricated, installed or completed. Contractor shall bear all costs of correcting such rejected work, including compensation for the engineer's additional services made necessary thereby. Contractor shall also bear the costs of making good all work of the

Owner or separate Contractor destroyed or damaged by such correction or removal.

**18.2** All removal and replacement work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected work within ten (10) days after receipt of Written Notice, the Owner may remove such work and store the materials at the expense of the Contractor, including compensation for the engineer's additional services made necessary thereby.

## **19.0 SUBSURFACE CONDITIONS**

**19.1** The Contractor shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the Owner by Written Notice of:

- A. Subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents; or
- B. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract Documents.

**19.2** The Owner shall promptly investigate the conditions, and if it finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the Work, an equitable adjustment shall be made and the Contract Documents shall be modified by a Change Order. Any claim of the Contractor for adjustment hereunder shall not be allowed unless he has given the required Written Notice; provided that the Owner may, if he determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

## **20.0 SUSPENSION OF WORK, TERMINATION AND DELAY**

**20.1** The Owner may suspend the Work or any portion thereof for a period of not more than ninety (90) days or such further time as agreed upon by the Contractor, by Written Notice to the Contractor and the Engineer which notice shall fix the date on which Work shall be resumed. The Contractor shall resume that Work on the date so fixed. The Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension.

**20.2** In addition to any other reasons for termination provided in the Contract, the Contractor shall be considered in default of the Contract and such default will be considered as cause for the Owner to terminate the Contract for any of the following reasons if the Contractor:

- A. Fails to begin the Work under the Contract within the time specified in the "Notice To Proceed," or
- B. Fails to perform the Work or fails to provide sufficient workers, equipment or materials to assure completion of Work in accordance with the terms of the

Contract, or

- C. Performs the Work unsuitably or neglects or refuses to remove materials or to perform such new Work as may be rejected as unacceptable and unsuitable, or
- D. Discontinues the prosecution of the Work, or
- E. Fails to resume Work which has been discontinued within a reasonable time after notice to do so, or
- F. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or
- G. Allows any final judgment to stand against him unsatisfied for a period of 10 days, or
- H. Makes an assignment for the benefit of creditors, or acceptable manner, or
- I. Is otherwise in breach of the Contract and has failed to remedy the breach within ten (10) days of written notice of the existence of such breach, or
- J. Fails to provide safe conditions for its workers and/or the general public.

Should the Owner consider the Contractor in default of the Contract for any reason above, he shall immediately give Written Notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the Contract.

If the Contractor or Surety, within a period of 10 days after Written Notice, does not proceed in accordance therewith, then the Owner shall have, upon written notification of the facts of such delay or neglect, the power and authority without violating the Contract, to take the prosecution of the Work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the Work and are acceptable and may enter into an Contract for the completion of said Contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Owner will be required for the completion of said Contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the Work under Contract, will be deducted from any monies due or which may come due the Contractor. If such expense exceeds the sum which would have been payable under the Contract, then the Contractor and the Surety shall pay to the Owner the amount of such excess.

**20.3** Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of monies due Contractor by Owner will not release Contractor from liability.

**20.4** Upon seven days Written Notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, elect to terminate the Contract. In such case, Contractor shall be paid (without duplication of any items):

**20.4.1** for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such work;

**20.4.2** for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead on such expenses;

**20.4.3** for reasonable costs incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

**20.4.4** for reasonable expenses directly attributable to termination.

Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

**20.5** If the Work should be stopped under an order of any court or other public authority for a period of more than ninety (90) days, through no act or fault of the Contractor or of anyone employed by him, or if the Owner should fail to pay the Contractor within 45 days after the time specified in the Payments To Contractor, Section 22.0, then the Contractor may, upon 15 days Written Notice to the Owner, stop Work until payment of the amount owing has been received.

**20.6** The Owner may terminate the Contract or a portion thereof if conditions encountered during the progress of the Work make it impossible or impracticable to proceed with the Work or a local or national emergency exists.

When Contracts, or any portion thereof, are terminated before completion of all Work in the Contract, adjustments in the amount bid for the pay items will be made on the actual quantity of Work performed and accepted, or as mutually agreed for pay items of Work partially completed or not started. No claim for loss of anticipated profits will be considered.

Termination of the Contract or any portion thereof shall not relieve the Contractor of its responsibilities for the completed work nor the surety of its obligation for and concerning any just claims arising out of the Work performed.

## **21.0 ISSUANCE OF NOTICE OF COMPLETION AND FINAL ACCEPTANCE BY OWNER**

**21.1** Upon completion of the Project, a Final Inspection shall be requested by the Contractor in writing and the Owner will make an inspection within seven (7) days. If all construction provided for and contemplated by the contract is found completed to his satisfaction, that inspection shall constitute the final inspection and the Owner will make the final acceptance and issue a Certificate

Of Completion to the Contractor.

If, however, the inspection discloses any Work, in whole or in part, as being unsatisfactory, the Owner will give the Contractor the necessary instructions for correction of same, and the Contractor shall immediately comply with and execute such instructions. Upon correction of the Work, another inspection will be made which shall constitute the final inspection provided the Work has been satisfactorily completed. In such event, the Owner will make the final acceptance and issue a Certificate Of Completion to the Contractor.

## **22.0 PAYMENTS TO CONTRACTOR**

**22.1** In addition to any documents required by the Engineer to be submitted to Engineer at the time a partial pay estimate is submitted, including partial lien released as specified in Section 22.9 of the General Conditions, the Contractor shall, at least ten (10) days before each progress payment falls due (but not more often than once a month), submit to the Engineer a partial payment estimate filled out and signed by the Contractor covering the Work performed during the period covered by the partial payment estimate and supported by such data as the Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the Work, title to such materials and equipment shall vest in the Owner, and Contractor shall supply, at the time of submission of payment estimate, supporting documents satisfactory to the Owner, to establish and protect Owner's interest in the materials and equipment, and Contractor shall maintain appropriate insurance on same until such time as actual possession by the Owner of the materials and equipment shall occur. The Engineer will, within seven (7) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the Owner or return the partial payment estimate to the Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial payment estimate. The Owner will, within fourteen (14) days of presentation to him of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The Owner shall retain ten (10) percent of the amount of each payment until final completion and acceptance of all Work covered by the Contract Documents. When the Contract is fifty percent completed, one-half of the amount retained shall be paid to the Contractor provided the Contractor makes a written request for the payment and the Contractor is making satisfactory progress on the Contract and there is no specific cause or claim requiring a greater amount to be retained. After the Contract is fifty per cent completed, no more than five per cent of the amount of any subsequent progress payments made under the Contract may be retained providing the Contractor is making satisfactory progress on the project, except that if at any time the Owner determines satisfactory progress is not being made, ten per cent retention shall be reinstated for all progress payments made under the Contract subsequent to the determination.

**22.2** In lieu of ten percent (10%) retention provided for in paragraph 22.1, of this Article, the Owner shall, at the Contractor's option, accept as a substitute an assignment of any of the following:

- A. Time certificates of deposit of banks licensed by the State of Arizona; or

- B. Securities of or guaranteed by the United States of America; or
- C. Securities of the State of Arizona, or any county, municipality or school district thereof; or
- D. Shares of savings and loan institutions authorized to transact business in the State of Arizona.

Such assigned instruments shall have a face value in an amount equal to ten percent (10%) of the progress payment for which such instruments are tendered and shall be retained by the Owner as a guarantee for complete performance of the Contract.

In the event the Owner accepts substitute security as provided herein for the ten percent (10%) retention, the Contractor shall be entitled to all interest or income earned by such security, and all such security in lieu of retention shall be returned to the Contractor within sixty (60) days after final completion and acceptance of all material, equipment and work covered by the contract if the Contractor has furnished the Owner satisfactory receipts for all labor and material billed and waivers of liens from any and all persons holding claims against the work.

In no event shall the Owner accept a time certificate of deposit of a bank or shares of a savings and loan institution in lieu of the retention specified in paragraph 22.1 of this Article unless accompanied by a signed and acknowledged waiver of the bank or savings and loan institution of any right or power to set off against either the Owner or the Contractor in relationship to the certificates or shares assigned.

**22.3** The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner out of the amount paid to the Contractor on account of such Subcontractors' Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractors' Work. The Contractor shall, by an appropriate Contract with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractors in similar manner.

**22.4** Prior to Substantial Completion, the Owner, with the approval of the Engineer and with the concurrence of the Contractor, may use any completed or substantially completed portions of the Work. Such use shall not constitute an acceptance of such portions of the Work.

**22.5** The Owner shall have the right to enter the premises for the purpose of doing Work not covered by the Contract Documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work, or the restoration of any damaged Work except such as may be caused by agents or employees of the Owner.

**22.6** Upon final completion and acceptance of the Work, the Engineer shall issue a certificate attached to the final payment request that the Work has been accepted under the conditions of the Contract Documents. No retention of payments may be delayed or retained without a specific written finding by the Engineer or Owner of the reasons justifying the delay in payment. The

entire balance found to be due the Contractor, including the retained percentages, except the amount necessary to pay the expenses the Owner reasonably expected to incur in order to pay or discharge the expenses determined by the Engineer or Owner in the finding justifying the retention or delay, shall be paid to the Contractor, within sixty (60) days of completion or proper filing of the Notice of Completion.

**22.7** The Contractor shall indemnify and save the Owner or the Owner's agents harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the Work. The Contractor shall, at the Owner's request, furnish satisfactory evidence, in the form of lien releases or other documents deemed appropriate by the Owner, that all obligations of the nature designated above have been paid, discharged, or waived. If the Contractor fails to do so the Owner may, after having notified the Contractor, either pay unpaid bills or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of the Contract Documents, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor, his Surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the Owner shall be considered as a payment made under the Contract Documents by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

**22.8** If any payment to Contractor is delayed after the date due, interest shall be paid at the rate of one percent per month or fraction of a month on such unpaid balance as may be due. If the Owner fails to make payment sixty (60) days after final completion and acceptance, in addition to other remedies available to the Contractor, interest shall be paid at the rate of one per cent per month or fraction of the month on such unpaid balance as may be due, except for that amount necessary to pay the expenses the Owner reasonably expects to incur in order to pay or discharge the expense determined by the Engineer or Owner in the finding justifying the retention or delay.

**22.9** The Owner may require the Contractor to furnish partial releases or liens executed by all persons, firms and corporations who have furnished labor services or materials incorporated into the Work during the period of time for which the progress payment is due, releasing such lien rights as these persons, firms or corporations may have for that period.

### **23.0 ACCEPTANCE OF FINAL PAYMENT AS RELEASE**

**23.1** Following the Owner's acceptance of the Work, the Owner will issue a Notice of Completion to the Contractor. Sixty days after the issuing of the Notice of Completion, and upon receipt of the necessary Unconditional lien releases executed by all persons, firms and corporations who have furnished labor services or materials incorporated into the work evidencing that all liabilities have been fully discharged, the Owner will pay to the Contractor the entire sum so found to be due after deducting therefrom all previous payments and all amounts to be kept and all amounts to be retained under the provisions of the Contract. All previous prior partial estimates and

payments shall be subject to correction in the final estimate and payment.

**23.2** The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor other than claims in stated amounts as may be specifically excepted by the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the Owner and others relating to or arising out of this Work. Any payment, however, final or otherwise, shall not release the Contractor or his sureties from any obligations under the Contract Documents or the Performance Bond and Payment Bonds.

## **24.0 INSURANCE**

**24.1** The Contractor shall give special attention to Section 00500-A of the Bid Documents when preparing a bid, which outline the insurance requirements of Owner and the Contractor shall consider these insurance requirements part of the Bid/Contract documents.

The Contractor shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's execution of the Work, whether such execution be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- A. Claims under worker's compensation, disability benefit and other similar employee benefit acts;
- B. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;
- C. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;
- D. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person; and
- E. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

The Contractor is responsible to respond to claims arising as a result of its work. See Section 500-B for specific procedures.

**24.2** Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled unless at least ten (10) days prior Written Notice has been given to the Owner, "Attention: Contract Administrator, 2330 McCulloch Boulevard North, Lake Havasu City, AZ, 86403".

**24.3** The Contractor shall procure and maintain, at its own expense, during the Contract Time, liability insurance as specified in Section 500-A, incorporated herein.

## **25.0 CONTRACT SECURITY**

**25.1** The Contractor shall within ten (10) days after the receipt of the Notice Of Award furnish the Owner with a Performance Bond and a Payment Bond in sums equal to the amount of the Contract PRICE, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and Contracts of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the Work provided by the Contract Documents. Such Bonds shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the state in which the Work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these Bonds shall be borne by the Contractor. If at any time a surety on any such Bond is declared a bankrupt or loses its right to do business in the state in which the Work is to be performed or is removed from the list of Surety Companies accepted on Federal Bonds, Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable Bond (or Bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such Bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable Bond to the Owner.

## **26.0 ASSIGNMENTS**

**26.1** Neither the Contractor nor the Owner shall sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of his right, title or interest therein, or his obligations thereunder, without written consent of the other party. Nor shall the Contractor assign any monies due or to become due to him hereunder without the previous written consent of the Owner.

**26.2** The Owner and Contractor each bind itself, its partners, successors and assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, Contracts and obligations contained in the Contract Documents.

## **27.0 INDEMNIFICATION**

**27.1** Contractor shall indemnify and hold harmless City, its officers and employees from and against any and all liabilities, damages, losses, and costs, including reasonable attorney's fees, but only to the extent caused by the negligence, recklessness, or intentional wrongful conduct of Contractor or other persons employed or used by the Contractor in the performance of this Contract. It is agreed that Contractor will be responsible for primary loss investigation, defense, and judgment costs where this indemnification is applicable.

**27.2** In any and all claims against the Owner or the Engineer, or any of their agents or

employees, by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation of benefits payable by or for the Contractor or any Subcontractor under worker's compensation acts, disability benefit acts or other employee benefits acts.

**27.3** The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, his agents or employees arising out of the preparation or approval of maps, DRAWINGS, opinions, reports, surveys, Change Orders, designs or Specifications.

## **28.0 SEPARATE CONTRACTS**

**28.1** The Owner reserves the right to let other contracts in connection with this Project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate its Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results.

**28.2** The Owner may perform additional Work related to the Project by itself, or it may let other contracts containing provisions similar to these. The Contractor shall afford the other Contractors who are parties to such Contracts (or the Owner, if he is performing the additional Work himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of Work, and shall properly connect and coordinate his Work with theirs.

**28.3** If the performance of additional Work by other Contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice thereof shall be given to the Contractor prior to starting any such additional Work. If the Contractor believes that the performance of such additional Work by the Owner or others involves it in additional expense or entitles him to an extension of the Contract Time, it may make a claim therefore as provided in Sections 16 and 17.

## **29.0 SUBCONTRACTING**

**29.1** The Contractor may utilize the services of specialty Subcontractors on those parts of the Work which come under normal contracting practices or are typically performed by specialty Subcontractors, provided the Contractor, simultaneously with the delivery of the executed Contract, shall furnish to the Owner and the Engineer in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The engineer will promptly reply to the Contractor in writing stating whether or not the Owner or the Engineer, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Engineer to promptly reply shall constitute notice of no reasonable objection. The Contractor shall not contract with any such proposed person or entity to whom the Owner or Engineer has made reasonable objection and the Contractor shall not be required to contract with anyone to whom

he has a reasonable objection. If the Owner or Engineer has a reasonable objection to any proposed person or entity, the Contractor shall submit a substitute to whom the Owner or the Engineer has no reasonable objection. The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner or Engineer makes reasonable objection to such substitution.

**29.2** The Contractor shall not award Work to Subcontractor(s), in excess of forty-nine (49%) percent of the Contract Price, without prior written approval of the Owner.

**29.3** The Contractor shall be fully responsible to the Owner for the acts and omissions of its Subcontractors, and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

**29.4** The Contractor shall not employ any Subcontractors that are not properly licensed with Lake Havasu City and the State of Arizona. Changes of Subcontractors listed with the Proposal shall be made only with the approval of the Owner.

**29.5** Nothing contained in these Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner; the Contractor shall be as fully responsible to the Owner for the acts and omissions of Subcontractors, and of persons employed by them, as he is for the acts and omissions of persons directly employed by him.

**29.6** The Contractor shall, without additional expense to the Owner, utilize the services of specialty Subcontractors on those parts of the Work which are specified or required by State or local laws to be performed by specialty Subcontractors.

**29.7** The Contractor shall be responsible for the coordination of all trades, Subcontractors, material and people engaged upon this Work. The Owner will not undertake to settle any differences between the Contractor and his Subcontractors or between Subcontractors.

**29.8** The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the Work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

**29.9** Nothing contained in this Contract shall create any contractual relation between any Subcontractor and the Owner.

### **30.0 ENGINEER'S AUTHORITY**

**30.1** The Engineer shall act as the Owner's representative during the construction period. The Engineer shall decide questions which may arise as to quality and acceptability of materials furnished and Work performed and shall interpret the intent of the Contract Documents in a fair and unbiased manner. The Engineer will make periodic visits to the site and determine if the Work is proceeding in accordance with the Contract Documents.

**30.2** The Contractor will be held strictly to the intent of the Contract Documents in regard to the quality of materials, workmanship and execution of the Work. Inspections may be made at the factory or fabrication plant of the source of material supply.

**30.3** The Engineer shall not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety precautions and programs in connection with the Work and will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Engineer shall not be responsible or have control or charge over the acts or omissions of the Subcontractors, or any of their agents or employees, or any other person performing any of the Work.

**30.4** The Engineer shall promptly make decisions relative to interpretation of the Contract Documents.

**30.5** The Engineer will have the authority to reject Work which does not conform to the Contract Documents. Whenever, in its opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Engineer will have authority to require special inspection or testing of the Work in accordance with the other terms of this Contract whether or not such Work be then fabricated, installed or completed.

### **31.0 LAND AND RIGHTS-OF-WAY**

**31.1** Prior to issuance of Notice To Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the Work to be performed pursuant to the Contract Documents, unless otherwise mutually agreed.

**31.2** The Owner shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

**31.3** The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

### **32.0 GUARANTEE**

**32.1** Except as otherwise specified, all Work shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment, or workmanship for a period of one (1) year from the date the Certificate of Substantial Completion is issued by the Owner, or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents.

**32.2** If, within any guarantee period, repairs or changes are required in connection with guaranteed Work, which, in the opinion of the Owner, is rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract, the Contractor shall, promptly upon receipt of

notice from the Owner, and without expense, (1) place in satisfactory condition in every particular all of such guaranteed Work, correcting all defects therein; (2) make good all damage to the building, site or Work, or equipment or contents thereof, which in the opinion of the Owner, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the contract; and (3) make good any Work or material, or the equipment and contents of said building, site or Work disturbed in fulfilling any such guarantee. If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected and the Contractor and his surety shall be liable for all expense incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

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**GUARANTEE**

**32.3** The Contractor agrees to execute, and to cause each Subcontractor to execute, a written guarantee to the Owner, in substantially the following form:

GUARANTEE FOR:

We hereby guarantee, both jointly and severally, that the improvement which we have installed for the Owner of Project, specifically described as:

**Project Name & Project No. \_\_\_\_\_**

has been done in accordance with the Contract Drawings and Specifications.

We agree, both jointly and severally, to repair and replace any or all Work included in said improvement, together with any other adjacent work which may be displaced or damaged by so doing, that may prove to be defective in its workmanship or material within a period of one year from date of the Certificate of Substantial Completion, ordinary wear and tear and unusual abuse or neglect accepted.

In the event of our failure to comply with the above mentioned conditions within a reasonable period of time (as determined by the Owner) after being notified in writing by the Owner, we both jointly and severally, do hereby authorize the Owner to proceed to have said defects repaired and made good at our expense, and we will honor and pay the costs and charges therefore upon demand.

Signed \_\_\_\_\_

Countersigned \_\_\_\_\_

Local Representative to be contacted for service:

Name \_\_\_\_\_

Address \_\_\_\_\_

Phone No. \_\_\_\_\_

FAX \_\_\_\_\_

The guarantee form(s) shall be completed and returned with the acknowledgement of the Certificate of Completion.

The failure of the Contractor or any Subcontractor to execute, such guarantee shall not affect the right of the Owner to rely on and enforce the guarantee and the obligations respectively assumed by the Contractor and each Subcontractor under Subparagraph 32.1 and 32.2 hereof.

### **33.0 ARBITRATION**

**33.1** Provided both parties mutually agree, all claims, disputes and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, except for claims which have been waived by the making and acceptance of final payment as provided by Section 23, may be decided by arbitration in accordance with the American Arbitration Association or any other similar body. The foregoing Contract to arbitrate shall be specifically enforceable under the prevailing arbitration law (Arizona Revised Statutes Sections 12-1501, *et seq.*) of the State of Arizona. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

**33.2** Notice of the demand for arbitration shall be filed in writing with the other party to the Contract Documents and with the American Arbitration Association and a copy shall be filed with the Engineer. The party filing for arbitration may select which arbitration service to use. Demand for arbitration shall in no event be made on any claim, dispute or other matter in question which would be barred by the applicable statute of limitations.

**33.3** The Contractor shall carry on the Work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

**33.4** The provisions of the Contract pertaining to arbitration are not binding upon Engineer and Engineer cannot be compelled to participate against his will in an arbitration arising out of a dispute over the Contract or Contract Documents unless Engineer so consents in writing to be a party to the arbitration.

### **34.0 TAXES AND CHARGES**

**34.1** The Contractor shall pay all State and local sales and use taxes on items, and in a manner as required by the laws and statutes of the State of Arizona and its political subdivisions. The Contractor shall withhold and pay any and all withholding taxes, whether State or Federal, and pay all Social Security charges, State Unemployment Compensation charges, industrial insurance, workers compensation charges, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees, or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

### **35.0 MISCELLANEOUS CONDITIONS**

**35.1** In the event that either party to the Contract is required to institute arbitration or litigation

to enforce its rights under the terms of the Contract, then the prevailing party in the arbitration or litigation shall be entitled to recover all costs and attorney's fees incurred.

**35.2** In the event that any provision contained in the Contract is found to be contrary to the applicable law, then it shall be severed and the remaining provisions of the Contract shall remain in full force and effect.

**35.3** The Contract shall be governed by the laws of the State of Arizona.

### **36.0 CONFLICTS WITHIN THE PLANS OR SPECIFICATIONS**

**36.1** In the event that a conflict is discovered between sections of the Specifications or between the Plans and the Specifications, the following list of priority shall be used to resolve the conflict:

- A. Executed Change Orders
- B. Addenda
- C. Contract
- D. Special Provisions
- E. General Conditions
- F. Instructions to Bidders
- G. Technical Specifications
- H. Plans
- I. Referenced Standard Specifications or Other Documents

### **37.0 NONDISCRIMINATION**

**37.1** The Contractor, with regard to the work performed pursuant to this contract, shall not discriminate on the grounds of race, color, sex, religion, creed, age, physical or mental disability, or national origin or ancestry in any contracts with the public and in the selection and retention of employees or subcontractors, nor in the procurement of materials and leases of equipment.

### **38.0 INTEGRATION**

**38.1** This Contract represents the entire Contract between the parties hereto and supersedes any and all prior negotiations or representations, either written or oral.

**38.2** Amendments or modifications to the Contract shall be in writing, signed by both parties, or by Change Orders.

**38.3** The Contract Documents shall not be construed to create any contractual relationship of any kind between the Engineer and the Contractor, but the Engineer shall be entitled to performance of obligations intended for his benefit, and to the enforcement thereof.

### **39.0 HAZARD COMMUNICATION PROGRAM**

**39.1** All contractors working on City projects shall submit a copy of their hazard communication

plan to the Fire Prevention Office prior to commencement of work on any project. This will ensure that other individuals on the job site are not unknowingly exposed to a hazardous substance or chemical.

The Fire Prevention Office shall be provided a list of the hazardous substances and the material safety data sheets that are applicable to the work areas of those contract employees.

All contract labor within City facilities will be treated the same as regular employees with regard to this hazard communication standard.

**\*\* END OF SECTION \*\***

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SECTION 00800  
**SPECIAL PROVISIONS**

**1.0 SCOPE**

These Special Provisions supplement and modify the General Conditions, Technical Specifications, and Plans. All requirements and provisions of the General Conditions, Technical Specifications and Plans apply except where modified by these Special Provisions.

**2.0 PROJECT DESCRIPTION**

Work of this Contract comprises two alternatives: Alternative 1– general rehabilitation of the existing Tank 2A-06 including new aluminum roof (Alternative 1A) or steel roof (Alternative 1B), and Alternative 2 - removal of existing steel Tank 2A-06 and construction new tank in the same location with new aluminum roof (Alternative 2A) or steel roof (Alternative 2B).

**3.0 DEFINITION OF TERMS**

Wherever in these documents the word "OWNER" appears, it shall be understood to mean Lake Havasu City, Arizona, the governing body of which is the City Council. Wherever in these documents the word "CONTRACTOR" appears, it shall be understood to mean the party or parties contracting with the OWNER to perform the Work. Wherever in these documents the word "ENGINEER" appears, it shall be understood to mean Lake Havasu City Public Works Department, Engineering Division.

**4.0 PRECONSTRUCTION CONFERENCE**

Within ten (10) days after the contract has been awarded, but before the start of construction, the ENGINEER will schedule a conference to be held at the site of the project for the purpose of discussing such matters as project supervision, onsite inspections, progress schedules and reports, payrolls, payments to Contractors, equal employment opportunity, contract change orders, insurance, safety, and any other items pertinent to the project. The Contractor shall arrange to have all supervisory personnel connected with the project on hand to meet with the representatives of the Owner and the Engineer.

**5.0 COMPLIANCE WITH LAWS AND LABOR MATERIAL REQUIREMENTS**

The CONTRACTOR shall conduct the work in compliance with all existing state and national laws and county and municipal ordinance and regulations limiting or controlling the work in any manner. Particular attention is called to the following State of Arizona laws:

**WORKMAN'S COMPENSATION INSURANCE** All personnel working on the project shall be covered by Workmen's Compensation Insurance as provided or approved by the Arizona Industrial Commission in accordance with ARS 23-901 et. seq.

**EMPLOYMENT OF ALIENS** Employment of aliens on Public Works projects prohibited. ARS 34-301 and residence requirements for employees, ARS 34-302.

The Contractor understands and acknowledges the applicability to it of the American with Disabilities Act, the Immigration Reform and Control Act of 1986 and the Drug Free Workplace Act of 1989. The following is only applicable to construction contracts: The Contractor must also comply with A.R.S. § 34-301, "Employment of Aliens on Public Works Prohibited", and A.R.S. § 34-302, as amended, "Residence Requirements for Employees".

Under the provisions of A.R.S. §41-4401, Contractor hereby warrants to the City that the Contractor and each of its subcontractors ("Subcontractors") will comply with, and are contractually obligated to comply with, all Federal Immigration laws and regulations that relate to their employees and A.R.S. §23-214(A) (hereinafter "Contractor Immigration Warranty").

A breach of the Contractor Immigration Warranty shall constitute a material breach of this Contract and shall subject the Contractor to penalties up to and including termination of this Contract at the sole discretion of the City.

The City retains the legal right to inspect the papers of any Contractor or Subcontractors employee who works on this Contract to ensure that the Contractor or Subcontractor is complying with the Contractor Immigration Warranty. Contractor agrees to assist the City in regard to any such inspections.

The City may, at its sole discretion, conduct random verification of the employment records of the Contractor and any of subcontractors to ensure compliance with Contractor's Immigration Warranty. Contractor agrees to assist the City in regard to any random verifications performed.

Neither the Contractor nor any of Subcontractor shall be deemed to have materially breached the Contractor Immigration Warranty if the Contractor or Subcontractor establishes that it has complied with the employment verification provisions prescribed by sections 274A and 274B of the Federal Immigration and Nationality Act and the E-Verify requirements prescribed by A.R.S. §23-214, Subsection A.

The provisions of this Article must be included in any contract the Contractor enters into with any and all of its subcontractors who provide services under this Contract or any subcontract. "Services" are defined as furnishing labor, time or effort in the State of Arizona by a contractor or subcontractor. Services include construction or maintenance of any structure, building or transportation facility or improvement to real property.

## **6.0 COPIES OF DOCUMENTS**

The OWNER will furnish to the CONTRACTOR one electronic copy of the CONTRACT DOCUMENTS in pdf format, unless otherwise requested.

## **7.0 DRAWINGS OF RECORD**

Two sets of the Contract Documents are to be kept at the job site, maintained in good condition, and marked daily by the Contractor as the work proceeds. The Contract Documents shall be kept available for inspection by the OWNER at all times, and shall be kept up to date.

## **8.0 CONTRACT TIME**

The contract time shall be **120 CALENDAR DAYS** from the NOTICE to PROCEED.

## **9.0 SURVEYS**

The CONTRACTOR shall layout the WORK, in accordance with the drawings, shall establish all necessary lines, etc., required to complete the work in accordance with the Contract Documents. The CONTRACTOR shall employ an experienced and competent Arizona Registered Land Surveyor (R.L.S.) satisfactory to the OWNER to layout the WORK and to verify lines and elevations as the WORK progresses.

## **10.0 WEATHER CONDITIONS**

In the event of temporary suspension of work, or during inclement weather, or whenever the OWNER shall direct, the Contractor will and will cause his Subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the OWNER, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to so protect his work, such materials shall be removed and replaced at the expense of the Contractor.

## **11.0 SUBMITTALS**

Prior to construction and as soon as possible, the Contractor shall supply all submittals required by the Technical Specifications or as requested by the Owner.

## **12.0 INSPECTION OF THE WORK**

The Owner intends to provide a full-time resident inspector for the project. The resident inspector will be available for a forty (40) hour period during the week from Monday through Friday during the period of the Contract. In the event the Contractor elects to work outside the forty (40) hour week that occurs between Monday through Friday, such as Saturday, Sunday or legal holidays, in accordance with Section 17.0 of the General Conditions the Contractor will be responsible for all inspection, engineering, and testing costs incurred during that period. For any inspection work performed on Saturday, Sunday, or local municipal holidays the minimum chargeable time shall be four (4) hours. The Owner reserves the right to deduct these additional inspection, engineering, and testing costs directly from the Contractor's payments.

### **13.0 WATER AND POWER**

#### **A. WATER**

Water is available from the Water Department at no cost to the Contractor. The Contractor shall make application and obtain a hydrant meter from the Water Department for the purpose of metering the use of water on the project. The Contractor shall adhere to all conditions stated in the Meter Application, including payment of a deposit for the meter, return of the meter to the Water Department each month during the project for reading, and notification to the Water Department prior to any change in the location of the hydrant meter. The maximum water to be drawn off a hydrant at any time is 200 gpm (water drawn from 4" hydrant whenever available). Water shall only be drawn off hydrants approved by the Lake Havasu City Water Superintendent or his authorized representative.

#### **B. POWER**

All power for lighting, operation of Contractor's plant or equipment or for any other use as may be required for proper completion of the work to be performed under the provisions of these contract documents, shall be provided by the Contractor at his sole cost and expense.

### **14.0 BURNING OF VEGETATION**

No burning of vegetation will be allowed.

### **15.0 MATERIALS TESTING**

#### **A. CONSTRUCTION TESTING**

All quality control testing must be provided by CONTRACTOR. The material and workmanship provided during construction will be tested on a regular basis by the CONTRACTOR. It shall be the responsibility of the CONTRACTOR, at no additional cost, to provide material samples for testing at the **OWNER's** request.

The CONTRACTOR shall be responsible for charges resulting from failed tests, costs for retesting shall be based upon hourly and/or individual test rates.

In the event any portion of the project is rejected because of substandard work, all materials testing, engineering, and inspection costs associated with corrective measures shall be chargeable to the CONTRACTOR at the current respective rates.

#### **B. PRELIMINARY MATERIALS TESTING**

All preliminary materials testing and mix design testing required by the specifications to ensure materials and mix designs are suitable for project use will be the responsibility of the CONTRACTOR at no additional cost to the OWNER.

### **16.0 CLEANUP AND POLLUTION CONTROL**

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**A. GENERAL**

The CONTRACTOR shall be responsible for the removal of all debris, litter and waste from the job site(s) and/or equipment maintenance area and the restoration of any and all areas affected, directly or indirectly by the construction, transportation of equipment or materials and/or by the acts of neglect or omission by his employees.

All debris, litter, etc., shall be disposed of in accordance with prevailing ordinance or law. Open burning of trash, debris, etc., will not be permitted.

Such clean-up operations shall be on a daily basis. All pavement, concrete, brush, rocks, excess materials, etc. accumulated or removed during the course of construction must be disposed of in those areas designated by the Engineer or his authorized representative, including but not limited to the Lake Havasu City Landfill. All costs for disposal, including gate or tipping fees, etc. are the responsibility of the Contractor. This material must be disposed of within ten (10) days of time of removal. If the areas in question are not cleaned up to the satisfaction of the ENGINEER, progress payments will be withheld until clean-up is completed and approved by the ENGINEER, or, in the case of private projects, other legal action will be taken.

**B. TEMPORARY FACILITIES**

The CONTRACTOR shall provide temporary mailboxes and traffic control signs where necessary until completion of backfilling and clean-up.

**C. SOLID WASTES**

All solid wastes shall be removed and disposed of in accordance with prevailing ordinance or law. Clean-up shall be completed on a daily basis. All costs for disposal shall be the responsibility of the Contractor, and shall be considered incidental to the costs of the various bid items.

All spilled paving material shall be removed and disposed of prior to final acceptance and payment.

**D. MAINTENANCE AREAS**

Maintenance areas shall be kept clean during construction and shall be free of litter at all times. All empty containers, debris, waste, etc., shall be removed and disposed of prior to final acceptance. Upon inspection by the ENGINEER, the CONTRACTOR may be required to dress the surface of the ground, dependent upon the extent of spillage of petroleum products on the surface. If so directed, such dressing shall consist of scarifying the surface to a depth of six (6) inches and moving and compacting the soil in such a way as to blend the spill areas into clean soil and restore the surface by partial compaction.

**E. POLLUTION**

The CONTRACTOR shall be held responsible for acts leading to pollution of water, air or land by any means.

Open burning of trash, debris, etc., will not be permitted anywhere in the City limits.

The discharge of any pollutants upon the surface of the ground, or into any stream, ravine, wash or body of water which may result in pollution of the public water supply, or of groundwater contributory thereto, will not be permitted.

Violation of these conditions will be cause for the termination of work, and possible legal action.

**F. REMOVAL AND REPLACEMENT OF SIGNS, MAILBOXES, ETC.**

It is the responsibility of the CONTRACTOR to remove all poles, etc. which are located within the construction area and replace at the time of backfilling and clean-up in the locations determined by the Street Superintendent. In the case of landscaping or other private items located in the construction area, the CONTRACTOR shall hand-deliver a written notice to all residences in that area stating his intentions to perform construction activities and shall do so at least five (5) working days prior to work commencing. If, at the time of construction these items are still in the construction area, the CONTRACTOR is to remove and dispose of them properly. All signs and mailboxes shall be permanently installed within forty-eight (48) hours of completion of construction activities.

**G. NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT**

At the time of the preconstruction conference, the contractor shall submit, for the Engineer's approval, a program which includes all the measures which the contractor proposes to take for the construction of permanent erosion control work specified in the contract and all the temporary control measures to prevent erosion and pollution of streams, lakes and reservoirs.

Permanent erosion control work and pollution prevention measures shall be performed at the earliest practicable time consistent with good construction practices. Temporary work and measures are not meant to be performed in lieu of permanent work specified in the contract.

Construction of drainage facilities as well as the performance of other contract work which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with earthwork operations or as soon thereafter as possible.

Except for that approved in writing by the Engineer, the contractor shall perform no clearing and grubbing or earthwork until the contractor's program has been approved.

If in the opinion of the Engineer, clearing and grubbing, excavation, or other construction

operations are likely to create an erosion problem because of the exposure of erodible earth material, the Engineer may limit the surface area to be disturbed until satisfactory control measures have been accomplished. Unless otherwise permitted by the Engineer, the contractor shall not expose an area of erodible earth material greater than 217,800 square feet at any one location.

The Engineer may order the contractor to provide immediate measures to control erosion and prevent pollution. Such measures may involve the construction of temporary berms, dikes, dams, sediment basins and slope drains; the use of temporary mulches, mats and seeds and the use of other devices, methods, items, etc., as necessary.

At any time the contractor proposes to change his/her schedule of operations, the contractor shall review and update his/her erosion and pollution control program and submit it to the Engineer for approval.

The contractor shall not be entitled to additional compensation or an extension of contract time for any delays to the work because of the contractor's failure to submit an acceptable erosion and pollution control program.

Erosion control and pollution prevention work specified in the contract which is to be accomplished under any of the various contract items will be paid for by the bid item. Any additional work required by the Owner will be paid for by the Force Account set up for this work.

The cost of any erosion control and pollution prevention work which may be proposed by the contractor in his/her program, in addition to that specified in the contract, will be considered as included in the prices bid for contract items.

## **17.0 DUST CONTROL**

It shall be the CONTRACTOR's responsibility to provide adequate water for dust control. It is imperative that the air quality standards are maintained. In addition, dust could be quite hazardous in the everyday operations. It shall be the CONTRACTOR's responsibility to ensure that all regulations for air quality and safety are met.

## **18.0 SUPERVISORY PERSONNEL**

It is the intent of these Specifications to provide a completed project which will in every way reflect the work of competent journeyman mechanics in the various trades represented. The Contractor shall ensure that each portion of the work is supervised by a qualified person, well versed in the operation of the various tools required for the trade, the method in which the work is to be done, and a knowledge of the general requirements of the construction work. All work is to be done in accordance with the latest methods devised for such work to ensure the highest quality product.

## **19.0 SAFETY REQUIREMENTS**

The CONTRACTOR shall comply with all pertinent provisions of the Department of Labor "Safety and Health Regulations for Construction" (29 CFR Part 1518, 36 CFR 7340), with additions or modifications thereto, in effect during construction of this project.

**THE FOLLOWING MEASURES OR PROVISIONS ARE TO BE ADHERED TO AT ALL TIMES DURING THE CONSTRUCTION OF THIS PROJECT:**

- A.** All heavy construction machinery to include trenching machines, bulldozers, backhoes, etc., must be equipped with a roll bar meeting the requirements of the above regulation.
- B.** Safety helmets will be worn by all personnel working at the site. In addition, all spectators and inspectors will be required to wear safety helmets in construction zone.
- C.** Steel toe safety shoes or boots will be worn by all personnel working at the site.

**20.0 PRESERVATION OF BENCH MARKS AND MONUMENTS**

The Contractor shall exercise caution to ensure that permanent bench marks, monuments, established property corners, survey lines, and points are not damaged or disturbed by this work. If any survey monuments, property corners, survey lines or points are damaged or disturbed, the Contractor's representative shall immediately notify the inspector. All centerline survey monumentation located in pavement removal areas shall be replaced by an Arizona Registered Land Surveyor (R.L.S.) after completion of the pavement removal and replacement operations. All costs incurred to re-establish such points shall be borne by the Contractor.

**21.0 DISPOSAL OF EXCESS MATERIAL**

Excess soil and unsuitable materials shall be removed from the site by the Contractor at his own expense and disposed of in accordance with the Contract Documents unless otherwise permitted herein. In the event the Contractor chooses to utilize local private lots to dispose of excess material, the Contractor must provide the Engineer with written permission from the lot owner prior to utilizing the lot. Placing material suitable for fill on vacant lots will require a Grading Permit in advance of placing the material.

**22.0 REFERENCE STANDARD SPECIFICATIONS**

Where standard specifications or testing methods have been referred to, such as ASTM or AASHTO, the intent is to refer to the latest applicable issue or revision of such specifications or testing methods. The following abbreviations are used in these specifications.

- |        |  |
|--------|--|
| AWWA   | American Waterworks Association                                    |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACI    | American Concrete Institute  |

AI	Asphalt Institute
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute (formerly the USA Standards Institute)
ASTM	American Society for Testing and Materials
NSF	National Sanitation Foundation
S.P.W.C.	Standard Specifications for Public Works Construction. (Wherever written herein shall mean "Maricopa Association of Governments, Arizona Specification for Public Works Construction".) The "Sample Forms" and "Part 100 – General Conditions" of these Standard Specifications for Public Works Construction are excluded from the documents for this project.

### **23.0 CODES, ORDINANCES AND LOCAL SPECIFICATIONS**

All work under this project shall be performed in strict accordance with these specifications and the Standard Specifications for Public Works Construction (SPWC). Where any conflict occurs between these plans and specifications and the local codes and ordinances in effect at the time, such codes and ordinances shall take precedence over these plans and specifications only if these plans and specifications are inferior as to materials and workmanship called for by such codes and ordinances.

### **24.0 INTERFERING STRUCTURES AND UTILITIES**

The Contractor shall notify Blue Stake (1-800-782-5348) at least three (3) working days prior to any excavations.

The Contractor shall exercise all possible caution to prevent damage to existing structures and utilities, whether above ground or underground. The Contractor shall notify all utility offices concerned at least seventy-two (72) hours in advance of construction operations in which a utility's facilities may be involved.

Any structure or utility damage caused by the work shall be repaired or replaced in a condition equal to or better than the condition prior to the damage. Such repair or replacement shall be accomplished at the Contractor's expense without additional compensation from the Owner.

If interfering structures or installations such as vaults, manholes, valves, utility poles, guy wires, or anchors are encountered, the Contractor shall notify the Engineer and contact the appropriate utility or structure owner at least seven (7) days in advance of construction to arrange for protection or relocation of the structure.

The Contractor shall remove, protect and/or replace all existing structures, utilities or other  
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improvements and similar items within the proposed improvements at his own expense without additional compensation from the Owner unless specifically provided for as a pay item of work by the Specifications or as otherwise provided for on the Plans. Replacement shall be in a manner and in a condition at least equivalent to, or better than, the original condition.

If the Contractor encounters existing facilities which will prevent the construction of any facility and which are not properly shown on the Plans, he shall notify the Owner before continuing with the construction in order that the Owner may make such field revisions as necessary to avoid conflict with the existing structure. The cost of waiting or "down" time during such field revision shall be borne by the Contractor without additional cost to the Owner. If the Contractor fails to notify the Owner when an existing structure is encountered, but proceeds with the construction despite this interference, he does so at his own risk. In particular, when the location of the new construction will prohibit the restoration of existing structures to their original condition; the Contractor shall notify the Engineer and contact the utility or structure owner so a field relocation may be made if possible to avoid the conflict.

In the event of interruption to any utility service as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority. He shall cooperate with the said authority in restoration of service as promptly as possible and shall bear all costs of repair. In no case shall interruption of any utility service be allowed to exist outside working hours unless prior approval of the Owner is received.

Neither the Owner nor its officers or agents shall be responsible for damages to the Contractor as a result of the locations of the water and sewer lines or utilities being other than those shown on the Plans or for the existence of water, sewer lines or utilities not shown on the Plans.

## **25.0 AIR QUALITY - OPERATING PERMITS**

The Contractor may be required to obtain registration certificates and/or operating permits for sources of air pollution.

Information concerning these certificates and permits may be obtained from:

The Office of Air Quality  
Arizona Department of Environmental Quality  
P.O. Box 600  
Phoenix, AZ 85001-0600  
(602) 207-2300

## **26.0 ADJUST UTILITIES TO FINISHED GRADE**

The Contractor shall be responsible for locating all manhole rims, valve boxes, meter boxes, utility vaults, etc., and setting them to finished grade. The Contractor shall adjust sewer and water facilities to finished grade in accordance with the specifications within seven (7) days after street surfacing has been completed on each street. All valves and/or manholes will be made visible and accessible for emergency use within 24 hours. It shall be the responsibility of the Contractor to

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coordinate with the various private utility companies so that they can adjust their facilities to finished grade at an appropriate time. Adjust all facilities in accordance with these specifications and the MAG Standard Details, as modified by Lake Havasu City.

## **27.0 SAFETY, HEALTH AND SANITATION PROVISIONS**

The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the Arizona State Department of Health.

The Contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions, on his own responsibility or as the Owner may determine, reasonably necessary to protect the life and health of employees on the job, the safety of the public and to protect property in connection with the performance of the work covered by the contract.

Precaution shall be exercised by the Contractor at all times for the protection of persons (including employees) and property. The Contractor shall comply with the provisions of all applicable laws, pertaining to such protection including all Federal and State occupational safety and health acts, and standards and regulations promulgated thereunder.

## **28.0 PUBLIC SAFETY AND TRAFFIC CONTROL**

Every attempt shall be made to provide public safety during the construction of the project. Traffic control shall be performed in accordance with Section 2650, Traffic Control, of the Technical Specifications.

During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access for all property owners to their property. No person shall be cut off from access to his residence or place of business for a period exceeding two (2) hours, unless the Contractor has made a special arrangement with the affected persons. It shall be the Contractor's responsibility to notify all adjacent property owners of the construction activity and the schedule of such activities.

The CONTRACTOR shall submit for approval a traffic control and barricade plan within ten (10) days of receipt of Notification of Award of Contract. There shall be no deviations from the approved barricade plan unless a revised barricade plan is submitted and approved. The CONTRACTOR shall issue a news release once a week for duration of the project. The release will be published in Sunday's newspaper and shall indicate the area in which the CONTRACTOR will be performing work for that week.

Businesses must be notified forty-eight (48) hours prior to any restrictions on normal parking areas used by their employees or patrons.

The CONTRACTOR shall contact, cooperate with, and give notice to each resident, homeowner, business or school that will be affected by any part of the construction process, particularly  
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concerning temporary interruptions to vehicular access.

Written notice of the approximate schedule and explanation of work shall be given to each resident, homeowner, business or school at least five (5) days prior to commencement of work in the area. Verbal door-to-door communication shall be made at least twenty-four (24) hours prior to construction to remind all affected parties of the construction to take place.

The OWNER shall receive a copy of all notifications to residents. In the event of complaints by residents, the OWNER may require the CONTRACTOR to provide documentation (ie. check list) showing the date & time of the verbal door-to-door communication.

In addition, the CONTRACTOR is responsible to answer and resolve any conflicts that may arise between a homeowner or business owner and himself during the construction process.

The CONTRACTOR shall provide and station competent flaggers whose sole purpose shall be to direct the movement of public traffic through or around the work. Proper advanced warning signs shall be in place when flaggers are working and removed when work requiring flaggers is completed. Flaggers must be used to assist trucks for safe ingress and egress whenever truck movements may interfere with safe passage through the work zone.

All traffic control devices that are not in use or will not be used for a period greater than 72 hours or that are determined by the Engineer to be unnecessary, confusing, or causing an unsafe condition, shall be removed by the CONTRACTOR from the public right-of-way immediately upon notification by the Engineer.

Every attempt shall be made to provide public safety during the construction of the project. Traffic control shall be performed in accordance with Section 2650, Traffic Control, of the Technical Specifications. No person shall be cut off from access to his residence or place of business for a period exceeding six (6) hours, unless the Contractor has made a special arrangement with the affected persons. In addition, no work will be scheduled which will interrupt regular trash pickup to either residential or commercial properties. It will be the CONTRACTOR'S responsibility to coordinate his activities with the local trash haulers.

No streets, avenues, boulevards or cul-de-sacs will be closed to traffic unless prior arrangements have been made and approval has been obtained from the ENGINEER.

## **29.0 TEMPORARY FACILITIES ON SITE**

### **A. General**

Except as otherwise provided, the OWNER shall bear no costs of temporary facilities and their removal.

### **B. Temporary Utility Services**

The Contractor shall provide temporary electric power as necessary for the execution of the

Work, including that required by all Subcontractors. He shall make the necessary arrangements with Owner, shall bear all costs for these temporary services and shall furnish and install all necessary transformers, metering facilities and distribution centers from branch circuits as he may require.

The Contractor shall provide lighting and outlets in temporary structures throughout the project as may be required for safety, proper performance and inspection of the Work. If operations are performed during hours of darkness, or if natural lighting is deemed insufficient by Owner, the Contractor shall provide adequate floodlights, clusters and spot illumination. The use of permanently installed lighting fixtures, lamps and tubes for work will not be permitted except by special permission of Owner. The Contractor shall make arrangements with Subcontractors for electrical services and lighting as may be necessary in the performance of their work.

Temporary water service lines, if required, shall be installed and removed by the Contractor, who shall pay all charges for making the connections, running the temporary lines, removing the temporary lines at the completion of the Work and disconnecting the services. All relocations required to clear the work of others shall be performed by the Contractor when requested by the Owner.

**C. Temporary Structures**

Prior to starting Work, the Contractor shall, as directed by Owner, provide and maintain suitable temporary office facilities for the duration of the Project as required for the Contractor's project administration; and all necessary sheds and facilities for the proper storage of tools, materials and equipment employed in the performance of the Work.

**D. Toilet Facilities**

The Contractor shall provide and maintain temporary toilet facilities for the duration of operations, which shall be maintained in a clean and sanitary condition acceptable to Owner and in full compliance with applicable regulations of any public authority.

**E. Telephones**

The Contractor shall provide, maintain and pay for telephone services for the duration of the Work as required for the Contractor's operation.

**F. Fence and Barricades**

The Contractor shall provide such protective fences and barricades as he may deem necessary for public safety and to protect his storage areas and the Work in place. The location and appearance of all fences shall be subject to the approval of the Owner.

**G. Contractor Parking**

The Contractor shall not park his equipment, nor allow his personnel to park, in any area except those specifically designated by the Owner.

**H. Temporary Living Quarters**

Temporary living quarters shall not be allowed on the job site or on publicly owned properties. In addition, all Lake Havasu City Zoning Codes for the area in question shall be strictly adhered to.

**I. Removal of Temporary Construction**

The Contractor shall remove temporary office facilities, toilets, storage sheds and other temporary construction from the site as soon as, in Owner's opinion, the progress of Work permits. He shall recondition and restore those portions of the site occupied by the same to a condition equal to or better than it was prior to construction.

**30.0 ACCESS TO WASHES**

**A.** Unless otherwise mentioned herein, the Contractor must obtain written permission from the Owner prior to gaining access or utilizing washes or City parcels for any purpose. Request for access to washes and City parcels will be reviewed on a case by case basis. The Contractor shall have access to washes and City parcels via public streets and/or private easements only. For the purposes of this paragraph, "private easement" means an Contract by and between the Contractor and a property owner, in writing, authorizing the Contractor to travel across the property owner's real property in order to have ingress or egress to washes, parcels or any portion thereof. Such Contract, if any, shall be filed with the Office of the City Engineer before the Contractor may exercise the rights thereunder granted. Access to any wash, parcels, or portion thereof by any means not in compliance with the terms of this paragraph shall be deemed a trespass and a breach of the terms of the Contract.

**B.** Violations of the provisions of subparagraph (a.) hereof, shall entitle the City to deduct the sum of One Thousand Dollars (\$1,000.00) from the monies due to Contractor as and for liquidated damages for each such violation. For the purposes of this paragraph, each entry by a vehicle upon land for which Contractor has not received permission to enter shall be deemed a separate violation of subparagraph (a.) hereof.

**31.0 COORDINATION AND COOPERATION WITH UTILITY COMPANIES AND OTHER TRADES**

**A. Coordination/Interruption**

The Contractor is responsible to coordinate work with all utility companies and other trades, on or affecting the job, for an efficient and effective execution of the complete project. The Contractor shall carefully examine all work that may conflict, and plan removal and/or

installation details in advance of the construction to avoid any such conflict. Failure on the contractor's part to coordinate with any and all utilities, public or private, shall preclude the City's consideration for additional time or cost.

**B. Permission Required**

Utility mains and utility service to buildings shall not be cut off or otherwise interrupted without the Contractor obtaining permission from the Owner in each and every instance.

**C. Scheduling of Interruptions**

Where utilities serve facilities or buildings in use, interruptions in service shall be scheduled during the hours when the facility is not in operation. Any overtime costs occasioned thereby shall be regarded as incidental to, and included within, the Contract Sum.

**D. General Requirements**

Prior to interrupting any utility service, the Contractor shall ascertain that he has the proper materials, together with adequate workmen and equipment, to complete the Work with a minimum of delay.

**E. Project Electrical Service**

The Contractor is responsible to coordinate with Unisource, Electric Division, to determine the extent of work to be performed by Unisource and by the Contractor to provide electric service for the finished product. The Contractor is also responsible to contact Unisource to determine the hardware required by Unisource to provide service to the final product. Unisource does not provide service to delta connections.

**32.0 MODIFICATIONS TO STANDARD TECHNICAL SPECIFICATIONS**

**FOR ALL STANDARD TECHNICAL SPECIFICATIONS:**

**DELETE** PART 4, MEASUREMENT AND PAYMENT, in its entirety, and **REPLACE** with the following:

PART 4 – MEASUREMENT AND PAYMENT

4.1 Measurement and Payment

Refer to Section 01210.

## **SPECIFICATION 01320 – PROJECT MEETINGS, SCHEDULES, AND REPORTS**

1.1.C, Schedules and Reports, **ADD** the following subparagraphs:

- 7.** Quality Control Testing Plan and Reports.
- 8.** Health and Safety Plan.

1.3.D.1.a, Construction Progress Reports, **ADD** the following subparagraphs:

- (5)** CONTRACTOR quality control testing update.
- (6)** Health and safety update.

1.3, Schedules and Reports, **ADD** the following subparagraph:

### **G. Quality Control Testing Plan and Reports**

- 1.** A Quality Control Testing Plan shall be developed by the CONTRACTOR and submitted to the ENGINEER no later than the Preconstruction Conference. The Plan will include the following items:
  - a.** Qualifications of the proposed laboratory including laboratory accreditations and certifications for technicians proposed for the work.
  - b.** Test Frequency Table (one table for each specification section requiring CONTRACTOR quality control) establishing the proposed number of tests. The Table shall include columns for:
    - (1)** Material Tested
    - (2)** Sampling and Testing Points
    - (3)** Test Method
    - (4)** Minimum Sampling Frequency
    - (5)** Estimated Quantity of Materials
    - (6)** Number of Tests Required
    - (7)** The Table shall also include columns for number of tests complete and % of tests complete. These last two columns are for use in periodic reporting of QC testing to the ENGINEER.

2. The CONTRACTOR shall submit reports of Quality Control Testing to the ENGINEER at each Coordination Meeting. The report shall include all Quality Control test reports for testing completed during the prior week, and shall include updated Test Summary Tables. The Tables shall include updated values for cumulative number of tests completed and % of required number of tests completed. One Table shall be submitted for each specification item requiring CONTRACTOR quality control testing, and it shall be updated through the end of the prior week.

## **SPECIFICATION 01325 – CONSTRUCTION PHOTOGRAPHS**

3.1, Route Photographs, **REVISE** to read:

“Project Site Photographs”

3.1.A, **REPLACE** in its entirety with the following:

- A. The CONTRACTOR shall be responsible for photographing the entire project site to show the existing and general condition of the site prior to construction. Each photograph must be time stamped with the date of the photograph. In addition, the CONTRACTOR shall take photographs before, during, and after each of the following phases of construction:

1. Site clearing
2. Demolitions
3. Excavations
4. Installation
5. Final completion

3.1.C, **REPLACE** in its entirety with the following:

- C. The principal reason for obtaining photographs is to document the existing condition of items not scheduled for replacement or items to be removed and replaced in kind such as landscaping, privacy walls, wash locations, etc., as may be necessary for the completion of the WORK. The photographs may, in some degree, preclude the possibility of post construction litigation between CONTRACTOR, adjacent property owners, and the OWNER.

## **SPECIFICATION 01330 – SUBMITTALS**

1.3.B, **ADD** the following subparagraph:

6. CONTRACTOR shall provide submittals for the following items no later than 30 days after Notice to Proceed (if applicable rehabilitation/replacement alternative was selected by the CITY).

- A. Aluminum Roof
- B. Steel Welded Tank

## **SPECIFICATION 01580 – PROJECT IDENTIFICATION AND SIGNS**

3.1A.1, **REPLACE** in its entirety with the following:

1. CONTRACTOR shall obtain OWNER's approval for the location of the CONTRACTOR's identification sign. The sign shall be installed in an appropriate location so as not to obstruct traffic, pedestrians, or construction traffic.

## **SPECIFICATION 02200 – EARTHWORK**

1.2.A, **REPLACE** in its entirety with the following:

**A. Reference Test Standards and Specifications** (current at time of bid)

ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>)

ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method

ASTM D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Rock Correction Procedure for Maximum Density Determination, ARIZ 227

1.2.B.2, **REPLACE** D6938-08a with D6938.

1.3.A, **ADD** the following to the end of the paragraph:

Compaction test reports shall be submitted to the ENGINEER within two (2) business days of completion for a given test.

Part 2 – Materials, **ADD** the following subsection:

### **2.3 Crushed Rock Surfacing**

Material used for crushed rock surfacing shall conform to following requirements:

Percentage wear (ASTM C131):  
100 revolution – 15 maximum  
500 revolution – 52 maximum

Sieve Size	Percent by Weight Passing
1 1/2-inch	100
1-inch	90-100
3/4-inch	30-60
1/2-inch	0-20
3/8-inch	-
No. 4	0-5
No. 8	-

**2.4 Geosynthetics**

- A. Filter fabric shall be manufactured from polyester, nylon, or polypropylene material; shall be of nonwoven construction; and shall meet the following requirements:
  - 1. Grab tensile strength (ASTM D4632): 90 lbs minimum for a 1-inch grip.
  - 2. Apparent opening size per ASTM D4751: 100.
- B. Filter fabric shall be MIRAFI No. 140N, manufactured by Celanese Fibers Marketing Co., Charlotte, North Carolina; Horchst Fibers No. 1145; or equal.

**SPECIFICATION 02254 – SHEETING AND SHORED EXCAVATIONS**

3.5, Trench Excavation, **ADD** the following subparagraph:

- C. Sheet piling used for shoring shall extend at least 2 feet below the bottom of the trench. After completion of the pipe, it may be removed by cutting at least 12 inches above the top of the pipe. No vibratory methods for pile removal will be accepted, and piling lower than 12 inches above the top of the pipe shall be left in place.

**SPECIFICATION 02300 – TRENCH EXCAVATION AND BACKFILL**

1.1.B, **REPLACE** in its entirety with the following:

**B. Related Work Specified Elsewhere**

Earthwork.....Section 02200  
 Steel Pipe and Specials.....Section 02651

1.2.A, **REPLACE** in its entirety with the following:

**A. Reference Test Standards and Specifications** (current at time of bid)

ASTM C94, Standard Specification for Ready Mix Concrete

ASTM C117, Standard Test Method for Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing

ASTM C131, Standard Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregate

ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>)

ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method

ASTM D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

ASTM D4215, Standard Specification for Cold Mixed, Cold Laid Bituminous Paving Mixtures

ASTM D4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2.B.1, Frequency of Testing, **ADD** the following paragraph:

- c. The ENGINEER at the discretion of the OWNER may perform quality assurance testing for compaction, gradation and plasticity index of bedding sand and select backfill. If any test results show non-compliance with the project specifications, the non-complying materials shall be removed and replaced or reworked by the CONTRACTOR. The CONTRACTOR shall perform additional tests at his cost to verify an acceptable condition prior to acceptance by the ENGINEER.

1.2.B, Frequency of Testing, **ADD** the following paragraph:

**3. Sieve Analysis of Aggregate, ASTM C136**

- a. CONTRACTOR shall perform one test per 1,000 cy of Bedding Sand Material incorporated into the WORK.
- b. CONTRACTOR shall perform one test per 5,000 cy of Select Backfill Material incorporated into the WORK.

**4. Plasticity Index of Soils, ASTM D4318**

- a. CONTRACTOR shall perform one test per 1,000 cy of Bedding Sand material incorporated into the WORK.
- b. CONTRACTOR shall perform one test per 5,000 cy of Select Backfill material incorporated into the WORK.

1.3.A.2, **ADD** the following to the end of the paragraph:

Compaction test reports shall be submitted to the ENGINEER within two (2) business days of completion of each test.

1.3.D, Dewatering, **REPLACE** in its entirety with the following:

Provide plans, details and calculations by a professional Engineer registered in the State of Arizona if dewatering is required.

2.1.B.1, Bedding Sand, **REPLACE** the first sentence with the following:

Bedding sand shall consist of non-plastic sandy material conforming to the following requirements:

Sand Equivalent (SE), 30 Minimum  
 PH 6.5 – 8.5  
 Resistivity 2,000 – 50,000 ohm-cm  
 Sulfate (optional) 1500 PPM or less

2.1.D, Granular Backfill, **REPLACE** the gradation table with the following:

Sieve Size	Percent by Weight Passing
¾ inch	100
No. 4	40-85
No. 8	30-75
No. 40	10-50
No. 100	5-20
No. 200	3-12

3.4.E.2, Water Jetting, **REPLACE** in its entirety with the following:

Water jetting shall not be used.

3.4.F.1, Compaction Methods, **REPLACE** the first sentence with the following:

Construction shall be accomplished by mechanical methods.

3.4.F.3, Water Jetting, **REPLACE** in its entirety with the following:

Water jetting shall not be used.

3.4.F.4, Compaction Densities, – **ADD** the following to the table:

<b>PERCENT RELATIVE COMPACTION MINIMUM DENSITY REQUIRED</b>				
<b>Backfill Type</b>	<b>Location</b>	<b>From Subgrade Surface To 2' Below Surface</b>	<b>From 2' Below Surface To 1' Above Top of Pipe</b>	<b>From 1' Above Top of Pipe To Bottom of Trench</b>
IV	Outside of right-of-way and not below any curb, gutter sidewalk or other structures.	90% in all cases		

**SPECIFICATION 02321 – EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES**

1.2, Quality Assurance, **REPLACE** in its entirety with the following:

- A.** Quality Assurance shall be as specified in Section 02300, Part 1.

1.3, Submittals, **ADD** the following subparagraph:

- C.** Comply with all requirements of sub-section 1.3, Submittals, of Section 02300.

2.1, Fill and Backfill Material, **REPLACE** in its entirety with the following:

- A.** Fill and backfill material shall be as specified in Section 02300, Part 2.

3.2.B, Earth Backfill, **REVISE** to read "Select Backfill".

**SPECIFICATION 03100 – CONCRETE FORMWORK**

Part 1 – General, **ADD** the following subsection:

### **1.3 Submittals**

- A.** The CONTRACTOR shall, in accordance with the requirements in Section 01330, Submittals, submit detailed plans of any falsework proposed to be used. Such plans shall be of sufficient detail to indicate the general layout, sizes of members, anticipated stresses, grade of materials to be used in the falsework, and typical soil conditions. All shoring, bracing and falsework shall be designed and certified by an Arizona State registered Civil Engineer or responsible person as required by the Arizona Administrative Code.

2.1, Materials for Facing, **REPLACE** in its entirety with the following:

### **2.1 Form and Falsework Materials**

- A.** Materials for concrete forms, formwork, and falsework shall conform to the following requirements:
  - 1.** Lumber shall be Douglas Fir or Southern Pine, construction grade, in conformance with U.S. Product Standard PS20.
  - 2.** Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine plywood manufactured especially for concrete framework and shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.
  - 3.** Form materials shall be metal, wood, plywood, or other approved material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade indicated. Metal forms shall be an approved type that will accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Exterior Grade.
  - 4.** Form liners for textured concrete finish shall be extruded ABS plastic as indicated on the DRAWINGS and as manufactured by Fitzgerald, Symons, Greenstreak, or equal.
- B.** Unless otherwise shown, exterior corners in concrete members shall be provided with 3/4-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise shown.
- C.** Forms and falsework to support floor slabs shall be designed by the CONTRACTOR for a minimum dead load plus a live load of 50 psf, plus any and all such additional loadings as may occur.

Part 3, Execution, **ADD** the following subsection:

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### 3.4 Reuse of Forms

- A.** Forms may be reused only if in good condition and only if acceptable to the ENGINEER. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the ENGINEER.

### SPECIFICATION 03300 – CONCRETE STRUCTURES

1.2.A.2, American Society for Testing and Materials (ASTM), **ADD** the following Standard:

ASTM C157, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

**RE-NUMBER** sub-paragraphs starting with 1.2.A.2, Concrete Plant Mixer Standards of the Plant Mixer Manufacturers Division Concrete Plant Manufacturers Bureau, through 1.2.A.7, National Ready-Mix Concrete Association, "Truck Mixer, and Agitator Standards of the Truck Mixer Manufacturers Bureau, to read 1.2.A.3 through 1.2.A.8.

1.2.B.2, **REPLACE** in its entirety with the following:

The Laboratory will sample, cure and test concrete in accordance with ASTM C31, C157 (modified), C192 and C39. Six cylinders shall be tested for compression; three cylinders at 7 days of age and three at 28 days of age. Six specimens shall be tested for shrinkage as described in sub-paragraph 2.1.C.6, Shrinkage.

1.3, Submittals, **ADD** the following subparagraph:

- G.** Certified Delivery Tickets as specified in subsection 2.7.F.5.e.

2.1.A.1, **ADD** the following sentence:

Portland cement shall be from the same manufacturer throughout the project.

2.1.A.5.c, Other Admixtures, **ADD** the following subparagraph:

- (2)** Shrinkage Reducing Admixtures: Conform to manufacturer's recommendations for use.

2.1.C, Concrete Qualities Required, **ADD** the following subparagraph:

6. Shrinkage: 0.042% maximum at 28 days when tested in accordance with ASTM C157 (modified).

2.1.D.2.a.(1), **REVISE** the 3<sup>rd</sup> sentence to read:

“Each point on the curve shall represent the average of at least three cylinders tested at 7 days and at 28 days”.

2.1.D.2.a, Laboratory Trial Batch, **ADD** the following subparagraph:

- (3) Laboratory trial batches shall be used to determine the drying shrinkage performance of the concrete mix. If a shrinkage reducing admixture is to be used, reference concrete containing no admixture must be included in the test matrix. Shrinkage tests shall be performed in accordance with ASTM C157 as modified and described in Technical Bulletin TB-1000 prepared by W. R. Grace & Co.-Conn. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage by more than 25 percent. If the required shrinkage limitation is not met during construction, the CONTRACTOR shall be required to take any or all of the following actions, at no additional cost to the OWNER, for securing the specified shrinkage requirements. These actions may include changing the source of aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

2.1.D.2.a.(3)(d), **ADD** the following subparagraph:

4. Shrinkage, length change data table and length change vs time curves.

2.1.F.5.e, **ADD** the following subparagraph:

- (8) Each ticket shall verify that the cement, sand and aggregate in the load are from the same source used in the mix design. Each ticket shall show the public weighmaster's signature, and the total quantities, by weight of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate, the amount added at the plant, and the maximum amount that may be added at the site for the specific design mix.

2.2.B.1, **REPLACE** in its entirety with the following:

1. Required for setting handrail posts, for setting equipment recommended by the manufacturer to be set with non-shrinking grout, for repairing all holes and defects in concrete members which are not water bearing and not in contact with soil or other fill material.

2.2.B.2, **ADD** the following sentence:

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Grout shall have a minimum 28-day compressive strength of 5,000 psi.

2.2, Grout, **ADD** the following subsections:

**D. Topping Grout and Concrete Fill**

1. Topping grout and concrete fill shall contain a minimum of 564 pound of cement per cubic yard with a maximum water cement ratio of 0.45.
2. The minimum 28-day compressive strength of topping grout shall be 4,000 psi.
3. The slump for topping grout and concrete fill shall be adjusted to match placement and finishing conditions but shall not exceed 4-inches.

**E. Epoxy Grout**

1. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
2. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.
3. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 °F.
4. The epoxy grout shall develop a compressive strength of 5000 psi in 24 hours and 10,000 psi in seven days when tested in accordance with ASTM C 579, Method B. There shall be no shrinkage (0.0 percent) and a maximum 4.0 percent expansion when tested in accordance with ASTM C 827.
5. The epoxy grout shall exhibit a minimum effective bearing area of 95 percent. This shall be determined by a test consisting of filling a 2-inch diameter by 4-inch high metal cylinder mold covered with a glass plate coated with a release agent. A weight shall be placed on the glass plate. At 24 hours after casting, the weight and plate shall be removed and the area in plan of all voids measured. The surface of the grout shall be probed with a sharp instrument to locate all voids.

6. The peak exotherm of a 2-inch diameter by 4-inch high cylinder shall not exceed 95 degrees F when tested with 75 °F material at laboratory temperature. The epoxy grout shall exhibit a maximum thermal coefficient of  $30 \times 10^{-6}$  inches/inch/°F when tested according to ASTM C 531 or ASTM D 696.
7. Application. Epoxy grout shall be used to embed all anchor bolts and reinforcing steel required to be set in grout, and for all other applications required in the CONTRACT DOCUMENTS.

2.5.A, **ADD** the following sentence:

The curing compound shall contain a fugitive dye so that areas of application will be readily distinguishable. Curing compound shall be non-toxic to potable water.

3.1.B, Installation of Embedded Items, **ADD** the following subsection:

5. Concrete shall not be placed without prior ENGINEER's approval of the placement of all items to be embedded.

3.2.A.2.b, **ADD** the following sentence:

Chutes longer than 50 feet shall not be used.

3.4.A.4, **REPLACE** in its entirety with the following:

4. Using polyethylene sheets applied in full contact with surfaces for a minimum of 14 days. The sheets shall be left in place during the 14-day curing period and shall not be removed until after concrete for adjacent work has been placed. Should the sheets become torn or otherwise ineffective, the CONTRACTOR shall replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the sheets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8-inch minimum thickness, laid over the sheets.

3.8, Miscellaneous Concrete Items, **ADD** the following subsections:

**C. Topping Grout**

1. All mechanical, electrical, and finish work shall be completed prior to placement of topping or concrete fill. The base slab shall be given a roughened textured surface by sandblasting or hydroblasting exposing the

aggregates to ensure bonding to the base slab.

2. Unless otherwise shown in the DRAWINGS, the minimum thickness of grout topping and concrete fill shall be one inch. Where the finished surface of concrete fill is to form an intersecting angle of less than 45° with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2-inches wide by 1-1/2-inches deep.
3. The base slab shall be thoroughly cleaned and wetted prior to placing topping and fill. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat Type II cement grout shall be broomed into the surface of the slab just before topping of fill placement. The topping and fill shall be compacted by rolling or tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping and fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

#### **E. Concrete for Exterior Electrical Duct Encasement**

1. For exterior electrical duct encasement use concrete with minimum 28-day compressive strength of 2,000 psi, minimum cement content -450 pound/cubic yard. Use color additive for identification purposes: coral red "Chromix C-22" as manufactured by L.M. Scofield Co. or equal. Add the color additive while concrete is being mixed using quantity per cubic yard of concrete recommended by manufacturer.

### **SPECIFICATION 09900 – PROTECTIVE COATINGS**

PART 2 – MATERIALS, **ADD** the following section:

#### **2.3 Areas of Application**

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**R.** Fluoropolymer Coating for Exposed Aluminum:

- 1.** Surface Preparation and Coating Application: AAMA 2605-05
- 2.** Coating: PVDF Kynar 500 or Hylar 5000 coating system

**SPECIFICATION 16902 – MEASURING AND CONTROLLING INSTRUMENTS AND LOOPS**

2.1 Acceptable Manufacturers, **ADD** the following subsection:

**G. Digital Pressure Transmitter**

- 1.** Digital pressure transmitter (pressure type level meter for water tank shall be Endress & Hauser Cerebar S PMC 71 for 0-24 ft

**\*\* END OF SECTION 00800 \*\***

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## **SUPPLEMENTAL TECHNICAL SPECIFICATIONS**

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## SECTION 01110

### SUMMARY OF WORK

#### PART 1 – GENERAL

##### 1.1 Summary

- A.** This Section summarizes the WORK covered in detail in the complete CONTRACT DOCUMENTS.
- B. Owner:** Lake Havasu City is contracting for WORK described in the CONTRACT DOCUMENTS.
- 1.** Contract Identification: Tank 2A-06 Rehabilitation/  
Replacement Project  
(WT6090)
- Work Site Location:  
2938 Havasupai Blvd  
Lake Havasu City, Arizona
- C.** The CONTRACT DOCUMENTS were prepared by Atkins North America, Inc., 2270 Corporate Circle, Suite 200., Henderson, NV 89074.

##### 1.2 Project Description

###### **A. Description of Contract**

Work of this Contract compromises two alternatives: Alternative 1 – general rehabilitation of the existing Tank 2A-06 including new aluminum dome roof (Alternative 1A) or steel roof (Alternative 1B) and Alternative 2 - removal of existing steel Tank 2A-06 and construction new tank in the same location with new aluminum dome roof (Alternative 2A) or steel roof (Alternative 2B).

Alternative 1 consists of the following work:

- 1.** Remove steel roof of existing Tank 2A -06
- 2.** Remove steel floor of existing Tank 2A-06
- 3.** Remove and replace existing inlet/outlet, interconnecting and overflow piping
- 4.** Construct new steel floor including oil impregnated sand foundation
- 5.** Construct new aluminum roof (Alternative 1A), or steel roof (Alternative 1B)

6. Construct tank appurtenances
7. Remove and re-install Cathodic Protection system
8. Reconnect tank instrumentation and control system
9. Provide Internal coating
10. Provide External coating
11. Tank testing and disinfection

Alternative 2 consists of the following work:

1. Remove existing Tank 2A -06 and appurtenances
2. Construct new tank with aluminum dome roof (Alternative 2A), or with steel roof (Alternative 2B)
3. Construct tank appurtenances
4. Reconnect site piping
5. Construct new Cathodic Protection system
6. Reconnect tank instrumentation and control system
7. Provide Internal coating
8. Provide External coating
9. Tank testing and disinfection

The work also includes minor site improvements, including minor grading and construction of concrete and AC aprons for overflow pipe.

## **B. WORK Covered by CONTRACT DOCUMENTS**

The WORK includes all construction activities associated with the construction of the replacement/rehabilitation of Tank 2A-06, including all necessary connections to existing water mains, coordination with the OWNER and other utility providers for shutdowns and system connections, and complete restoration of all areas disturbed by construction operations.

## **C. Drawings and Specifications**

All WORK shall be performed in accordance with the CONTRACT DRAWINGS, Special Provisions, Standard Technical SPECIFICATIONS for Public Works Construction as furnished by the OWNER, Supplemental Technical SPECIFICATIONS and all referenced Standards. All referenced SPECIFICATIONS shall be editions current at the time of contract bid. It is the CONTRACTOR's responsibility to thoroughly review and adhere to the CONTRACT DRAWINGS, Technical SPECIFICATIONS, and all referenced Standards, test methods, and procedures.

#### **D. WORK Restrictions**

The structural integrity of roof structure of Tank 2A-06 is compromised. Contractor shall secure roof structure and proceed with extreme caution before entering the tank.

### **1.3 Contractor's Use Of Premises**

#### **A. Limited Use**

- 1.** CONTRACTOR shall restrict construction operations to the combined Tank 2A-06 and 2A-07 sites. Unauthorized use of washes, OWNER Parcels, and Private Property may result in a fine per Section 00800, Section 30.
- 2.** CONTRACTOR shall conduct all operations in such a manner to ensure the least inconvenience to OWNER, adjacent residents, and the general public.
- 3.** The OWNER operations personnel shall have access to the site and existing Booster Pump Station and Tank 2A-07. The CONTRACTOR shall cooperate and coordinate with the OWNER to facilitate the OWNER's operations and to minimize interference with the CONTRACTOR's operations at the same time. In any event, the OWNER shall be allowed unimpeded access to the project site at all times during the period of construction.

### **1.4 General Requirements**

- A. Continuous Operation.** The WORK shall be conducted in a manner that maintains continuous operation of the existing booster station and Tank 2A-07.
- B. Work Area and Access.** The general sequence of construction will be determined by the CONTRACTOR and submitted to the OWNER for approval. It is important that construction activities be confined to the pump station site.

CONTRACTOR shall not restrict access to any residential property for the duration of the contract. If restricted access is absolutely necessary, the CONTRACTOR shall give the homeowner a minimum of 24 hours' notice. Access shall not be restricted for more than an 8-hour period over any 24-hour day.

Prior to any construction activity in any area, the CONTRACTOR shall take digital photographs in sufficient detail to record the existing condition of each area. The CONTRACTOR shall provide two copies of the photographs on a compact disk, according to Section 01325, to the ENGINEER for review and approval prior to commencing work in that area.

- C. Crushed Rock Surface.** There is existing crushed rock surfacing around Tank 2A-06. CONTRACTOR shall remove it as necessary for new construction and site re-grading, salvaged and re-used for new crushed rock surfacing. Import of crushed rock surfacing material may be required.

### **1.5 Contract Documents**

- A.** After execution of Agreement, CONTRACTOR will be furnished at no cost, digital files of plans and specifications.

### **PART 2 – PRODUCTS – Not Applicable**

### **PART 3 – EXECUTION – Not Applicable**

### **PART 4 – MEASUREMENT & PAYMENT – Not Applicable**

**\*\* END OF SECTION \*\***

## **SECTION 01210**

### **MEASUREMENT AND PAYMENT**

#### **PART 1 – GENERAL**

##### **1.1 Description**

- A.** The outline of measurement and payment in this section is intended to provide a general guideline to the CONTRACTOR in preparing bids and submitting pay requests. Listing of work included in each bid item is not intended to include all work, but is to provide general guidance to the CONTRACTOR for allocating costs. All work will be paid for on a unit price basis with payment made for the quantity of each item completed.
  
- B.** All materials required for construction shall be furnished by the CONTRACTOR unless specifically stated. Items not specifically measured and paid for shall be considered as subsidiary items required to complete the installation in accordance with the intent of the contract documents. The CONTRACTOR shall include in the unit price bid items, all costs associated with subsidiary items not being measured for payment.

##### **1.2 Authority**

- A.** Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section governs.
  
- B.** Take all measurements and compute quantities. The ENGINEER will verify measurements and quantities.

##### **1.3 Unit Quantities**

- A.** Quantities indicated in the Bid Form are for bidding and contract purpose only. Quantities and measurements supplied or placed in the Work and verified by the ENGINEER shall determine payment.
  
- B.** If the actual Work requires more or fewer quantities than indicated, provide the required quantities at the unit prices contracted.

**PART 2 – PRODUCTS – Not Applicable**

**PART 3 – CONSTRUCTION – Not Applicable**

**PART 4 – MEASUREMENT AND PAYMENT**

**4.1 General**

- A.** All items that are included in the bid for measurement and payment are included herein. All other items of work shall be considered subsidiary to construction and will not be measured for payment.

**4.2 Base Bid and Add Alternative Bid Items**

- A.** Work of this contract compromise two Alternatives and each of the Alternative has two alternate roof material options. The WORK of each Alternative has been divided into three portions: Base Bid, Add Alternate "A" and Add Alternate "B".
- B.** Add Alternate "A" includes additional construction items specific to aluminum roof, and add Alternate "B" includes additional construction items specific to steel roof.
- C.** The CONTRACTOR shall bid on the Base Bid (Schedule 1 and 2) and both of the Add Alternative Bid Items (Alternate "A" and "B"). The Base Bid (either Schedule 1 or 2) and either Alternate "A" or "B" bid items shall be awarded.

**4.3 Measurement and Payment**

**BID SCHEDULE 1**

**BASE BID (ITEMS 1-14)**

- 1. Mobilization/Demobilization, Bonds, Permitting, and Insurance**
  - a.** The quantity of "Mobilization/Demobilization, Bonds, Permitting and Insurance" measured for payment shall be lump sum.
  - b.** The contract lump sum price for "Mobilization/Demobilization, Bonds, Permitting, and Insurance" shall be full compensation

for furnishing all materials, labor, equipment and tools for all required bonds, insurance, acquiring permits and fees, mobilization of staff and equipment, submittals, construction surveying and staking, and any other costs associated with complying with the contract administrative requirements and commencing work at the project site. This item also includes all work and materials necessary to complete the work and to demobilize and perform project closeout as described in the plans and specifications. **Payment for this item shall not be requested until at least thirty days from the notice to proceed has elapsed.**

- c. Payment for this item shall be made in accordance with Table A.

TABLE A

Payment for Mobilization on First Partial Payment	Not to exceed 2.5% of the Lump Sum Base Bid
Subsequent payments for Mobilization	Not to exceed 2.5% of the Lump Sum Base Bid
Payment For Mobilization on Final Partial Payment	Any remaining Mobilization in excess of 5% of the Lump Sum Base Bid

**2. Demolition of Existing Tank Roof**

- a. The quantity of "Demolition of Existing Tank Roof" measured for payment shall be lump sum, complete in place.
- b. The contract lump sum price for "Demolition of Existing Tank Roof" shall be full compensation for furnishing all materials, labor, equipment and tools to remove the Tank's 2A steel roof and associated appurtenances and equipment as shown on the CONTRACT DOCUMENTS, including, but not limited to removal of steel welded tank's roof and roof appurtenances including center column and base, girders, rafters, inside and outside ladder, top angle, and preparation of the tank's shell for new roof. The price shall also include protection of remaining tank's components and all fees for transportation and disposal of all demolition work to certified disposal sites.

**3. Demolition of Existing Tank Floor**

- a. The quantity of "Demolition of Existing Tank Floor" measured

for payment shall be lump sum, complete in place.

- b.** The contract lump sum price for "Demolition of Existing Tank Floor" shall be full compensation for furnishing all materials, labor, equipment and tools to remove the Tank's 2A steel floor plate and associated appurtenances and equipment as shown on the CONTRACT DOCUMENTS, including, but not limited to removal of steel welded tank's floor, pipe connections, inlet, outlet and overflow pipes, preparation of the tank's shell for new floor, and as shown on the drawings and as directed by the ENGINEER. The price shall also include protection of remaining tank's components and all fees for transportation and disposal of all demolition work to certified disposal sites.

**4. Tank New Floor**

- a.** The quantity of "Tank New Floor" measured for payment shall be lump sum, complete in place.
- b.** The contract lump sum price for "Tank New Floor" shall be full compensation for furnishing all materials, labor, equipment and tools to install new steel floor and associated appurtenances and equipment as shown on the CONTRACT DOCUMENTS, including, but not limited to new steel welded tank's floor and pipe connections and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

**5. 6-inch Thick Oil Impregnated Sand Base**

- a.** The quantity of "6-inch Thick Oil Impregnated Sand Base" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for "6" Oil Impregnated Sand Base" shall be full compensation for furnishing all materials, labor, equipment and tools to provide 6-inches of oil impregnated sand layer, preparation and compaction of subgrade, and other work not specified in other bid items, as shown on the CONTRACT DOCUMENTS, including, but not limited to, excavation, furnishing and installing 6-inches of oil-impregnated sand layer, backfill, compaction, offsite disposal of excess material, cleanup, protection of all adjacent utilities and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

**6. Retaining Ring Repair**

- a.** The quantity of "Retaining Ring Repair" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for "Retaining Ring Repair" shall be full compensation for furnishing all materials, labor, equipment and tools to repair steel ring retaining tank's subbase and other work not specified in other bid items, as shown on the CONTRACT DOCUMENTS, including, but not limited to, inspection, adjusting and providing missing bolts for steel retaining ring, providing and installation of stainless steel anchors and concrete, providing missing granular material, backfill, compaction, re-grading surfaces around the tank to provide positive drainage, offsite disposal of excess material, cleanup, protection of all adjacent utilities and all other work associated with the installation as shown on the Plans, specified in Specifications and as directed by the ENGINEER.

**7. 16-inch Inlet/Outlet Piping**

- a.** The quantity of "16-inch Inlet/Outlet Piping" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for "16-inch Inlet/Outlet Piping" shall be full compensation for furnishing all materials, labor, equipment and tools to install the 16-inch CML&C Steel Inlet and Outlet Pipe and Fittings complete and in place as shown on the CONTRACT DOCUMENTS, including, but not limited to, excavation, furnishing and installing bedding, pipe zone material, backfill, compaction, offsite disposal of excess material, 16-inch cement mortar lined and coated steel pipe and fittings (site piping), 16-inch cement mortar lined and epoxy coated steel pipe and fittings (inside tank piping), 16-inch CL150 steel flanges, insulating flanges assemblies and test stations, nuts and bolts, concrete encasement where required, pressure testing and disinfection, inspection, cleanup, connections to the existing pipelines, and protection of all adjacent utilities and all other work associated with the installation as shown on the Plans, specified in Specifications, and as directed by the ENGINEER.

## **8. 16-inch Interconnecting Piping**

- a.** The quantity of "16-inch Interconnecting Piping" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for "16-inch Interconnecting Piping" shall be full compensation for furnishing all materials, labor, equipment and tools to install the 16-inch CML&C Steel Interconnecting pipe complete and in place as shown on the CONTRACT DOCUMENTS, including, but not limited to, excavation, furnishing and installing bedding, pipe zone material, backfill, compaction, offsite disposal of excess material, 16-inch cement mortar lined and coated steel pipe and fittings, floor inlet, silt barrier, 16-inch CL150 steel flanges, insulating flange assembly, nuts and bolts, concrete encasement where required, pressure testing and disinfection, inspection, cleanup, connections to the existing pipelines, and protection of all adjacent utilities and all other work associated with the installation as shown on the Plans specified in Specifications and as directed by the ENGINEER.

## **9. Overflow Pipe**

- a.** The quantity of "Overflow Pipe" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for "Overflow Pipe" shall be full compensation for furnishing all materials, labor, equipment and tools to install the 16-inch Steel Overflow Pipe complete and in place as shown on the CONTRACT DOCUMENTS, including, but not limited to, 16-inch steel pipe and fittings, steel inlet, antivortex plate, pipe supports, 16-inch CL150 steel flanges, nuts and bolts, SST screen at outlet, concrete and AC drain aprons, disinfection, inspection, cleanup, and all other work associated with the installation as shown on the Plans, specified in Specifications and as directed by the ENGINEER.

## **10. Hydrostatic Testing and Disinfection**

- a.** The quantity of "Hydrostatic Testing and Disinfection" measured for payment shall be per lump sum.
- b.** The contract lump sum price for "Hydrostatic Testing and Disinfection" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the

disinfection and testing of tanks as shown on the CONTRACT DOCUMENTS, including, but not limited to, potable water, chlorine solution, bacteriological testing, chlorine concentration measurements, cleanup, protection of all adjacent utilities and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

#### **11. Cathodic Protection System for Welded Steel Tank**

- a. The quantity of "Cathodic Protection System for Welded Steel Tanks" measured for payment shall be lump sum installed.
- b. The contract lump sum price for "Cathodic Protection System for Welded Steel Tanks" shall be full compensation for furnishing all materials, labor, equipment and tools to remove and re-construct existing cathodic protection system for steel tank all as shown on the CONTRACT DOCUMENTS, including, but not limited to, survey of location of existing anodes, removal of existing anodes, rectifier, wiring, hangers and connection hardware, storage of this equipment and re-installation after completion of tank's rehabilitation work, inspection, testing, restoration of surrounding areas, protection of all adjacent utilities, and all other work associated with the installation as shown on the Plans, specified in Specification Section 13111, and as directed by the ENGINEER.

#### **12. Tank Instrumentation and Controls**

- a. The quantity of "Tank Instrumentation and Controls" measured for payment shall be lump sum.
- b. The contract lump sum price for "Instrumentation and Controls" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the Instrumentation and Controls as shown on the CONTRACT DOCUMENTS. **The OWNER will provide system integration contractor to perform any needed programming and integration with the existing system.** The CONTRACTOR shall be responsible for providing and installation of conduits and wiring from new RTU/MCC to pressure transmitter, CP rectifier and electric receptacles after rehabilitation of existing tank. CONTRACTOR shall provide all materials, equipment and labor to perform the work, including, but not limited to, excavation, furnishing and installing bedding, pipe zone material, backfill, compaction, offsite disposal of excess material, installation, concrete

equipment pads, electric receptacles and mounting hardware, inspection, testing, cleanup, protection of all adjacent utilities, coordination with system integration contractor, and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

### **13. Tank Appurtenances**

- a.** The quantity for "Tank Appurtenances" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for "Tank Appurtenances" shall be full compensation for all labor, materials, and equipment for the installation of 30" diameter access manway, shell sampling ports and enclosures, enclosure for pressure transmitter, furnished and installed, including but not limited to, structural calculations, modifications to the existing tank shell, testing, and all other work associated with the construction as shown on the Plans specified in Specifications, and as directed by the ENGINEER.

### **14. Force Account**

- a.** The lump sum quantity shown in the "Force Account" shall be included in the Bid. Only the **OWNER** shall determine the use of monies in the "Force Account".

## **BID SCHEDULE 1A**

### **(ITEMS 1A – 2A)**

#### **1A. Aluminum Dome Roof for Existing 1.0 MG Welded Steel Tank.**

- a.** The quantity for "Aluminum Dome Roof" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for " Aluminum Dome Roof" shall be full compensation for all labor, materials, and equipment for the AWWA D108 aluminum dome roof with specified finish, furnished and installed, including but not limited to, structural calculations, modifications to the existing tank shell, sealants, side vents on tank wall, OSHA compliant exterior ladder with fall protection system, hand railing and ramps, aluminum dome roof, access hatches, access ports for CP system, clog resistant

roof vents, level gauge, and all other work associated with the construction as shown on the Plans specified in Specifications, and as directed by the ENGINEER.

**2A. Tank Interior and Exterior Coatings.**

- a. The quantity of "Interior and Exterior Tank Coatings" measured for payment shall be lump sum installed.
- b. The contract lump sum price for "Interior and Exterior Tank Coatings" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the interior and exterior tank coatings as shown on the CONTRACT DOCUMENTS, including, but not limited to, preparation of tank surfaces prior to application of coatings, including, but not limited to, sandblasting, dust collection, and cleaning, interior coating, exterior coating, scaffolding, DFT testing, holiday testing, worker safety equipment, appropriately sized dust collection system, ventilation system, dehumidifier control system, exterior containment for protection of surrounding properties and facilities from dust and over-spraying, restoration of surrounding areas, protection of all adjacent utilities, and all other work associated with the installation as shown on the Plans, specified in the Specifications, and as directed by the ENGINEER.

**BID SCHEDULE 1B**

**(ITEMS 1B – 2B)**

**1B. Steel Roof for Existing 1.0 MG Welded Steel Tank.**

- a. The quantity for "Steel Roof for 1.0 MG Welded Steel Tank" measured for payment shall be per lump sum, complete in place.
- b. The contract lump sum price for "Steel Roof for 1.0 MG Welded Steel Tank" shall be full compensation for all labor, materials, and equipment for the self supporting steel roof, furnished and installed, including but not limited to, structural calculations, modifications to the existing tank shell, sealants, side vents on the tank's wall, OSHA compliant exterior ladder with fall prevention system, hand railing and ramps, steel roof structure, access hatches, clog resistant roof vents, level gauge, access ports for CP system, and all other work associated with the construction as shown on the Plans specified in Specifications,

and as directed by the ENGINEER.

**2B. Tank Interior and Exterior Coatings.**

- a. The quantity of "Interior and Exterior Tank Coatings" measured for payment shall be lump sum installed.
- b. The contract lump sum price for "Interior and Exterior Tank Coatings" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the interior and exterior tank coatings including steel roof all as shown on the CONTRACT DOCUMENTS, including, but not limited to, preparation of tank surfaces prior to application of coatings, including, but not limited to, sandblasting, dust collection, and cleaning, interior coating, exterior coating, scaffolding, DFT testing, holiday testing, worker safety equipment, appropriately sized dust collection system, ventilation system, dehumidifier control system, exterior containment for protection of surrounding properties and facilities from dust and overspraying, restoration of surrounding areas, protection of all adjacent utilities, and all other work associated with the installation as shown on the Plans, specified in the Specifications, and as directed by the ENGINEER.

**BID SCHEDULE 2**

**BASE BID (ITEMS 1-11)**

**1. Mobilization/Demobilization, Bonds, Permitting, and Insurance**

- a. The quantity of "Mobilization/Demobilization, Bonds, Permitting and Insurance" measured for payment shall be lump sum.
- b. The contract lump sum price for "Mobilization/Demobilization, Bonds, Permitting, and Insurance" shall be full compensation for furnishing all materials, labor, equipment and tools for all required bonds, insurance, acquiring permits and fees, mobilization of staff and equipment, submittals, construction surveying and staking, and any other costs associated with complying with the contract administrative requirements and commencing work at the project site. This item also includes all work and materials necessary to complete the work and to demobilize and perform project closeout as described in the plans and specifications. **Payment for this item shall**

**not be requested until at least thirty days from the notice to proceed has elapsed.**

c. Payment for this item shall be made in accordance with Table A.

TABLE A

Payment for Mobilization on First Partial Payment	Not to exceed 2.5% of the Lump Sum Base Bid
Subsequent payments for Mobilization	Not to exceed 2.5% of the Lump Sum Base Bid
Payment For Mobilization on Final Partial Payment	Any remaining Mobilization in excess of 5% of the Lump Sum Base Bid

**2. Demolition of Existing Tank and Retaining Ring**

- a. The quantity of "Demolition of Existing Tank and Retaining Ring" measured for payment shall be lump sum, complete in place.
- b. The contract lump sum price for "Demolition of Existing Tank and Retaining Ring" shall be full compensation for furnishing all materials, labor, equipment and tools to remove the equipment and facilities as shown on the CONTRACT DOCUMENTS, including, but not limited to excavation, backfill, compaction, removal of steel welded tank and tank appurtenances, removal of existing site piping associated with the tank, removal of steel soil retaining ring, temporary removal of existing crushed rock site surfacing, storage and re-installation after completion of work, grading around the tank to provide positive drainage, and support and protection of all adjacent utilities. The price shall also include all fees for transportation and disposal of all demolition work to certified disposal sites.

**3. Tank Concrete Ring Foundation**

- a. The quantity of "Tank Concrete Ring Foundation" measured for payment shall be lump sum, complete in place.
- b. The contract lump sum price for "Tank Concrete Ring Foundation" shall be full compensation for the design and furnishing all materials, labor, equipment and tools to provide the reinforced concrete footing for welded steel water tank as

shown on the CONTRACT DOCUMENTS, including, but not limited to, excavation, backfill, compaction, concrete, steel reinforcement, formwork, and restoration of surrounding areas, protection of all adjacent utilities, and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER

**4. 6-inch Thick Oil Impregnated Sand Base**

- a. The quantity of "6-inch Thick Oil Impregnated Sand Base" measured for payment shall be per lump sum, complete in place.
- b. The contract lump sum price for "6" Oil Impregnated Sand Base" shall be full compensation for furnishing all materials, labor, equipment and tools to provide 6-inches of oil impregnated sand layer, impermeable vapor layer, 3" PVC perforated drain pipe and drain cleanouts, preparation and compaction of subgrade, and not specified in other bid items, as shown on the CONTRACT DOCUMENTS, including, but not limited to, excavation, furnishing and installing 6-inches of oil-impregnated sand layer, backfill, PVC pipe, impermeable vapor layer, compaction, offsite disposal of excess material, cleanup, protection of all adjacent utilities and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

**5. 16-inch Inlet/Outlet Piping**

- a. The quantity of "16-inch Inlet/Outlet Piping" measured for payment shall be per lump sum, complete in place.
- b. The contract lump sum price for "16-inch Inlet/Outlet Piping" shall be full compensation for furnishing all materials, labor, equipment and tools to install the 16-inch CML&C Steel Inlet and Outlet Pipe and Fittings complete and in place as shown on the CONTRACT DOCUMENTS, including, but not limited to, excavation, furnishing and installing bedding, pipe zone material, backfill, compaction, offsite disposal of excess material, 16-inch cement mortar lined and coated steel pipe and fittings (site piping), 16-inch cement mortar lined and epoxy coated steel pipe and fittings (inside tank piping), 16-inch CL150 steel flanges, 16-inch butterfly valve, insulating flanges assemblies and test stations, nuts and bolts, concrete encasement where required, pressure testing and disinfection,

inspection, cleanup, connections to the existing pipelines, and protection of all adjacent utilities and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER

**6. 16-inch Interconnecting Piping**

- a. The quantity of "16-inch Interconnecting Piping" measured for payment shall be per lump sum, complete in place.
- b. The contract lump sum price for "16-inch Interconnecting Piping" shall be full compensation for furnishing all materials, labor, equipment and tools to install the 16-inch CML&C Steel Interconnecting pipe complete and in place as shown on the CONTRACT DOCUMENTS, including, but not limited to, excavation, furnishing and installing bedding, pipe zone material, backfill, compaction, offsite disposal of excess material, 16-inch cement mortar lined and coated steel pipe and fittings, floor inlet, silt barrier, 16-inch CL150 steel flanges, insulating flange assembly and test station, flexible coupling assembly, nuts and bolts, concrete encasement where required, pressure testing and disinfection, inspection, cleanup, connections to the existing pipelines, and protection of all adjacent utilities and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

**7. Overflow Pipe**

- a. The quantity of "Overflow Pipe" measured for payment shall be per lump sum, complete in place.
- b. The contract lump sum price for "Overflow Pipe" shall be full compensation for furnishing all materials, labor, equipment and tools to install the 16-inch Steel Overflow Pipe complete and in place as shown on the CONTRACT DOCUMENTS, including, but not limited to, 16-inch steel pipe and fittings, steel inlet, antivortex plate, pipe supports, 16-inch CL150 steel flanges, nuts and bolts, SST screen at outlet, concrete drain apron, AC apron, disinfection, inspection, cleanup, and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

**8. Hydrostatic Testing and Disinfection**

- a. The quantity of "Hydrostatic Testing and Disinfection" measured for payment shall be per lump sum.
- b. The contract lump sum price for "Hydrostatic Testing and Disinfection" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the disinfection and testing of tanks as shown on the CONTRACT DOCUMENTS, including, but not limited to, potable water, chlorine solution, bacteriological testing, chlorine concentration measurements, cleanup, protection of all adjacent utilities and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

#### 9. **Cathodic Protection System for Welded Steel Tank**

- a. The quantity of "Cathodic Protection System for Welded Steel Tank" measured for payment shall be lump sum installed.
- b. The contract lump sum price for "Cathodic Protection System for Welded Steel Tanks" shall be full compensation for furnishing all materials, labor, equipment and tools to provide cathodic protection for welded steel tanks and site piping all as shown on the CONTRACT DOCUMENTS, including, but not limited to, anode control box, wiring, hangers and connection hardware, anodes, exothermic welds, reference electrodes, access handholes, inspection, testing, restoration of surrounding areas, protection of all adjacent utilities, and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

#### 10. **Tank Instrumentation and Controls**

- a. The quantity of "Tank Instrumentation and Controls" measured for payment shall be lump sum.
- b. The contract lump sum price for "Instrumentation and Controls" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the Instrumentation and Controls as shown on the CONTRACT DOCUMENTS. **The OWNER will provide system integration contractor to perform any needed programming and integration with the existing system.** The CONTRACTOR shall be responsible for providing and installation of conduits and wiring from new RTU/MCC to pressure transmitter and electric receptacles after

rehabilitation of existing tank. CONTRACTOR shall provide all materials, equipment and labor to perform the work, including, but not limited to, excavation, furnishing and installing bedding, pipe zone material, backfill, compaction, offsite disposal of excess material, installation, concrete equipment pads, electric receptacles and mounting hardware, inspection, testing, cleanup, protection of all adjacent utilities, coordination with system integration contractor, and all other work associated with the installation as shown on the Plans and as directed by the ENGINEER.

**11. Force Account**

- a. The lump sum quantity shown in the "Force Account" shall be included in the Bid. Only the **OWNER** shall determine the use of monies in the "Force Account".

**BID SCHEDULE 2A**

**(ITEMS 1A – 2A)**

**1A. 1.0 MG Welded Steel Tank with Aluminum Dome Roof.**

- a. The quantity for "1.0 MG Welded Steel Tank with Aluminum Roof" measured for payment shall be per lump sum, complete in place.
- b. The contract lump sum price for "1.0 MG Welded Steel Tank with Aluminum Roof" shall be full compensation for all labor, materials, and equipment for the AWWA D100 welded steel tank reservoir, furnished and installed, including but not limited to, structural calculations, geotechnical investigations, welded steel tank, sealants, wall penetrations, anchor bolts (if required), shell side vents, OSHA compliant exterior ladder with fall prevention system, hand railing and ramps, aluminum dome roof with specified finish, access hatches, clog resistant roof vents, level gage, access manways and cleanouts, access ports for CP system, and all other work associated with the construction as shown on the Plans specified in Specifications, and as directed by the ENGINEER.

**2A. Tank Interior and Exterior Coatings.**

- a. The quantity of "Interior and Exterior Tank Coatings" measured for payment shall be lump sum installed.

- b.** The contract lump sum price for "Interior and Exterior Tank Coatings" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the interior and exterior tank coatings (except aluminum roof) all as shown on the CONTRACT DOCUMENTS, including, but not limited to, preparation of tank surfaces prior to application of coatings, including, but not limited to, sandblasting, dust collection, and cleaning, interior coating, exterior coating, scaffolding, DFT testing, holiday testing, worker safety equipment, appropriately sized dust collection system, ventilation system, dehumidifier control system, exterior containment for protection of surrounding properties and facilities from dust and over-spraying, restoration of surrounding areas, protection of all adjacent utilities, and all other work associated with the installation as shown on the Plans, specified in the Specifications, and as directed by the ENGINEER.

## **BID SCHEDULE 2B**

### **(ITEMS 1B – 2B)**

#### **1B. 1.0 MG Welded Steel Tank with Steel Roof.**

- a.** The quantity for "1.0 MG Welded Steel Tank with Steel Roof" measured for payment shall be per lump sum, complete in place.
- b.** The contract lump sum price for "1.0 MG Welded Steel Tank with Steel Roof" shall be full compensation for all labor, materials, and equipment for the AWWA D100 welded steel tank reservoir, furnished and installed, including but not limited to, structural calculations, geotechnical investigations, welded steel tank, wall penetrations, anchor bolts (if required), shell side vents, OSHA compliant exterior ladder with fall prevention system, hand railing and ramps, steel roof, access hatches, clog resistant roof vents, level gage, access manways and cleanouts, access ports for CP system, and all other work associated with the construction as shown on the Plans specified in Specifications, and as directed by the ENGINEER.

#### **2B. Tank Interior and Exterior Coatings.**

- a.** The quantity of "Interior and Exterior Tank Coatings" measured for payment shall be lump sum installed.
- b.** The contract lump sum price for "Interior and Exterior Tank

Coatings" shall be full compensation for furnishing all materials, labor, equipment and tools to provide the interior and exterior tank coatings including steel roof all as shown on the CONTRACT DOCUMENTS, including, but not limited to, preparation of tank surfaces prior to application of coatings, including, but not limited to, sandblasting, dust collection, and cleaning, interior coating, exterior coating, scaffolding, DFT testing, holiday testing, worker safety equipment, appropriately sized dust collection system, ventilation system, dehumidifier control system, exterior containment for protection of surrounding properties and facilities from dust and overspraying, restoration of surrounding areas, protection of all adjacent utilities, and all other work associated with the installation as shown on the Plans, specified in the Specifications, and as directed by the ENGINEER.

#### **4.3 Progress Payments**

- A.** Contract provides for payment of 90% for completed work until final payment. Completed work includes placement of all equipment and piping, site work, testing, clean-up and inspection.
- B.** Partial pay estimates must be submitted to the ENGINEER no later than the 25th of each month. Pay estimates may only include work that has been completed at that time.

#### **4.4 Final Payment**

- A.** Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the ENGINEER multiplied by the unit sum/price for work which is incorporated in or made necessary by the Work.

### **PART 5 – DEFECT ASSESSMENT**

- 5.1** Replace the Work, or portions of the work, not conforming to specified requirements.
- 5.2** If, in the opinion of the ENGINEER, it is not practical to remove and replace the Work, the ENGINEER will direct/approve remedies to repair defective work.
- 5.3** The authority of the ENGINEER to assess the defect and identity payment adjustment is final.

## **PART 6 – NON-PAYMENT FOR REJECTED PRODUCTS**

- 6.1** Payment will not be made for any of the following:
- A.** Products wasted or disposed of in a manner that is not acceptable.
  - B.** Products determined as unacceptable before or after placement.
  - C.** Products not completely unloaded from the transportation vehicle.
  - D.** Products placed beyond the lines and levels of the required Work.
  - E.** Products remaining on hand after completion of the Work.
  - F.** Loading, hauling and disposing of rejected products.

**\*\* END OF SECTION \*\***

## **SECTION 01610**

### **SITE SECURITY**

#### **PART 1 – GENERAL**

##### **1.1 Description**

- A.** This section describes the CONTRACTOR's responsibility for the security of the work site, existing facilities, off-site storage, and CONTRACTOR's tools and equipment.

##### **1.2 Requirements**

- A.** The CONTRACTOR shall safely guard all work, materials, equipment, and property from loss, theft, damage, and vandalism. CONTRACTOR's' duty to safely guard property shall include the OWNER's property and other private property from injury or loss in connection with the performance of the WORK.
- B.** Security for any off-site storage of equipment and materials is the responsibility of the CONTRACTOR.
- C.** The CONTRACTOR shall provide the OWNER a list of assigned field personnel to ensure security of the OWNER facilities.
- D.** The CONTRACTOR shall employ watchmen as needed to provide the required security and prevent unauthorized entry.
- E.** The CONTRACTOR may make no claim against the OWNER for damage resulting from trespass.
- F.** The party responsible for security shall make good all damage to property of the OWNER and others resulting from failure to provide adequate security.
- G.** If existing fencing or barriers are breached or removed for the purposes of construction, the CONTRACTOR shall provide and maintain temporary security fencing equal to the existing in a manner satisfactory to the ENGINEER.
- H.** Security measures taken by the CONTRACTOR shall be at least equal to those typically provided by the OWNER to protect the existing facilities during normal operation.

- I. A security program shall be maintained throughout construction until final acceptance and occupancy precludes need for CONTRACTOR's security program.
- J. CONTRACTOR shall provide its field personnel with identifiable uniforms when on OWNER property.
- K. The OWNER will not take any responsibility for missing or damaged equipment, tools, construction, or personal belongings. In the instance of any such loss, theft, or damage, the CONTRACTOR shall be responsible to renew, restore, or replace remedy the work, tools, equipment, personal belongings without additional costs to the OWNER.

**PART 2 – PRODUCTS – Not Applicable**

**PART 3 – EXECUTION – Not Applicable**

**PART 4 – MEASUREMENT AND PAYMENT**

**4.1** Refer to Section 01210, Measurement and Payment

**\*\* END OF SECTION \*\***

**SECTION 02050**

**DEMOLITION AND REMOVALS**

**PART 1 – GENERAL**

**1.1 Description**

- A.** The work of this Section consists of the demolition, removal, and disposal of the existing designated facilities, including steel tank at Site 2A, site piping, and appurtenances, as designated in the CONTRACT DOCUMENTS all as necessary for the performance of this Contract.
  
- B.** All items designated for removal shall be completely removed from the site, hauled and disposed in a legal manner. No on-site disposal shall be permitted.

**1.2 Related Sections**

- A.** The work of the following Sections applies to the Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

Measurement and Payment.....Section 01210  
Submittals..... .Section 01330

**1.3 CONTRACTOR Submittals**

- A. Affidavit of Compliance.** Prior to commencing with demolition work, the CONTRACTOR shall submit to OWNER an affidavit of compliance detailing the final disposition for items and materials to be removed from the site. Said affidavit shall list the locations of all offsite disposal sites to be utilized, and shall include the CONTRACTOR's certification that those sites are legal for the disposal of the subject items or materials. The affidavit shall include a similar list of recyclers and CONTRACTOR's certification, if utilized.
  
- B. Receipts.** CONTRACTOR shall submit receipts from all disposal sites and recyclers utilized for the disposal of items and materials removed from the site. Said receipts shall account for the entire quantities of all items and materials removed from the site.

## **PART 2 – PRODUCTS**

### **2.1 General**

- A.** All demolition and removals shall be of the types shown on the CONTRACT DOCUMENTS and shall conform to the applicable Sections of these Specifications.
- B.** All concrete products to be demolished and removed shall be disposed of off-site to an approved disposal facility. At no time will concrete be allowed to be crushed on-site, nor shall it be re-used in any way for the Work identified in the CONTRACT DOCUMENTS.

## **PART 3 – EXECUTION**

### **3.1 General**

- A.** Execution of all demolition and removals shall be per the CONTRACT DOCUMENTS and shall conform to the applicable Sections of these Specifications.

### **3.2 Salvage Work**

- A.** When the CONTRACTOR is required to remove existing pipe and appurtenances, or portions thereof, from the ground, such materials may, at the discretion of the ENGINEER, be considered salvage. All materials identified as salvage are considered property of the OWNER.
- B.** The CONTRACTOR shall remove and temporarily stockpile all materials identified as salvage in a safe location that will not disrupt traffic until the times can be delivered to the OWNER's Public Works Maintenance Facility.
- C.** The CONTRACTOR shall legally dispose of all other materials in an appropriate manner. Disposal is the responsibility of the CONTRACTOR. Obtain concurrence from the agency having disposal jurisdiction with respect to disposal sites and transportation methods.

### **3.3 Protection of Items to Remain**

- A.** CONTRACTOR shall be responsible to protect from damage any items not subject to removal, including, but not limited to,

existing vegetation and landscaping, electrical, SCADA and mechanical equipment, structures, or piping.

- B.** Should damage occur to items not subject to removal due to CONTRACTOR's operations during any phase of the WORK, CONTRACTOR shall repair or replace said items to the satisfaction of the OWNER at CONTRACTOR's expense.
- C.** The existing concrete slab and storage located near Tank 2A-06, existing pump station and tank 2A-07, including all associated piping, power, telephone, telemetry, equipment and appurtenances, shall be protected, and shall remain intact, operational, and accessible throughout construction operations. CONTRACTOR shall coordinate his efforts with the OWNER to assure this outcome, and shall bear all costs associated with this coordination and assurance of this outcome.
- D.** For Alternative 1A and 1B, the existing Corrosion Protection system will be re-installed after rehabilitation work is completed. The CONTRACTOR shall carefully remove the pin insulators and clevises, anodes and rectifier and store in suitable place.

### **3.4 Demolition and Removal**

- A.** CONTRACTOR shall demolish or dismantle and remove all items scheduled for demolition and removal as shown on the drawings and as specified herein that will interfere with the planned construction, or as otherwise directed by ENGINEER. CONTRACTOR shall comply with all pertinent regulations of OSHA and local codes and practices. The site shall be kept neat and orderly during the demolition. Adjacent public right-of-way and private property shall be kept free of debris at all times. Stockpiles of items or materials to be removed shall be removed from the site on a daily basis, or stored in a dumpster or other portable trash receptacle, which shall be emptied on a weekly basis. Accumulations of flammable material shall not be permitted.

### **3.5 Disposal and Recycling**

- A.** All items or debris removed from the site shall be transported offsite in a legal manner and disposed of at a legal disposal site. Concrete debris shall be transported to an appropriate recycler of such materials. All disposal sites and recycling facilities shall be approved by the OWNER prior to initiation of the work.

Hazardous materials (i.e. asbestos materials) shall be handled and disposed of at a legally acceptable recycler or placed into a legally acceptable landfill, all in accordance with all applicable laws, codes, and regulations.

Items to be demolished/disposed shall be removed from the project's premises by the end of the project.

### **3.6 Abandonment**

- A.** Where shown on the Drawings, where specified herein, or as approved by the ENGINEER, CONTRACTOR may select to abandon in place those existing facilities that are not required to remain in service and that will not otherwise interfere with the execution of the CONTRACT. Facilities to be abandoned shall be abandoned in accordance with the CONTRACT DOCUMENTS.

### **3.7 Record Drawings**

- A.** CONTRACTOR shall be responsible to familiarize himself with the existing conditions and facilities operation prior to commencing with the work of this Section, or any other work under this Contract except as specified elsewhere.
- B.** An available record drawings are included in the Specifications Appendix A for CONTRACTOR's reference. CONTRACTOR shall obtain copies of those drawings, to properly familiarize himself with the existing conditions and facilities operations; and to be able to schedule and complete the required demolition and construction operations necessary within the constraints of these Specifications. The OWNER doesn't guarantee accuracy of the record drawings.

## **PART 4 – MEASUREMENT AND PAYMENT**

- 4.1** See Section 01210 "Measurement and Payment".

**\*\* END OF SECTION \*\***

## **SECTION 02652**

### **STEEL PIPE AND SPECIALS**

#### **PART 1 – GENERAL**

##### **1.1 Description**

- A.** This section includes materials, fabrication, installation, and testing of steel pipe used for tank's inlet/outlet and overflow piping. The steel pipe shall be cement mortar lined and either epoxy coated or cement mortar coated as applicable.

##### **1.2 Related Sections**

- A.** The work of the following Sections applies to the WORK of this Section. Other Sections of the SPECIFICATIONS, not referenced below, shall also apply to the extent required for proper performance of this WORK.

Measurement and Payment	Section 01210
Submittals	Section 01330
Demolition and Removals	Section 02050
Earthwork	Section 02200
Trench Excavation and Backfill	Section 02300
Protective Coatings	Section 09900

##### **1.3 Submittals**

- A.** Submit submittal packages in accordance with Standard Specification Section 01330.
- B.** Submit piping layout drawings showing location and dimensions of all pipe and fittings. Include laying lengths of valves and other equipment determining piping dimensions. Label or number each fitting or piece of pipe and provide the following information for each item:
- C.** Material of construction, with ASTM or API reference and grade.
- D.** Wall thickness of steel pipe and fittings.
- E.** Details of lining and coating.
- F.** Manufacturer's certificates of compliance with referenced pipe standards, e.g., ASTM A 53, ASTM A 135, API 5L.

- G.** Call out weld sizes and dimensions of grooved ends, flanges, fittings, joint harnesses, annular thrust ring plates, and butt strap closures.
- H.** Shop drawings of all pipe and fittings shall be submitted to the ENGINEER for review. Shop drawings shall be complete in all respects. If the shop drawings show any deviations from the requirements of the Drawings and Standard Specifications because of standard shop practices or other reasons, the deviations and the reasons therefore shall be set forth in the Shop Drawing Submittal Form.

#### **1.4 Inspection and Field Verification**

- A.** Where new pipelines are to be connected to existing waterlines, the Contractor shall verify in the field the location, elevation, pipe material, pipe outside diameter, and any other characteristics of the existing waterline before proceeding with the pipe fabrication or installation. This field verification shall be performed in the presence of the ENGINEER. Adjust and align the new piping as necessary to meet the field conditions and provide all required material, labor, and equipment to make the connection.

### **PART 2 – MATERIALS**

#### **2.1 Steel Pipe**

- A.** Pipe shall be black carbon steel conforming to ASTM A 53, Type E or S, Grade B; API 5L, Grade B; or ASTM A 135, Grade B. Pipes shall be standard weight per ASME B36.10.

#### **2.2 Steel Fittings**

- A.** Steel fittings are defined as a special piece of pipe other than a normal straight section. Elbows, crosses, tees, and reducers are fittings.
- B.** Fittings shall be butt-welded conforming to ASME B16.9. Material shall be wrought steel conforming to ASTM A 234, Grade WPB. Wall thickness shall be the same as the pipe. Elbows shall be long radius.

### **2.3 Cement for Interior Lining**

- A.** Use cement conforming to ASTM C 150, Type II. Minimum cement mortar lining thickness for steel pipe and fittings shall be 5/16 inches.

### **2.4 Cement for Exterior Mortar Coating**

- A.** Use cement conforming to ASTM C 150, Type II. Minimum cement mortar coating thickness for buried steel pipe and fittings shall be 3/4 inches. Coating within one bolt length of a flange shall be held to a thinner application to allow for assemble of all bolts.

### **2.5 Flanges**

- A.** Provide flanges that match the flange of the connecting valve or other equipment and where shown in the Drawings.
- B.** Provide welding neck flanges for attachment to wrought steel fittings. Provide welding neck or slip on flanges for attachment to pipe. Slip on flanges shall be double welded. Flange material shall conform to ASTM A 105, A 181, or A 182. Flanges shall be flat faced.
- C.** Flanges shall comply with ASME B16.5, Class 150.

### **2.6 Bolts, Nuts and Gaskets for Flanges**

- A.** Stainless steel bolts and nuts shall be used for the installation. Bolts shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M for bolts and grade 8M for nuts.
- B.** Insulate SST bolts and nuts from carbon steel inside the tank. Use G10 isolating sleeves washers and gaskets.
- C.** Flange gaskets shall comply with AWWA C207. Flange gaskets shall be 1/8-inch thick acrylic or aramid fiber bound with nitrile. Gaskets shall be full-face type.

### **2.7 Insulating Flange Kits**

- A.** See Specification Section 13110.

### **2.8 Outlets**

- A.** For threaded outlets 3 inches and smaller, use a thredolet type per AWWA Manual M11 (Current Edition), Chapter 13. Outlets shall be

3000 pound WOG forged steel per ASTM A 105 or ASTM A 216, Grade WCB. Threads shall comply with ASME B1.20.1, NPT. Outlets shall be Bonney Forge Co. "Thredolet", Allied Piping Products Co. "Branchlet", or approved equal. Do not use pipe couplings for outlets.

- B. For flanged outlets 4 inches and larger, use a tee with a welding neck flange.

## **2.9 Type of Joints**

- A. Joints shall be flanged to connect to valves and other equipment.
- B. Joints between pipe, fittings, and welding neck flanges shall be full penetration butt weld. Joints between pipe and slip on flange shall be fillet welds to the interior and exterior.
- C. Provide butt strap closures to connect sections of pipe laid from opposite directions and to adjust the field lengths to meet the conditions of the installation. Butt straps 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 shall be centered over the plain ends of the pipe sections they are to join. Weld a 5-inch threaded, steel, standard half coupling to the interior and exterior of the top butt strap half section to provide access for mortar lining the inside of the joint. Provide a threaded steel plug for the coupling.

## **2.10 Painting and Coating**

- A. Coat pipe inside the tank (above the ground) with the same coating system used for tank's inside surfaces in accordance with Specification Section 09950. Apply prime coating (if applicable) in shop.
- B. Coat pipe outside the tank (above the ground) with the same coating system used for tank's outside surfaces in accordance with Specification Section 09950. Apply prime coating in shop.
- C. Cement mortar coat buried pipe where shown on the Drawings. Apply coating in shop.

## **2.11 Corrosion Control Components**

- A. See Specification Section 13110.

## **PART 3 – EXECUTION**

### **3.1 Fabrication, Assembly and Erection**

- A.** Beveled ends for butt welding shall conform to ASME B16.25. Remove slag by chipping or grinding. Surfaces shall be clean of paint, oil, rust, scale, slag, and other material detrimental to welding. When welding the reverse side, chip out slag before welding.
- B.** Fabrication shall comply with ASME B31.3, Chapter V. Welding procedure and performance qualifications shall be in accordance with Section IX, Articles II and III, respectively, of the ASME Boiler and Pressure Vessel Code.
- C.** Apply full penetration weld to exterior joint of butt welded pipe, fittings, and welding neck flanges. Apply fillet welds to the interior and exterior circumference of the pipe and slip on flanges. Minimum size of fillet weld shall be equal to the steel cylinder thickness. Complete each pass around the entire circumference of the pipe before commencing the next pass. Use electrodes recommended by the pipe fabricator. Do not deposit more than 1/8-inch of throat thickness per pass. The minimum number of passes or beads in the completed weld shall be as follows:

<b>Steel Cylinder Thickness (inch)</b>	<b>Minimum Number of Passes for Welded Joints</b>
0.2500 and Less	2
Greater than 0.2500	3

- D.** Use the shielded metal arc welding (SMAW) process for welding.
- E.** Welding preparation shall comply with ASME B31.3, paragraph 328.4. Limitations on imperfections in welds shall conform to the requirements in ASME B31.3, Table 341.3.2, and paragraph 341.4 for visual examination.
- F.** Identify welds in accordance with ASME B31.3, paragraph 328.5.
- G.** Clean each layer of deposited weld metal prior to depositing the next layer of weld metal, including the final pass, by a power-driven wire brush.
- H.** Welding electrodes shall comply with AWS A5.1.

- I. After shop fabrication and prior to shop applied linings and coatings, test each welded joint by the liquid penetrant method. Conform to the requirements specified in ASTM E 165. The materials used shall be either water washable or nonflammable. Products "Spotcheck" by the Magnaflux Corporation or "Met-L-Check Flaw-Findr" by the Met-L-Check Company. Chip out all defects, reweld, and retest the section affected until it shows no leaks or other defects.

### **3.2 Delivery and Temporary Storage of Pipe**

- A. Lift pipe with wide belt slings. Do not use cable slings or chains. Support the pipe on wooden blocks and secure it from rolling. Do not roll or drop the pipe on the ground or allow the pipe to fall from the delivery trucks. Do not remove the plastic caps placed over the ends until the pipe is ready to be placed in the trench or installed in the vault.

### **3.3 Installing Buried Pipe**

- A. Install the pipe with butt straps, metallic bond wires, marking tape, and other appurtenant items for the installation as shown in the Drawings. Wrap buried valves and flanges with polyethylene material. Repair polyethylene material damaged during construction.

### **3.4 Installing Pipe in Tank**

- A. Install pipe in the tank without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Provide temporary supports and place the assembled piping at the correct grade and position in the tank.

### **3.5 Installing Insulating Flange Kits**

- A. Install insulating flange kits with coatings per Specification Section 13110

### **3.6 Installing Corrosion Control Components**

- A. Install bond wires, anodes, and test stations per Specification Section 13110.

### **3.7 Testing New Pipe which connect to Existing Pipe**

- A.** Prior to hydrostatic pressure testing new pipes which are to be connected to the existing pipes, isolate the new pipe from the existing by the means of test bulkheads, spectacle flanges, blind flanges or test plugs.
- B.** Maintain the pipeline test pressure for the following duration and restore test pressure whenever drops 5 psi.

Nominal Pipe Size (in)	Duration of Test (hr)
8" and less	4
20" and greater	8

Allowable leakage for welded steel pipe shall be zero.

- C.** After satisfactory pressure testing, drain the pipe, remove bulkheads, temporary piping and valves, connect to existing facilities, and restore pipe coating.
- D.** Test pressure for pipes connecting the tank 2A-06 shall be 80 psi.

### **3.8 Disinfection**

- A.** See Specification Section 13211. Combine pipe disinfection with tank disinfection.

**\*\* END OF SECTION \*\***

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## **SECTION 05051**

### **SHOP-APPLIED METAL FINISHES**

#### **PART 1 – GENERAL**

##### **1.1 Description**

- A.** This section includes shop applied fluoropolymer (PVDF) powder coating and anodize finish for aluminum dome roof for water tank.

##### **1.2 References**

- A.** American Architectural Manufacturers Association (AAMA).
  - 1.** 611–12 - Voluntary Specification for Anodized Architectural Aluminum
  - 2.** 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels.
- B.** ASTM International (ASTM)
  - 1.** B449 - Standard Specification for Chromates on Aluminum.
  - 2.** D1730 - Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
  - 3.** D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
  - 3.** D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

##### **3.1 Quality Assurance**

- A.** Anodize finish: adhere to requirements of AAMA 611-12.
- B.** PVDF based finish: adhere to requirements of AAMA 2605-05.
- C.** Applicator qualifications: certified by AAMA
- D.** Verify accuracy of components, quantities, and sizes prior to application of finishes.

### **3.2 Submittals**

- A.** Submit submittal package in accordance with Specification Section 01330.
- B.** Submit 2x3.5inch coating samples showing available colors on aluminum backing.
- C.** Submit manufacturer's certification that finishes applied on Project components comply with referenced AAMA standards.
- D.** Provide information regarding touch-up, cleaning, and maintenance of finishes.

### **3.3 Delivery, Storage and Handling**

- A.** Apply manufacturer's protective coverings to finished surfaces.
- B.** Deliver, store, and handle finished components in manner to prevent damage to finishes.

### **3.4 Sample and Testing.**

- A.** The fabricator/finisher shall be responsible for providing adequate sampling and testing to insure that the production quality meets the AAMA 611-12 (anodize finish) or AAMA 2605-05 (PVDF finish) test requirements.
- B.** Tests records shall be kept on-file and include the product date and respective test results.

## **PART 2 – MATERIALS**

### **2.1 Anodize Finish**

- A.** All exposed aluminum roof surfaces and roof appurtenances should receive an architectural anodized finish in conformance with AAMA 611-12 standard. Processing should be sulfuric acid or equivalent anodizing with electrolytic or immersion deposited inorganic pigmentation in the coating. The resulting anodized finish should be continuous, fully sealed and free of powdery surfaces, smut and blemishes.
- B.** Anodized finish: AAMA 611-12 Class II anodized to 0.7 mils min thickness.
- C.** All coatings shall have matte finish. Color palette shall include light

brown/tan, bronze. Verify color and finish with ENGINEER before ordering.

- D. Sealant shall be compatible with coatings and meet the performance requirement of AAMA 800 sealant specifications.

## **2.2 PVDF based Coatings**

- A. All exposed aluminum roof surfaces and roof appurtenances should receive a fluoropolymer (PVDF) finish in conformance with AAMA 2605-05 standard. The resulting PVDF finish should be continuous, fully sealed and free of powdery surfaces, smut and blemishes.
- B. Fluoropolymer finish shall contain minimum 70 percent PVDF resins, three coat system.
- C. All coatings shall have matte finish. Color palette shall include light brown/tan, bronze. Verify color and finish with ENGINEER before ordering.
- D. Coating: PVDF Kynar 500 or Halar 5000 finish system.

## **PART 3 – EXECUTION**

### **3.1 Adjusting**

- A. Touch up minor scratches and abrasions in finishes in accordance with finish manufacturer's instructions; replace components having damage that cannot be successfully touched up.

### **3.2 Cleaning**

- A. Clean finished surfaces after installation in accordance with finish manufacturer's instructions.

## **PART 4 – MEASUREMENT AND PAYMENT**

- 4.1 Refer to Specification Section 01210, Measurement and Payment.

**\*\* END OF SECTION\*\***

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## **SECTION 05162**

### **ALUMINUM GEODESIC DOME ROOF**

#### **PART 1 – GENERAL**

##### **1.1 Summary**

- A.** This section covers the design, fabrication, and installation of an aluminum geodesic dome roof.

##### **1.2 Scope of Work**

- A.** Design, furnish labor, materials, equipment, and incidentals as required to install the geodesic dome roof specified herein.
- B.** Incidentals include modifications to the existing tank (Alternative 1A only) to make the tank suitable for the roof, included, but not limited to:
  - 1.** Removal of existing roof and support columns
  - 2.** Wind girder and top shell angle (if needed for rehab option)
  - 3.** New ladder platform, walkways and railings to allow safe access to the roof.
  - 4.** New level indicator
  - 5.** Tank shell modification

##### **1.3 Design Requirements**

- A.** Design the roof in accordance with AWWA D108.
- B.** Where that standard uses the term "Purchaser", it shall be meant to refer to the design engineer engaged by the CONTRACTOR, except where the information called for is provided herein.

##### **1.4 Submittals**

- A.** Submit the following in accordance with Specification Section 013300:
  - 1. Experience List:** A completed contracts summary shall

demonstrate that the firm has a minimum ten year experience in either retrofitting or installing new, geodesic domes to steel ground storage tanks, and list a minimum of five tanks of equal or greater capacity in successful operation for at least three years. Provide the location, capacity, year completed, contact names and phone numbers. Failure to provide this information shall be cause for rejection of the submittal.

2. **Construction Drawings:** Provide elevation, plan and sectional view drawings of the dome, tank modifications, and all appurtenant equipment and accessories. Show the location, dimensions, material specifications, joint attachment method and finish requirements. The submittal shall be sealed by a structural engineer licensed in the State of Arizona.
3. **Calculations:** For dome designs other than those utilizing computer programs, submit engineering design calculations for structural and covering components. Design calculations shall be signed by a structural engineer licensed in the State of Arizona. For computer-programmed designs, submit the stress values utilized in the analysis and a certificate, signed by a structural engineer licensed in the State of Arizona, stating the design criteria and procedures used in attesting to adequacy and accuracy of the design.

### 1.5 Existing Tank

- A. The thicknesses of the existing shell courses, roof and bottom plates of Tank 2A are based on actual measurements performed by Tank Industrial Consultants (December 2015).

Tank element thicknesses:

Element	Units	
Roof Plates	inches	0.209-0.213
Shell Ring #3	inches	0.286-0.289
Shell Ring #2	inches	0.358-0.362
Shell Ring #1	inches	0.526-0.530
Bottom Plates	Inches	0.313-0.318

## **1.6 Unit Responsibility**

The CONTRACTOR shall assign the design, fabrication, and erection of the domes to a manufacturer who specializes in such structures.

## **1.7 Manufacture's Services**

Provide dome manufacturer's technical services at the jobsite for the minimum labor days listed below, travel time excluded:

- A.** Three labor days to check initial conditions prior to erecting the dome, verify that the proper erection procedures have been established, and advise during the initial dome erection.
- B.** Two labor days to check installation at approximately the midpoint of the installation.
- C.** Two labor days to check the final installation and advise during the final erection and completion of the dome.

## **PART 2 – PRODUCTS**

### **2.1 Dome Design Criteria**

- A.** Domes shall be semi-spherical structures conforming to the dimensions shown in the drawings and having the following characteristics:
  - 1.** Fully triangulated space truss structure with non-corrugated closure panels.
  - 2.** Clear span and designed to be self-supporting from the periphery of the structure.
  - 3.** Design to allow for thermal expansion/contraction over the roof temperature range of 30 to 150 deg F.
  - 4.** Dome structure deadweight shall not exceed 3.5 psf of surface area.
  - 5.** The roof shall be designed to bear the weight of a person when walking on any portion of the roof's surface.
- B.** The design of the domes shall be in accordance with the following

standards and codes:

1. "Specifications for Aluminum Structures" as published by the Aluminum Association
  2. AWWA D108
- C.** Design dome surface paneling as a watertight system under all design loads and temperature conditions.
- D.** Design dome frame and skin for full dead load plus the following load conditions:
1. Live load – As Required per ASCE 7-05 Section 4.9.1
  2. Snow Load – 25 psf
  3. Unbalanced Snow Load – As required per ASCE 7-05, Section 7.6.4 and Figure 7-3 but not less than required by local building codes.
  4. Wind Load - 100 mph in accordance with AWWA D100, Exposure "C", Use I=1.5.
  5. Seismic loading per AWWA D100, Group III.
  6. Combined Loads: Basic, live plus dead load and other combinations for the dome analysis shall be in accordance with AWWA D100.

## 2.2 Material of Construction

Item	Material
Triangulated dome framing struts	6061-T6 Aluminum
Structural frame gussets	6061-T6 Aluminum
Triangular closure panels and flashing	3003 H16 Aluminum
Tension Ring	6061-T6 Aluminum
Fasteners	Type 316 Stainless Steel
Dormes, doors, vents, hatches	6061-T6 or 5086-H34 Aluminum
Battens	6061-T6 Aluminum

## **2.3 Sealants**

- A.** All sealants shall be silicone and resistant to ozone and ultraviolet light, and conform to Federal Specification TT-S-00230C.
- B.** Sealants shall be solid color (non-transparent).

## **2.4 Gaskets**

- A.** All gaskets shall be ozone resistant, silicone only. The gaskets shall have 1/8" min thickness.

## **2.5 Dome Finish**

- A.** All external exposed surfaces, including battens, caps and appurtenances should receive an architectural anodized finish in conformance with Aluminum Association AAMA 611 Specifications and Section 05051, or fluoropolymer (PVDF) powder coating in conformance with Aluminum Association AAMA 2605 Specifications and Section 05051.

## **2.6 Handrails and Walkways**

- A.** Handrails, walkways and other safety devices shall conform to OSHA CFR Part 1910.
- B.** Provide walkways to both hatches as shown on the Drawings.

## **2.7 Roof-Shell Seal**

- A.** Provide continuous PTFE seal between roof structure and tank shell. Seal shall be permanently attached to the tank's roof and shell with bolts or rivets.

# **PART 3 – EXECUTION**

## **3.1 Inspection**

- A.** Upon receipt of material at job site, the Contractor shall inspect materials for shipping damage.

## **3.2 Installation**

- A.** Installing CONTRACTOR to coordinate and verify that other construction trades and materials have been installed per the

contract drawings, and, that they are accurate in location, alignment, elevation, and are plumb and level.

- B.** Install in accordance with the installation drawings supplied by the roof supplier.
- C.** Install materials accurately in location and elevation, level, and plumb. Field fabricate as necessary for accurate fit.
- D.** Field cuts, holes or abrasions shall be coated to prevent corrosion.
- E.** Field re-fabrication of structural components or panels will not be accepted. Forcing of the structure to achieve fit-up during construction is expressly forbidden and not acceptable.
- F.** All gasket materials shall be continuous, splices are not allowed. All sealants shall be placed only in a manner as recommended by the sealant manufacturer.

### **3.3 Service Condition**

- A.** The dome will be installed over a steel potable water tank. Assume the air under the dome to have the following characteristic:
  - 1.** 100% saturated water vapor
  - 2.** Temperature inside of the dome of up to 130 deg F
  - 3.** Chlorine content up to 30 ppm

### **3.4 Field Testing**

- A.** After the dome has been erected, conduct a field test as follows. On four separate panels selected by the Engineer, apply a uniform load of 90 psf over the entire panel area. The panels shall withstand this load without permanent distortion or buckling.
- B.** If any of the panels fails the test, than the Engineer will select another four panels on the dome for testing. If all four panels pass the test, than the first panel failure will be disregarded. If one of the second batch panels fails the test, then the dome will be considered defective, The CONTRACTOR shall then do one of the following:
  - 1.** Replace all the panels on the dome and retest

2. Test each panel on the dome and replace any panels that fail the test.
- C. Leak Testing: test in accordance with AWWA D-108, Section 8. Repair or replace leaking joints or panels. Entire dome shall be leak free.

#### **PART 4 – MEASUREMENT AND PAYMENT**

- 4.1** Refer to Section 01210, Measurement and Payment.

**\*\* END OF SECTION \*\***

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## **SECTION 05510**

### **METAL FABRICATIONS**

#### **PART 1 – GENERAL**

##### **1.1 Description**

- A.** This specification covers metal work and miscellaneous metal work not covered by the AWWA and API Tank Standards. The Contractor shall examine Drawings and include all items normally required for a complete and safe job. Work includes, but is not limited to, the following items:
- 1.** Ladders and Anti-climb door
  - 2.** Miscellaneous bars, clips, and channels
  - 3.** Miscellaneous connections, anchors, bolts, clips, spacers, nuts, washers, shapes and inserts, as required
  - 4.** Shop painting of miscellaneous ferrous metals
  - 5.** Galvanizing, including field touch ups of same

##### **1.2 Submittals**

- A.** Submit the following in accordance with Specification Section 01330:
- 1.** Shop/Erection Drawings. Prior to purchase or fabrication, submit shop drawings and erection drawings for approval. Provide complete details of fabrication, assembly, and erection, including at a minimum; sizes of all members, fastenings, supports and anchors, patterns, clearances, and all necessary connections to work of other trades.
  - 2.** Test Reports. Submit copies of certified test reports for physical and chemical mill properties and conformance with applicable Federal and ASTM specifications, prepared by an independent testing laboratory.
  - 3.** Manufacturer's Instructions. Where the manufacturer of any item to be installed in the work provides instructions on the installation of an item, submit a copy of the instructions to the Engineer along with the submittal describing the item.

4. Shop Painting Data. In coordinated manner with requirements for Painting and Protective Coatings specified in Section 09950, Contractor shall submit product list with product data sheets of intended shop coats which, for compatibility, shall be the same products and manufacturer as those of deferred field-applied systems intended to be used in work of Division 9.
5. Welders' certifications.

### **1.3 Welding Standards**

- A. Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
- B. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Welders shall be qualified by tests in accordance with AWS B3.0.

### **1.4 Precedence of Specifications**

- A. AWWA, API 650 and OSHA standards take precedence over the requirements of this Section.

## **PART 2 – PRODUCTS**

### **2.1 Metals**

#### **A. Steel**

1. Rolled shapes and bars shall conform to the latest edition of the AISC "Manual of Steel Construction" and shall also conform to current ASTM Designation A 36.
2. Plates shall be of material as stated in AWWA D100.
3. Pipe for structural applications. Conform to ASTM A 53, Grade B seamless galvanized as required, Schedule 40 except as otherwise shown on Drawings.

- B. Stainless Steel:** Unless otherwise designated or approved, use stainless steel alloy types as follows which conform to ASTM A-167 and ASTM A-276:

1. Stainless steel plates and bars shall be Type 316 or Type 317 unless otherwise noted.
2. Stainless steel bolts, nuts and washers shall be Type 316.

## **2.2 Fasteners**

- A. Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use. Select fasteners for the type, grade, and class required. For stainless steel construction, use 316 stainless steel commercial quality fasteners.
- B. Bolts (Cap screws): Regular hexagon-head type, ASTM A307 B or ASTM A325, Grade A.
- C. Hex nuts: ASTM A 563 or A194 2H.
- D. Machine Screws: ANSI B18.6.3.
- E. Washers: Round, carbon steel, ASTM F436.

## **2.3 Welding**

- A. Select welding rods and bare electrodes according to AWS specifications for the metal alloy to be welded.
- B. Steel Electrodes. Welding electrodes shall conform with AWS D1.1, except E7024 rods or electrodes shall not be used.

## **2.4 Galvanizing**

- A. Iron and Steel. ASTM A123, with average weight per square foot of 2.0 ounces and not less than 1.8 ounces per square foot.
- B. Ferrous Metal hardware Items. ASTM A153 with average coating weight of 1.3 ounces per square foot.
- C. Touch-Up Material for Galvanized Coatings. Galvanized coatings marred or damaged during erection or fabrication shall be repaired in accordance with Section 0990 "Painting and Protective Coatings".

## **2.5 Shop Prime Paint**

- A. To assure compatibility with field applied paint or coating systems,

for ferrous metals other than aluminum, stainless steel, and galvanized steel, use the same shop prime paint product and manufacturer as painting or protective coating system intended for field application specified in pertinent Section(s) of Division 9. Portions of work immediately adjacent to intended field welds shall not be shop primed.

### **PART 3 – EXECUTION**

#### **3.1 Verifications of Conditions**

- A.** Verify site conditions and obtain accurate dimensions. Fabricate items to match work that is installed. Where actual dimensions of already-installed work are different from those shown in the drawings, fabricate to the actual dimensions. Report to the Engineer discrepancies between Drawings and field dimensions prior to commencing work.
- B.** Where a fabricated metal item is to be attached to equipment, fabricate the item to match the dimensions of the equipment.
- C.** Proceeding with fabrication or installation of miscellaneous metal items will be construed as evidence of acceptance by the Contractor of conditions under which miscellaneous metal work will be done.

#### **3.2 Protection**

- A.** Handle items to avoid injury to persons and to avoid damage to materials or to work in place. Promptly repair or remove and replace work that has been damaged, to a condition equal to or better than that of the original specified condition, at no additional cost to the OWNER.
- B.** Provide temporary flooring, bracing, shoring, rails, guards and covers in accordance with OSHA requirements and as necessary to prevent damage or injury.
- C.** Temporarily fasten partially erected metal work during interruptions in erecting. Remove ladders and ramps when metal work is not in progress.
- D.** Store ferrous metals to prevent rusting. Cover or encase finished surfaces to avoid scratching or discoloration.
- E.** Protect work performed hereunder until completion and final acceptance of project by the OWNER.

### **3.3 General Fabrication and Installation Requirements**

- A.** Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. All metal work shall be erected true to line and level with accurate angles and surfaces and straight sharp edges, in its designated location.
- B.** Steel work shall conform to the best practices set forth in the "Specifications for Structural Steel for Buildings" for the American Institute of Steel Construction, latest edition.
- C.** Shop Assembly: Preassemble in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for field assembly and correlate the marks to part numbers shown in the shop drawings and in the assembly drawings.
- D.** Shear and punch metals cleanly and accurately. Torch-cutting of holes is allowed only if the cutting results in smooth, non-ragged, surfaces.
- E.** Holes and slots shall be only large enough to accommodate the intended fastener. Where fasteners are installed in slots, hardened washers shall be used to obtain bearing area.
- F.** Remove sharp or rough areas on exposed surfaces. Where torch-cutting of steel is necessary in the field, provide clean edges. File or grind as necessary to obtain a cut face comparable in roughness to a drilled or punched hole.
- G.** Steel shall be welded, by certified welders, in accordance with the "Structural Welding Code- Steel", AWS D1.1 - 2010.
  - 1.** Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2.** Obtain fusion without undercut or overlap.
  - 3.** Remove welding flux and weld splatter.
  - 4.** At exposed connections, finish exposed welds, and smooth and blend so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

- 5. Butt-welds are full penetration.
- 6. Weld symbols shown in the drawings are from the AISC Manual of Steel Construction. Where the size of weld is not shown, weld to develop the full strength of the member or assembly being welded.
- H. Keep welding rods in an air tight container, heated if necessary to prevent moisture absorption. Do not use rods that have gotten wet.
- I. Compliance with safety requirements. Dimensions required for the fabrication and installation of handrails, ladders, grating, plate, pipe hangers and etc., which are not shown on the drawings, shall conform to the applicable requirements of OSHA Standards.
- J. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

### **3.4 Field Assembly**

- A. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- B. Level and plumb individual members of the structure within specified AISC tolerances. Contractor shall provide and install all temporary bracing required until structure is complete.
- C. Establish required leveling and plumbing measurements on the mean operating temperature of the structure.
- D. Excessive force, defined as force which changes the shape of a member, or puts a preload stress on a member shall not be allowed as a means of fitting-up structures.

### **3.5 Misfit at Bolted Connections**

- A. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified and shall select an industry acceptable method to remedy such as:

1. Ream holes that must be enlarged to admit bolts and use oversized bolts.
2. Plug weld misaligned holes and redrill holes to admit standard size bolts.
3. Drill additional holes in the connection, conforming with Standards for bolt spacing, and end and edge distances and add additional bolts.
4. Reject the member containing the misfit, mis-sized, or misaligned holes and fabricate a new member to ensure proper fit.

**B.** Mis-sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins.

**3.6 Touchup Painting:** Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.

#### **PART 4 – MEASUREMENT AND PAYMENT**

**4.1** Refer to Specification Section 01210, Measurement and Payment.

**\*\* END OF SECTION \*\***

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## **SECTION 07150**

### **IMPERMEABLE VAPOR BARRIER**

#### **PART 1 – GENERAL**

##### **1.1 Requirements**

- A.** This section includes materials and installation of polyethylene film vapor barrier membrane located at the Tank 2A.

##### **1.2 Related WORK SPECIFIED ELSEWHERE**

- A.** Concrete Structures: 03300.

##### **1.3 Submittals**

- A.** Submit shop drawings and samples in accordance with Section 01330.
- B.** Submit manufacturer's catalog data, descriptive literature, and samples of the vapor barrier material, tape, and adhesive.

#### **PART 2 – PRODUCTS**

##### **2.1 Vapor Barrier Material**

- A.** Polyethylene sheeting, minimum 6 mils thick, black, conforming to ASTM D4397.
- B.** Sheets shall be as wide as practicable for application that will result in the least number of laps.

##### **2.2 Adhesive**

- A.** Trowel consistency adhesive as recommended by the membrane manufacturer.

##### **2.3 Tape**

- A.** Tape for the sealing of laps and joints shall be a pressure-sensitive adhesive tape as recommended by the manufacturer of the vapor barrier material. Tape shall be a minimum of 3 inches wide.

## **PART 3 – EXECUTION**

### **3.1 General**

- A.** Install beneath oil impregnated sand cushion as indicated in the drawings.

### **3.2 Installation**

- A.** Lay vapor barrier sheets directly over the compacted subgrade just before sand cushion is placed and tank floor is installed. Carefully install to avoid puncture or tear. Patch punctures and tears occurring during subsequent operations. Lap edges not less than 4 inches and lap end joints not less than 6 inches, with all laps continuously sealed with tape. Carry barrier over any pipes laid on the fill and seal in waterproof manner to any pipes or conduits which penetrate the fill. Turn up membrane a minimum of 3 inches at the edges and secure to exterior wall foundations or footings with adhesive.

## **PART 4 – MEASUREMENT AND PAYMENT**

- 4.1** Refer to Section 01210, Measurement and Payment

**\*\* END OF SECTION \*\***

## **SECTION 09950**

### **PROTECTIVE COATINGS FOR STEEL WATER TANKS**

#### **PART 1 – GENERAL**

##### **1.1 Summary**

**A.** Section Includes:

- 1.** Methods and procedures for surface preparation and painting of steel tanks.
- 2.** Provide surface preparation, application of surface coatings, curing the coatings, testing, and other work necessary to successfully paint interior of the steel tank including attachments, drain pipes, accessories, and appurtenances.

**B.** Following Surfaces shall not be painted unless otherwise specified or shown on Drawings:

- 1.** Concrete.
- 2.** Tank identification plate and water level indicator.
- 3.** Glass surfaces of any gages attached to the tank.
- 4.** Cathodic protection devices and related equipment attached to the tank interior and exterior.
- 5.** Plastic, copper tubing, nameplates, and other surfaces on which coating will not adhere or would interfere with operation of specific item.

##### **1.2 References**

**A.** Society for Protective Coatings (SSPC) Standards, most recent editions:

- 1.** SSPC SP 6– Commercial Blast Cleaning.
- 2.** SSPC SP10 - Blast Cleaning to Near-White Metal.
- 3.** SSPC SP 15 – Commercial Grade Power Tool Cleaning
- 4.** SSPC-VIS 1-89 - No. 1 - Pictorial Surface Preparation Standards for Painting Steel Surfaces.

- 5.** SSPC-PA1 - Paint Application Specification No. 1, Shop, Field and Maintenance Painting.
- B.** American Water Works Association (AWWA) Standards, most recent editions:
  - 1.** AWWA C652 - Disinfection of Water-Storage Facilities.
  - 2.** AWWA D102 - Coating Steel Water-Storage Tanks.
- C.** NSF-61 - National Sanitation Foundation Standard 61, most recent edition.
- D.** SP0188-2006-Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

### **1.3 Submittals**

- A.** Submittals: In accordance with Section 01330.
- B.** Procedures and materials for removal of existing coatings. Submit the name of the company and abrasive to be used, the generic type of abrasive and product data sheets.
- C.** Submit coating plan and schedule for coating work. Plan shall include number of applications and application thicknesses.
- D.** Coating Materials, Application Methods, Solvents, Thinners, Colors available, and Other Products to be Used on the Project Shall be Submitted to the ENGINEER for Approval:
  - 1.** Supply "paint out" samples to ENGINEER for approval before ordering primer or finish.
  - 2.** Primers, top coats, and decorative coats shall bear the same respective batch numbers from the same manufacturer. Batch numbers shall not be mixed within a coat.
  - 3.** Provide mixing instructions, thinning instructions, percent solids, spreading rate, weight, application time, temperature and humidity limitations, drying time, cure time, pot life, safety precautions, recoat cycle time and application method.
  - 4.** Submit coating manufacturer's surface preparation recommendations including maximum/minimum height of surface profile on abrasive blast cleaned steel.

- 5.** The applicator's certificate shall list the dates and locations that the coating work was completed for the various surfaces coated, and shall also list the dry film thickness obtained for each coat. The CONTRACTOR shall submit said paint applicator's certificates to the ENGINEER within 10 days after completion of each paint system.
  - 6.** Compliance with VOC Regulations. The paint manufacturer shall submit to the ENGINEER certification that all coatings used on the job comply with local air pollution regulations limiting the amount of volatile organic compounds (VOC) contained in industrial coatings.
- E.** Submit product data and procedures for the dehumidification and temperature control system, and dust control system.
  - F.** Provide, prior to coating any surfaces of the tank, written certifications from the coating manufacturers stating that the coating materials, thinners, solvents, and equipment cleaning fluids provided by the manufacturers do not contain perchloroethylene or trichloroethylene. The CONTRACTOR shall also certify, in writing, that no material containing perchloroethylene, trichloroethylene, lead, chromium, or zinc in any form will be used for the interior coatings of the tank. This shall include all solvents, thinners, and cleaning fluids at the job site, regardless of where the materials were obtained.
  - G.** Submit Manufacturer's Certification: In all cases the paint manufacturer shall certify in writing that the coating materials are compatible with the service environment of the exterior or interior surface of a steel potable water tank. Provide NSF-61 certification for coatings used for surfaces in contact with potable water.
  - H.** Provide copies of the Material Safety Data Sheet for all materials used in coating and painting operations including, but not limited to, coatings, paints, thinners, solvents, and cleaning fluids. Material Safety Data Sheets shall be readily available on-site at all times.
  - I.** Submit Qualifications of Coatings Applier.
  - J.** Submit manufacturer's technical data sheets and sample or samples of containment materials including screens, tarpaulins, sheets films and ground covers.
  - K.** Submit outrigger/containment structural support layout system to support containment material.

- L.** Submit Quality Control and Testing Plan.
- M.** Submit Disinfection Plan.
- N.** Submit manufacturer's specific ventilation requirements for product used on interior surfaces. Ventilation requirements shall be provided to ensure adequate evacuation of solvents and provide for timely coating system cure. Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof, of industrial design and shall be approved by the ENGINEER. Household-type venting is not acceptable. Ventilation shall reduce the concentration of spray to the degree that a hazard does not exist by adducting air, vapors, etc. from the confined space. Air circulation and exhausting of solvent vapors is mandatory. Forced air adduction during blast, coating and/or painting application operations is mandatory. Dehumidification equipment must be operated on a continuing basis, during all blasting, coating and curing operations.
- O.** Name and qualifications of the resin manufacturer's representative who shall be present during the initial phase of the coating application to insure that the manufacturer's mixing and application procedures are understood and being followed.
- P.** Written certification from the coating applicator verifying that coating was provided and applied as specified and that tests were performed and successful result obtained. Include the test results with this certification submittal.

#### **1.4 Qualifications**

- A.** Qualifications of Coatings Applier:
  - 1.** Minimum of 5 years' practical experience. SSPC-QP1 certified.
  - 2.** Successful history in the application of protective coatings to steel tanks used for the storage of potable water with a minimum of 10 tanks coated and in use for a minimum of 10 years.
  - 3.** Arizona state-licensed painting CONTRACTOR (C-34).

#### **1.5 Quality Control/Assurance**

- A.** CONTRACTOR is responsible for performing quality control testing and quality assurance measures as described in this Section and in the manner approved by ENGINEER. Refer to Paragraph 3.9 herein.

Testing shall be performed by NACE certified personnel.

- B.** Use quality assurance procedures and practices to monitor all phases of surface preparation, application, and inspection throughout the duration of the Project. Procedures or practices not specifically defined herein may be used provided they meet recognized and acceptable professional standards and are approved by ENGINEER.
- C.** Materials furnished shall be subject to inspection by ENGINEER. Comply with specifications for quality of materials and workmanship.
- D.** ENGINEER reserves the right to inspect CONTRACTOR's work procedures to ensure that procedures are in compliance with specifications, industry accepted inspection criteria, and coating manufacturer's published information. Provide safe accessibility to inspection personnel upon request of ENGINEER.
- E.** Work accomplished in the absence of prescribed inspection may be required to be removed and replaced under the proper inspection, and the entire cost of removal and replacement, including the cost of all materials, shall be borne by CONTRACTOR.
  - 1.** In the event that a pre-identified schedule is put in place and approved by the ENGINEER, some work may proceed without full inspection presence.
  - 2.** Any rejection of said work at the time of inspection will require all unsatisfactory conditions to be repaired at CONTRACTOR's expense.
- F.** Except as otherwise provided herein, the cost of inspection will be paid by the CONTRACTOR.
- G.** Whenever and wherever required by the ENGINEER, CONTRACTOR shall furnish illumination and scaffolding (level of illumination and scaffolding as determined by ENGINEER) to permit inspection prior to acceptance of work.

## **1.6 Delivery, Storage, and Handling**

- A.** Deliver Materials to the Job Site in the Original Sealed Containers with Manufacturer's Name, Brand, Color, Date of Manufacture, Expiration, and Batch Number Clearly Legible:
  - 1.** Do not open containers or use materials until ENGINEER has physically inspected the contents and obtained necessary data

from information printed on containers or labels.

2. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B.** Store coatings and paints in enclosed structures to protect from weather and excessive heat or cold. Store flammable coatings and paints to conform with city, county, state, and federal safety codes for flammable coating and paint materials.

## **1.7 Health and Safety**

1. General. In accordance with requirements of OSHA Safety and Health Standards for Construction (29CFR1926) and the applicable requirements of regulatory agencies having jurisdiction, as well as manufacturer's printed instructions, appropriate technical bulletins, manuals, and material safety data sheets, the CONTRACTOR shall provide and require use of personnel protective and safety equipment for persons working in or about the project site.
2. Illumination. Adequate illumination shall be provided while work is in progress, all lighting and electrical equipment used within the tank interior shall be explosion-proof. Light bulbs shall be guarded with a protective cage to prevent breakage. Lighting fixtures and bulbs shall comply with the requirements of Section 70 of the National Fire Protection Association (NFPA). "National Electric Code", for the atmosphere in which they are used. All lighting and other fixtures shall be ground fault type, as detailed in NFPA 70. The level of illumination shall comply SSPC Guide 12. Whenever required by the ENGINEER, the CONTRACTOR shall provide additional illumination to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the ENGINEER.
3. All spray and air hoses shall be properly grounded to prevent accumulation of static electric charges. All electrical cords shall be heavy duty industrial insulated type cords with twist lock connectors. Household type electrical extension cords shall not be permitted.
4. Air supply hoses shall employ the proper Chicago-type claw coupling connectors and proper type for the service in which they are to be used.
5. Air hose connections shall employ new gaskets and shall use spring loaded steel wire safety devices (whip checks) to prevent hose whipping should the hoses become accidentally disconnected. Hoses used to transport coating materials shall be heavy duty wire

reinforced hydraulic type hoses, with heavy duty screwed connectors.

6. The CONTRACTOR shall provide appropriate fire abatement devices and prohibit any flames, welding and smoking during mixing and application of materials. A minimum of two (2) 10 LB ABC type fire extinguishers shall be present in the work area whenever work is proceeding. All personnel shall be trained in the use of this type of fire extinguisher.
7. Sound levels: Whenever the occupational noise exposure exceeds the maximum allowable sound levels (OSHA 1910.95), the CONTRACTOR shall provide and require the use of approved ear protection devices.

### **1.8 Environmental Requirements**

- A. Apply coatings in accordance with manufacturer's material data sheet with particular attention to curing and drying times and temperature and humidity ranges.
- B. No coating shall be applied when the surrounding air temperature of the surface to be coated is below the minimum temperature allowed by manufacturer's recommendations for coating application or when it is expected that the air temperature will drop below the minimum within two hours after coating application.
- C. No coating shall be applied when the surrounding air temperature is forecasted to be less than 5 degrees F above the dew point within two hours after coating application.
- D. No coating shall be applied to a steel surface which has a temperature over 120 degrees, or in accordance with manufacturer's recommendation, whichever is more stringent.
- E. No Coating Shall be Applied to Wet or Damp Surfaces or in Rain, Snow, Fog or Mist:
  1. Coating shall not be applied on frosted or ice-coated surfaces.
  2. Dew point shall be measured by use of an instrument such as a Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables or equivalent.
- F. If above conditions are prevalent, coating application shall be

delayed or postponed until conditions are favorable. The day's coating application shall be completed in time to permit the film sufficient drying time before damage by atmospheric conditions.

- G.** CONTRACTOR must use dehumidification equipment to achieve required interior conditions.
- 1.** Proposed dehumidification equipment must be submitted for review by the ENGINEER. Provide a minimum of three air changes per hour unless dehumidification equipment manufacturer's calculations substantiate fewer air changes.
  - 2.** The dehumidification equipment shall supply dry, fresh (not recirculated) air within 12 inches of the tank bottom from a system of duct work and blowers. This ventilation system shall operate 24 hrs/day throughout the entire coating cure process.
  - 3.** The dehumidification equipment (and heating equipment if required) shall maintain air temperature minimum 20 F degree above dew point during internal coating application.
  - 4.** Dehumidification shall be maintained until abrasive cleaning operations, coating operations and cure are complete.

### **1.9 Warranty Inspection**

- A.** The CONTRACTOR shall warranty all work to be defect free for a period of one year from the time of final acceptance by the ENGINEER. A Warranty Inspection Shall be Conducted During the Eleventh Month Following Completion of All Coating and Painting Work. The inspection shall be per AWWA D-102 Section 5.2 and these specifications. The draining of the tank will be accomplished when there will be minimum inconvenience to the OWNER. The CONTRACTOR should be present at this inspection, unless otherwise directed by the OWNER . All defective work shall be repaired in strict accordance with this specification and to the satisfaction of the ENGINEER.
- 1.** Notification: The OWNER will establish the date for the inspection and will notify the CONTRACTOR at least 30 days in advance. The OWNER will drain the tank, the CONTRACTOR will be responsible for cleaning coated surfaces and removal of sediment if present. The CONTRACTOR shall provide, at his own expense, scaffolding, rigging to provide access to all points of the tank's interior and exterior coated surfaces,

suitable lighting (in accordance with SSPC Guide 12) and ventilation for the inspection. This equipment shall be on site, fully assembled and operational minimum one day prior scheduled inspection. Said inspection will require approximately seven working days.

- 2.** Inspection. The entire interior and exterior surfaces of the tank and its appurtenances shall be visually inspected to assess the integrity and performance of all coating systems as specified herein. All defective coating as well as damaged or corroded spots of the tank shall be satisfactorily repaired by and at the sole expense of the CONTRACTOR. All repaired areas shall then be tested as specified herein. Said repairs and testing procedures shall be repeated until the surface is acceptable to the ENGINEER.
- 3.** Inspection Report. The ENGINEER shall prepare and deliver to the CONTRACTOR an inspection report covering the first anniversary inspection, setting forth the number and type of failures observed, the percentage of the surface area where failure has occurred, and the names of the persons making the inspection.
- 4.** Schedule. Remedial work should be performed at the time of inspection (or within first trip). Any work beyond remedial will be scheduled by OWNER. Any delay on the part of the CONTRACTOR to meet schedule established by ENGINEER shall constitute breach of this CONTRACT and OWNER may proceed to have defects remedied as outlined under General Provisions.
- 5.** Remedial Work. Any location where coating has peeled, bubbled, or cracked and any location where corrosion is evident shall be considered to be a failure of the coating system. The CONTRACTOR shall make repairs at all points where failures are observed by removing the deteriorated coating, cleaning the surface and removing all corrosion, and reapplying new coating. All coatings shall be repaired with the same coating system as the original coating system, unless otherwise recommended by the manufacturer and approved by OWNER. If the area of failure exceeds 25 percent of a specific coated or painted surface, the ENGINEER may require that the entire applied system be removed and reapplied in accordance with the original specification. The CONTRACTOR may make minor repairs at the time of inspection. The

inspector will monitor the repairs to ensure the CONTRACTOR completes the work.

- 6.** Costs. All noted costs for inspection and all costs for repair, cleaning, disinfection, bacteriological tests, scaffolding, lighting and ventilation equipment shall be borne by the CONTRACTOR and in computing his bid, the CONTRACTOR shall include an appropriate amount for testing and repair as no additional allowance will be paid by the OWNER for said inspection and repair.

### **1.10 Safety**

- A.** The CONTRACTOR shall be responsible for and shall conform to all safety requirements regarding ventilation, electrical grounding, and care in handling coatings, paints, solvents, and equipment as set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals.

### **1.11 Existing Reservoir Coating System**

- A.** The type and thickness of existing reservoir coating is unknown.
- B.** The existing coating was tested and it is determined to be non-hazardous.

### **1.12 Preconstruction Conference**

- A.** At least 14 days prior to the shop or field application of the coating system to the steel tank, schedule and arrange a conference with the ENGINEER , tank manufacturer, coating applicator, and the coating manufacturer to coordinate the following:
  - 1.** Tank manufacturer's work to schedule for inspection coordination
  - 2.** Surface preparation methods
  - 3.** Specification compliance of blast abrasives and surface profile.
  - 4.** Schedule of blast cleaning and coating application
  - 5.** List of equipment for cleaning, coating, temperature, humidity and dust control.

**6. Weather limitations for acceptable work**

**PART 2 – PRODUCTS**

**2.1 Manufacturers**

- A. Acceptable Coating Manufacturers:**
  - 1.** ICI Devoe.
  - 2.** Tnemec Coatings.
  - 3.** Raven Lining Systems.
  - 4.** Sherwin Williams
  - 5.** ENGINEER approved equal.

**2.2 Materials**

- A.** Use products of same manufacturer for all coats. Coating material components shall be of the same batch number whenever possible. Limit daily paint mixing to the use of the same batch numbers.
- B.** Coatings used shall conform to the requirements of local and state air pollution regulatory agencies.
- C.** Abrasive used in blast cleaning operations shall be new, and free of contaminants that would interfere with adhesion of coatings and shall not be reused unless specifically approved by the ENGINEER.

**2.3 Interior Coating Materials**

- A.** Coating materials for interior surfaces shall conform to regulations and applicable requirements of local, state, and federal air pollution and health regulatory agencies. Products containing perchloroethylene, lead, chromium, and/or zinc will not be permitted.
- B.** Each of the manufacturers listed in Paragraph 2.1.A, are capable of supplying the coating materials specified. Submit proposed substitution requests in accordance with Section 01631 and requirements specified below.
- C.** Color of interior coating shall be white or cream.
- D.** Tank Protective Coating Systems:

1. AWWA D102 Inside Coating System No. 3 (ICS-3). Two-component 100% solids epoxy coat system having ANSI/NSF 61 approval for potable water service. Total nominal dry thickness DFT = 25-30 mils
2. Application in two coats or as recommended by the manufacturer.
3. Application shall be in strict accordance with the manufacturer's published requirements.

#### **2.4 External Tank Coating Materials.**

- A. Finish coat color shall be approved by the Engineer before ordering of coating
- B. Each of the manufacturers listed in Paragraph 2.1.A, are capable of supplying the coating materials specified. Submit proposed substitution requests in accordance with Section 01631 and requirements specified below.
- C. Tank Protective Coating System:
  1. AWWA D102 Outside Coating System No. 5 (OCS-5). Three-coat system consisting of a first and intermediate coat of two-component epoxy and a finish coat of two-component aliphatic polyurethane coating. Total dry thickness DFT = 9-12.5 mils.
  2. Primer coat to have nominal DFT of 3-4.5 mils. Intermediate coat to have a nominal 4.5-6 mils DFT. Finish coat to have a nominal 1.5-2 mils DFT.
  3. All field coats to be brush or roller applied. Spray application on site requires use of containment screening.

#### **2.5 Caulking**

- A. Caulking shall be a flexible polyurethane, NSF-61 approved for use in contact with potable water and compatible with the epoxy lining used in the tank.
- B. Caulking material shall be applied to all circumferential shell/roof interface, roof plate lap seams and any other crevices that preclude proper coating application.
- C. The coating manufacturer and caulk material manufacturer shall

confirm, in writing, that the internal epoxy coating system is compatible with caulk material.

## **2.6 Containment System**

- A.** Containment system proposed by the CONTRACTOR must assure the protection of the surrounding environment and must provide sufficient protection to meet Arizona Department of Environmental Quality requirements.
- B.** Prior to installation the containment system design must be submitted and reviewed by the ENGINEER.

## **2.7 Dust Collectors**

- A.** Blast cleaning equipment shall be equipped with integral dust collection system or CONTRACTOR shall provide adequate external dust collecting system capable to contain dust generated during surface preparation.

## **2.8 Procedures for Obtaining Approval for Materials not Listed**

- A.** Requests for Substitutions: In accordance with Section 01631.
- B.** Coatings used on this project shall be listed in list of material and equipment Suppliers. ENGINEER approved equals for coating manufacturers and suppliers must be submitted with the information stated below.
- C.** Proposed coating or paint system shall have a dry film thickness equal to or greater than that of the specified system.
- D.** Proposed Coating or Paint System Shall Employ an Equal or Greater Number of Separate Coats:
  - 1.** Primer and intermediate coating colors may be changed as long as there is a color difference between each coat.
  - 2.** Proposed coating or paint system shall employ coatings or paints of the same generic type.
- E.** All requests for substitution shall carry full descriptive literature and directions for applications, along with complete information on generic type, nonvolatile content by volume, and a list of three similar projects, all at least 1 year old, where the coatings or paints have been applied to similar exposure.

- F. If the above mentioned data appear to be in order, the ENGINEER may require that the CONTRACTOR provide certified laboratory data sheets showing the results of complete spectrographic and durability tests performed on the proposed substitute.
  - 1. Tests shall be performed by an independent testing laboratory satisfactory to the ENGINEER, and all costs incurred in the testing program shall be borne by the CONTRACTOR.
  - 2. In any case, the ENGINEER shall be sole and final judge of the acceptability of any proposed substitution.

## **2.9 Dehumidification Equipment**

- A. The Dehumidification Equipment shall be a solid desiccant (not liquid, granular or loose lithium chloride) design having a single rotary desiccant bed capable of continuous operation, fully automatic, with drip-proof automatic electrical controller.
- B. All chillers, heaters, or air conditioners may be used downstream of the dehumidifiers if they are approved for use by the manufacturer of the dehumidification equipment.

## **PART 3 – EXECUTION**

### **3.1 Acceptable installers/Supervisors**

- A. Perform work by skilled craftsmen qualified to perform the required work in a manner comparable with acceptable standards of practice. Continuity of personnel shall be maintained and transfers of key personnel shall be coordinated with the ENGINEER.
- B. Provide a supervisor to be at the work site during cleaning and application operations. Supervisor shall have the authority to sign daily quality control reports, coordinate work, and make other decisions pertaining to the contract fulfillment.

### **3.2 Preparation**

- A. Surface preparation as well as coating and paint application shall conform to applicable standards of American Water Works Association, the Society for Protective Coatings, and the manufacturers' printed instructions.

- B.** For external surface preparation, the CONTRACTOR shall determine his/her own means and methods to contain and trap all debris, with ENGINEER approval. All shrubs and bushes shall be covered to prevent damages from dusts.
- C.** All bare metal surfaces shall be thoroughly cleaned prior to the application of coatings. All oil, grease, dust, dirt, rust old paint, moisture, mill scale, and all other foreign substances which may interfere with or adversely affect the adhesion or durability of the new coating system shall be removed. Removal of any grease or oil shall be accomplished prior to mechanical or blast cleaning.
- D.** Material applied before approval of the surface by ENGINEER shall be removed and reapplied to the satisfaction of ENGINEER at the expense of the CONTRACTOR.
- E.** CONTRACTOR's coating and painting equipment shall be designed for application of materials specified and shall be maintained in acceptable working condition. CONTRACTOR's equipment shall be subject to approval of the ENGINEER.
- F.** Removal of grease and oil shall be in conformance with the specifications of the Steel Structures Painting Council, SSPC-SP1, Solvent Cleaning, where the use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods involve a solvent cleaning to avoid leaving a film or greasy residue.
- G.** Prior to abrasive blast cleaning, surface imperfection such as sharp fins, sharp edges, weld spatter, or burning slag shall be removed from the surface. Sharp corners and edges shall be ground to a smooth round edge with the radius of not less than 1/16 inch.
- H.** Exterior metal surfaces including but not limited to handrails, ladders, and telecommunication conduit boxes spanning across the roof shall be dry abrasive blast cleaned per SSPC SP10.
- I.** Field abrasive blast cleaning methods for all reservoir surfaces shall be submitted to the ENGINEER for approval. CONTRACTOR is responsible for maintaining dust emissions within the legal level and that level which would not create a nuisance.
- J.** Blast nozzle pressure shall be a minimum of 95 psi. and shall be verified by using an approved nozzle pressure gage at each start-up period or as directed by the ENGINEER. Number of nozzle crews used during all blast cleaning operations must be sufficient to insure timely completion of the project within the specified contract time

frame. Additional nozzle crews shall be employed to expedite the work if so directed by the ENGINEER.

- K.** Abrasive blasting nozzles shall be equipped with "deadman" emergency shut-off nozzles.
- L.** Blast cleaning from rolling scaffolds shall only be accomplished within the confines of interior perimeter of the scaffold. Reaching beyond the limits of perimeter of the scaffolding will be allowed only if the blast nozzle is maintained in a position which will produce a profile acceptable to the ENGINEER. Proper position for the blast nozzle is at a perpendicular angle to the flat surface of the work to be blasted.
- M.** Blast cleaned surfaces shall be cleaned prior to application of specified coatings via a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by the ENGINEER. "Blowing down" shall be accomplished using an air hose at least 1/2" in diameter and equipped with a minimum 1/2" diameter pipe stinger with a shut-off ball valve and a water trap.
- N.** Existing irregular welded surfaces, weld metal accumulation, weld spatters, slag, sharp and rough edges, including those from scaffold lugs, not previously properly removed or treated shall be ground smooth or removed, and then prepared for coating in accordance with SSPC-SP10, Near White Blast Cleaning. This work shall be accomplished prior to the application of any coatings.
- O.** Welds, when required by the ENGINEER, shall be neutralized with a suitable chemical compatible with the specified coating or paint material to be used.
- P.** During abrasive blasting and cleaning operations, caution shall be exercised to absolutely insure that existing and new previously placed coatings and paints are not exposed to abrasion from blast cleaning operations. Cleaning and coating operations shall be so programmed and coordinated that dust, dirt, grit, old paint, rust, mill scale, etc., will not damage or fall upon wet or newly coated or painted surfaces.
- Q.** Test surface preparation as specified in Section 3.9.
- R.** For rehabilitation of an existing tank: Moderately Pitted Surfaces - A moderately pitted surface is defined as a surface having pits less than 1/16 inch deep with a frequency of 4 to 5 pits per square foot. Prior to application of the specified coating system, the pitted

surface shall be blasted to SSPC-SP10. The first coat may be thinned (not to exceed manufacturer's published recommendations) and applied by stiff bristle brush or roller to all pitted surfaces. 100% solids coating shall not be thinned.

- S.** For rehabilitation of an existing tank: Badly Pitted Surfaces - A badly pitted surface is defined as a surface having pits greater than 1/16 inch deep and less than 1/2 of the metal thickness with a frequency of 8-12 pits per square foot. Prior to application of the specified system, the pitted surface shall be blasted to SSPC-SP10. Prior to applying the specified system, the pits shall be filled with an epoxy caulk seam sealer applied by putty knife or stiff bristle brush.
- T.** Application of the first coat shall immediately follow surface preparation and cleaning. Cleaned areas not receiving first coat within a 24-hour period shall be re-cleaned prior to application of first coat, unless surface(s) meet minimum specified surface preparation standards as tested by the ENGINEER.
- U.** Project is subject to intermittent shutdown if, in the opinion of the ENGINEER, cleaning, coating, and painting operations are creating a localized condition detrimental to ongoing activities, personnel, or adjacent property.
- V.** In the event of emergency shutdown by the ENGINEER, CONTRACTOR shall immediately correct deficiencies. All additional costs created by shutdown shall be borne by CONTRACTOR.
- W.** Tank shall be adequately vented to avoid structural damage.
- X.** Conduct All Operations as to Confine Abrasive Blasting Debris and Paint Over Spray to Within the Boundaries of the Site:
  - 1.** Take precautions necessary to prevent adverse off-Site consequences of painting operations.
  - 2.** Complaints received by Owner relating to any such off-Site problems will be immediately delivered to CONTRACTOR for corrective action.
  - 3.** All costs associated with protection of off-site properties and/or correction of damage to property as a result of blasting and painting operations shall be borne directly by CONTRACTOR at no additional expense to Owner.

4. The Owner approval of CONTRACTOR's over spray prevention procedures and ENGINEER's presence on the project site shall not relieve the CONTRACTOR from responsibility for over spray. Daily approval of procedures will be required prior to start of spraying operations.

### **3.3 Interior Surface Preparation**

- A. All existing interior coatings shall be completely removed and disposed of in accordance with regulations of appropriate agencies.
- B. New Tank Alternative: SSPC-SP10 Near-White Blast Cleaning.
- C. Existing Tank Rehabilitation Alternative: SSPC-SP10 Near-White Blast Cleaning.
- D. Small, not suitable for blast cleaning areas: SSPC-SP15 Commercial Grade Power Tool Cleaning (both alternatives).
- E. Surface profile shall be in accordance with the coating manufacturer's recommendation or comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces," SSPC-VIS 1" whichever is more stringent.

### **3.4 Exterior Surface Preparation**

- A. All existing exterior coatings shall be completely removed and disposed of in accordance with regulations of appropriate agencies.
- B. New Tank Alternative: SSPC-SP 6 Commercial Blast Cleaning.
- C. Existing Tank Rehabilitation Alternative: SSPC-SP 6 Commercial Blast Cleaning.
- D. Small, not suitable for blast cleaning areas: SSPC-SP15 Commercial Grade Power Tool Cleaning (both alternatives).
- E. Surface profile shall be in accordance with the coating manufacturer's recommendations.

### **3.5 Coating Application – General**

- A. CONTRACTOR shall complete all surface preparation and cleaning activities and obtain ENGINEER approval prior to beginning coating operation.
- B. Apply coatings as specified and as recommended by the

manufacturers of the coatings used. Preparation and application of proprietary coatings specified herein shall be in strict accordance with the manufacturer's instructions as supplemented by these Specifications.

- C.** The CONTRACTOR shall be responsible for removing and disposing all the existing interior coatings from the tanks.
- D.** Coating application shall conform to SSPC-PA1, SSPC-PA3, manufacturer of the coating and paint materials' printed literature, and as specified herein.
- E.** Apply Each Application of Coating and Paint Evenly, Free of Brush Marks, Sags, Runs, and With no Evidence of Poor Workmanship:
- F.** Coating and paint shall be sharply cut to lines.
- G.** Finished surfaces shall be free from defects or blemishes.
- H.** Use Protective Coverings and Drop Cloths to Protect Floors, Fixtures, Equipment, Prepared Surface, and Applied Coatings or Paints:
  - 1.** Personnel walking on exterior roof of tank shall take precautions to prevent damage or contamination of coated or painted surfaces.
  - 2.** Exercise care to prevent coating or paint from being spattered onto surfaces that are not to be coated or painted.
  - 3.** Surfaces from which material cannot be removed satisfactorily shall be repainted or recoated as required to produce a finish satisfactory to the ENGINEER.
  - 4.** Use of layer of blasting area to protect floor from over-spraying is not allowed.
- I.** Apply Brush Coat of the Specified Product to Irregular Surfaces Before General Application of the Respective Coat:
  - 1.** Brush irregular surfaces in multiple directions to ensure penetration and coverage.
- J.** Irregular surfaces include, but are not limited to welds, roof lap seams, nuts and bolts, ends of rafter flanges, and so forth. Mix coating components in exact proportions specified by the

manufacturer. Exercise care to ensure removal of all materials from containers during mixing and metering operations.

- K.** All coatings shall be thoroughly mixed, using an approved slow-speed power mixer until all components are thoroughly combined and are of a smooth consistency. Coatings shall not be applied beyond pot-life limits specified by the manufacturer.
- L.** Thinning shall only be permitted as recommended by the manufacturer and approved by ENGINEER, and shall not exceed limits set by regulatory agencies. If the CONTRACTOR applies coatings that have been modified and/or thinned to exceed established volatile organic compound standards, CONTRACTOR shall be responsible for fines, costs, remedies, or legal action and cost which may result.
- M.** Using a non-destructive, magnetic type thickness gauge, perform coating thickness tests upon completion of each coating operation.
- N.** Application shall be as directed by the manufacturer and approved by the ENGINEER. Drying time between coats shall be strictly observed as stated in manufacturer's printed instructions.
- O.** Perform mixing, thinning, initial application of the day, coating thickness testing for record, and holiday detection of coating in the presence of the ENGINEER.
- P.** At conclusion of each day's blast cleaning and coating operations, a 6 inch wide strip of blast-cleaned substrate shall remain uncoated to facilitate locating the point of origin for the successive days blast cleaning operations. If dehumidification is employed, this 6 inch strip shall remain at any point of material application.
- Q.** Exercise care during spray operations to hold the spray nozzle perpendicular and sufficiently close to surfaces being coated to avoid excessive evaporation of volatile constituents and loss of material into the air or the bridging of cracks and crevices.
  - 1.** Reaching beyond limits of scaffold perimeter will not be permitted.
  - 2.** Remove over spray as directed by ENGINEER.
  - 3.** Paint shall not be applied when wind speed exceeds 15 miles per hour, when damage to surrounding properties is likely, or as requested by ENGINEER.

### **3.6 Interior Coating Application**

- A.** Only after completion of surface preparation of the interior roof, floor and shell surfaces as specified, all surfaces shall receive the specified epoxy coating.
- B.** After completion of final coat application of epoxy coating, as specified, all void areas shall be primed, if required, and filled with joint sealant as specified. Fill voids flush.
- C.** Coat, test and make any necessary repair to all internal surfaces of tank's wall and roof before applying coating to the tank's floor.
- D.** Application on the interior tank surface shall be by spray, with the exception of difficult-to-coat areas may be additionally strip coated with brush or roller.

### **3.7 Exterior Coating Application**

- A.** All welds, rivets, corners, edges and like irregular surfaces are to be stripe coated as part of the first coat application. Brush stripe coats shall be employed at pits, depressions and crevices to work coating in.
- B.** All other paint applied to the exterior of erected tanks will be applied by brush or roller, using manufacturers recommended thinner (if applicable) for the application method selected. No spray painting on exterior surfaces will be permitted without the use of containment screens.
- C.** When more than one coat is to be applied, each coat should have a distinguishable color difference from the preceding and following coats. Note that stripe coating is considered to be part of the first coat application.

### **3.8 Disinfection**

- A.** Following the curing and ventilation period, clean, disinfect, and fill the tank in accordance with AWWA D652 (selected method to be approved by ENGINEER) and Specification Section 13211. Minimize amount of water to be disposed. Neutralize water as required for discharge.

### **3.9 Field Quality Control**

- A.** The CONTRACTOR shall notify ENGINEER minimum 3 days before

start any field preparation work or coating application work.

- B.** The OWNER will procure third-party inspector to provide quality assurance testing to confirm the test results determined by the CONTRACTOR's testing inspector.
- C.** Inspection of the applied coating will be accomplished as a joint effort involving the CONTRACTOR's verification and the Inspector's monitoring. CONTRACTOR shall bear primary responsibility for performing tests and for costs of performing tests.
- D.** Inspector will witness all testing as performed by CONTRACTOR. Coordinate with Inspector for daily witnessing of psychrometer and temperature readings.
- E.** Forward copies of daily reports to ENGINEER. Daily reports shall include, but not be limited to, psychrometer and temperature readings, summary of work, progress to date, and amount of coating used.
- F.** Tank Surface Cleanliness will be based upon compliance with SSPC-VIS 1:
  - 1.** Anchor profile for prepared surfaces shall be tested with a K-T Surface Profile Comparator or Testex Press-O-Film System.
  - 2.** Test for compliance and record the test results.
  - 3.** All results shall be recorded by the INSPECTOR.
- G.** Check Thickness of Coatings and Paint with a Non-Destructive, Magnetic Type Thickness Gage in Accordance with AWWA D102 and Verified with Calibration Blocks:
  - 1.** Test interior coated surfaces for pinholes with an inspection device approved by ENGINEER.
  - 2.** Mark and repair pinholes in accordance with manufacturer's printed recommendations and retest.
  - 3.** No pinholes or other irregularities will be permitted in the final coating.
  - 4.** Acceptable inspection devices for ferrous metal surfaces include, but are not limited to Tinker-Razor Models AP, AP-W and PCWI Porosity Tester.

5. Interior coatings below the top capacity level shall be tested with SP0188-2006.
  6. All surfaces ready to receive a coating must be approved by the ENGINEER before the application of the next succeeding specified coat.
- H.** Acceptable devices for ferrous metal surfaces include, but are not limited to "DeFelsko - Positectorr" or "Elcometer" or equal units for dry film thickness gauging. Inspection devices shall be operated in accordance with the manufacturer's instructions.
- I.** Upon completion of coating operations, after curing interval in accordance with manufacturer's recommendations, perform holiday detection with a wire brush electrode, using the Tinker-Razor AP, AP-W or PCWI Porosity tester set at 1,500 volts for the roof and shell and at 2,000 volts for the floor plate.
1. Perform repair and retesting until the surfaces are holiday free.
  2. ENGINEER may verify adequacy of holiday testing by accomplishing holiday detection of selected areas, using ENGINEER's own holiday detector.
  3. Upon completion of coating application to bottom surfaces, lower shell surfaces of completed epoxy coating which may have been subjected to damage from abrasive blast cleaning of bottom surfaces shall be holiday detected again and repaired as needed.

### **3.10 Final Curing**

- A.** Comply with manufacturer's recommendations on sufficient cure time before filling tank.
- B.** Use force-air ventilation at all times and after the application of the interior coating systems. It is essential that the solvent vapor released during the application and from the deposited film be removed from the tank interior. During the coating application provide ventilating system with the capacity of at least 300 cfm per gallon of coating applied per hour. After the application of the finish coat, force ventilate the tank continuously at the rate of one air exchange per hour for a period of five days. If the ENGINEER has any doubt of the adequacy of the curing conditions, provide

additional curing time with the continued forced-air ventilation.

- C.** CONTRACTOR may find it necessary to extend the curing time or ventilation time beyond the requirements in order to comply with the regulatory agency requirements or to reduce the leached organic compounds to the required levels. All costs in connection with extended curing times shall be borne by CONTRACTOR.
- D.** If an artificial heat source is employed to force cure the interior coating system, all activities shall conform to the coating manufacturer's instructions. Specific information regarding initial cure time prior to heating, localized positioning of heating duct, maximum localized temperatures, and temperature curing curves must be addressed in writing and approved by ENGINEER.
- E.** After Completion of Curing Cycle as Noted Above, Test the Applied Coating via an Acetone or Hardness Test to Verify, to ENGINEER, that Adequate Curing has Been Attained:
  - 1.** Acetone or hardness test requirements shall be as required by the coating manufacturer's written instructions.
  - 2.** If final cure has not been attained, based on above tests, ventilation shall be continued until applied coating passes the acetone or hardness test.
- F.** After final cure is approved by ENGINEER, remove fan or blower.

### **3.11 Cleanup**

- A.** Upon completion of the work, remove staging, scaffolding, and containers from the site or destroy in a manner approved by ENGINEER.
- B.** Remove coating spots upon adjacent surfaces and clean the entire job Site.
- C.** Remove all waste materials (hazardous or non-hazardous, in containers or on the ground) from the Site.
- D.** Clean, repair, or refinish damage to exterior surfaces of the tank, resulting from the work of this section, to the complete satisfaction of ENGINEER at no cost to Owner.
- E.** Upon Completion and Acceptance of All Coating and Painting Operations, Site Soil Shall be Retested in Same Locations Tested

Prior to Start of Work, for Presence of Lead or Other Heavy Metals.

- 1.** Testing shall be accomplished by the same laboratory as the original testing.
- 2.** If soils contain excessive levels of lead or other heavy metals above those levels determined by testing at start of work and beyond acceptable levels of current regulations, CONTRACTOR shall be responsible for removal and disposal of contaminated soil, and returning the site to its original condition.
- 3.** Copies of laboratory analyses reports shall be forwarded to ENGINEER immediately upon receipt from laboratory, prior to start of any work.
- 4.** Any required remediation schedule will be determined by the ENGINEER.

**\*\* END OF SECTION \*\***

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## **SECTION 13110**

### **CORROSION PROTECTION FOR STEEL TANK INTERNALS**

#### **AND CML&C STEEL PIPELINE**

### **PART 1 – GENERAL**

#### **1.1 Scope of Work**

- A.** The Contractor shall provide all materials, manpower, tools, and equipment to complete the Work specified herein and shall perform all subsidiary and incidental work necessary to complete the Work in conformance with the project requirements.
- B.** The Work includes all labor and materials to provide and install corrosion control facilities on the new or rehabilitated Lake Havasu City (City) Tank 2A Potable Water Reservoir and CML&C steel yard piping. The Work is in two categories as follows:
  - 1.** A sacrificial anode cathodic protection (CP) system for the internal surfaces of the steel reservoir, which includes supplying all materials; installing anode and portable reference cell access ports; installing anode header cable; installing anodes; installing permanent reference cells and anode control box, repairs to tank roof coating; connecting the anodes and testing; and all accessories required for a complete operable cathodic protection (CP) system.
  - 2.** Corrosion control and monitoring system on the buried steel yard piping including insulating flange kits and corrosion monitoring test stations and system testing.
- C.** The Contractor shall retain a qualified Corrosion Engineer to direct the construction of facilities specified herein. The Corrosion Engineer shall test and certify that the corrosion control facilities for this project are constructed properly and as specified, and are fully functional.

#### **1.2 Definitions**

- A.** **CONTRACTOR:** The licensed prime installer selected by the OWNER to perform the WORK.

- B.** OWNER: The Lake Havasu City (City).
- C.** CORROSION ENGINEER: A qualified Corrosion Engineer retained by the Contractor who is either a Registered Professional Corrosion Engineer or NACE-International Certified Cathodic Protection Specialist.
- D.** ENGINEER: The City's Resident Engineer or designated representative.
- E.** CITY'S CORROSION ENGINEER: The Engineer's appointed representative from the Lake Havasu City.

### **1.3 Reference Specifications, Codes, and Standards**

- A.** The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designations only.

American Society for Testing and Materials (ASTM):

B3	Soft or Annealed Copper Wire
B8	Concentric-Lay Stranded Copper Conductors
B107	Magnesium Alloy Extruded Bars, Rods, Shapes, Tubes, and Wire
C94	Ready-Mixed Concrete
D1248	Polyethylene Plastics Molding and Extrusion Materials
D2220	Polyvinylchloride Insulation for Wire and Cable

American Water Works Association (AWWA):

C217	Wax Tape Coatings for the Exterior of Fittings for Buried Steel Water Pipelines
D100	Welded Steel Tanks for Water Storage

National Association of Corrosion Engineers (NACE):

SP0169	Standard Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems
SP0196	Galvanic Anode Cathodic Protection of Internal Submerged Surfaces of Steel Water Storage Tanks
SP0286	Electrical Isolation of Cathodically Protected Pipelines

Underwriter's Laboratories, Inc. (UL) Publications:

83-80	Thermoplastic-Insulated Wires
486-76	Wire Connectors and Soldering Lugs for Use with Copper Conductors

## **1.4 SUBMITTALS**

The following information shall be submitted for approval of the Engineer prior to the start of work:

- A.** Catalog Cuts (3 copies):
  - 1.** Magnesium Anodes (15', Standard Potential)
  - 2.** Wire and Cable
  - 3.** Wire Splice Materials or Kits
  - 4.** Anode Access Ports (by parts)
  - 5.** Permanent Reference Cells
  - 6.** Reference Cell Access Ports (by parts)
  - 7.** Wire Insulators/Hangers
  - 8.** Anode Control Box
  - 9.** Conduit
  - 10.** At-Grade, Traffic-Rated Concrete Test Box With Cast Iron Lid
  - 11.** Flange Isolation Kits
  - 12.** External Coating For Buried Non-Mortar Coated Surfaces
  - 13.** Exothermic Weld Kits and Charges
  - 14.** Weld Caps and Primer
  - 15.** Weld Coating
  - 16.** Plastic Warning Tape
  - 17.** Wire Identification
  - 18.** Qualifications of the Contractor's Corrosion Engineer
  
- B.** The Contractor shall submit as-built drawings (marked-up drawings) showing the actual locations of all anode and reference cell ports, tank penetrations, conduit, and anode control box enclosure. As-built drawings shall be received by the Engineer before the work is considered complete. Any changes shall be clearly marked in red.

## **PART 2 –PRODUCTS**

### **2.1 General**

- A.** Materials and equipment furnished under this section of the specifications shall be the standard product of manufacturers regularly engaged in the manufacturing of such products and shall be the manufacturer's latest standard design that complies with

specification requirements. All materials and equipment shall bear evidence of U.L. approval when U.L. standards exist.

## **2.2 Magnesium Anodes (15', Standard Potential)**

**A.** Anodes shall be extruded magnesium alloy rods in accordance with ASTM B107 with a steel wire core. The standard potential magnesium alloy shall have a theoretical energy capacity of 1000 ampere-hours per pound and have a nominal useful capacity of 500 ampere-hours per pound.

**B.** The chemical composition shall be as follows:

Aluminum	2.5 to 3.5%
Manganese	0.20% Min.
Zinc	0.7 to 1.3%
Silicon	0.05% Max.
Copper	0.01% Max.
Nickel	0.001% Max.
Iron	0.002% Max.
Other (each)	0.05% Max.
Other (total)	0.30% Max.
Magnesium	Remainder

The open circuit potential of the anode shall be between 1.40 and 1.50 volts versus a copper/copper-sulfate reference electrode.

**C.** Anodes shall have an outside diameter of 2.024-inch and a nominal weight of 2.5 pounds per linear foot. Lengths are 15 feet as shown in the Drawings. The steel wire core shall be 3/16-inch diameter.

**D.** The anode lead cable shall be attached to the steel wire anode core with suitable brass crimp connector. The connection shall be silver soldered or brazed as shown in the Drawings. The connection shall be insulated with a heat shrink, mastic filled sleeve. The sleeved connection and 2 inches of the anode shall be fully encapsulated with a PVC cap filled with potting epoxy as shown in the Drawings.

## **2.3 Anode and Reference Cell Access Port Assembly**

**A.** Construction: The anode port assembly, shown in the Drawings, shall be fabricated from the following materials:

SS Clevis;  
Porcelain Roller;  
1/16" Neoprene Washer;

1/16" Nut, Bolt, and Washer  
Wire U-clamp

- B.** All metallic materials shall be Type 316 stainless steel.

## **2.4 Access Handholes**

- A.** Construction: The access handholes shall have a 6-inch diameter cover. The cover shall be 10 Ga. Type 316 stainless steel. The ring gasket shall be 1-inch wide by 1/8-inch thick neoprene with a 5-inch diameter ID. The 3/16-inch - 20 stainless steel bolt and stainless steel nuts and washers shall be as shown in the drawings.

## **2.5 Anode Control Box**

- A.** Type: Use Corpro CorrPower Magnesium Anode Controller.
- B.** Enclosure: fiberglass, NEMA 4X, rain tight enclosure. The enclosure shall have a hinged door with a lock hasp. All hinges and fasteners shall be stainless steel.
- C.** Anode Control Box Location/Installation: The anode control box shall be mounted adjacent to the tank ring wall at ground elevation and below the tank penetration for cathodic protection cables (located just below the radial line or "knuckle" of the tank). The box shall be mounted on a 2-inch X 6 foot galvanized steel post. The steel post shall be installed in the ground to a depth of 2 feet and shall be encased in concrete with a diameter of 24 inches. The post and test box shall extend above grade by 4 feet. Unistrut attached to the tank may be used in lieu of the steel post with approval from the engineer.

## **2.6 Copper Sulfate Reference Electrode (Permanent)**

- A.** General Requirements: Copper sulfate reference electrodes (or cells) shall be constructed with an ion trap to prevent contamination. The reference electrode shall have a design life of 15 years and a stability of +/-5 millivolts under a 3.0-microampere load.
- B.** Reference Electrode Wires: Provide each reference electrode with a No. 14 AWG THWN lead wire. The cells shall have red insulation. For reference cells installed inside tank, each lead wire shall be long enough to extend from the electrode to the anode resistor box without any splices. For buried reference cells installed inside tank, each lead wire shall be long enough to extend from the pipe trench

to the test box without any splices.

- C. Type: Use STAPERM™ Model CU-2-FW or approved equal.

## **2.7 Wire and Cable**

- A. All Wire: All wire shall be single conductor, stranded copper of the gauge indicated. Wire sizes shall be based on American Wire Gauge (AWG). Copper wire shall be in conformance with ASTM Standards B3 or B8. Wire with high molecular weight polyethylene (HMWPE) insulation and shall conform with the requirements of ASTM D1248m Type 1, Class C, Grade 5. Wire with THWN insulation shall conform with the requirements of ASTM D-2220.
- B. Anode Lead Wire: The anode lead wires shall be No. 8 AWG HMWPE. Each anode shall have a lead wire of sufficient length to reach from the anode to the splice to the header wire without a splice as shown in the Drawings.
- C. Cable Lengths: Anodes shall be provided with sufficient cable length to effect the installation as shown on the Drawings. Provide at least 3 feet of excess cable.
- D. Header Wire: No. 6 AWG with HMWPE insulation.
- E. Tank Lead Wire: No. 8 AWG with HMWPE insulation.
- F. Pipeline Test Leads: No. 6 AWG with HMWPE insulation.
- G. Reference Cell Lead Wire: No. 14 AWG with RHH-RHW insulation

## **2.8 Wire Hangers and Connection Hardware**

- A. Insulators (Wire Hangers): The anode header cable shall be secured to the tank roof with a porcelain insulator with an embedded steel threaded stud which is bolted to the tank roof plates as shown in the Drawings. A 1/16-inch thick neoprene gasket shall be placed between the insulator and the inside of the roof plate to completely seal the crevice. The insulators shall be fastened with stainless steel washer and two nuts.
- B. Support Hardware and Fasteners: All bolts, washers and wire support hardware shall be 316 stainless steel.
- C. Wire Connectors: Wire splices shall be made with brass crimp connectors specifically sized for the wire sizes being spliced.

- D.** Splice Encapsulation Materials: All wire splices shall be encapsulated in a watertight seal made with butyl rubber electrical putty and vinyl plastic tape. Pre-manufactured splice kits using molds and epoxy potting compounds can be submitted as an alternate for approval by the Engineer.

## **2.9 Conduit and Conduit Fittings**

- A.** Conduit and Fittings: See City Standard Specifications

## **2.10 At-Grade Test Stations**

- A.** Test Boxes: At-grade test boxes shall be round, pre-cast concrete, traffic rated, with a cast iron lid. The cast iron lid shall be cast with the legend "LHC CP Test" using letters not less than 1-1/2 inches high. Use Christy G-5 box, or approved equal.
- B.** Identification Tags: All test leads shall be identified with an Avery label, self-adhesive covered with polyolefin clear heat shrink tubing. The label shall include: name of facility, size pipe, material, coating, type of insulation, and station number. Brass tags may be used in lieu of heat shrink labels with approval from the Engineer.
- C.** Concrete Pad: Test boxes mounted in unpaved areas shall be mounted in a reinforced 24-inch X 24-inch X 6-inch thick concrete pad constructed of ASTM C94 ready-mix concrete. Rebar shall be No. 4 steel

## **2.11 Flange Isolation Kits and Test Station**

- A.** Gasket: Test ANSI B-16.21 full faced, Type "E" phenolic material with rectangular nitrile or Viton O-ring seal for operation between 20°F and 150°F. Gaskets shall be suitable for the temperature and pressure rating of the piping system in which they are installed.
- B.** Insulating Sleeves: 1/32-inch thick tube, full length, laminated glass material as per NEMA LI-1 G10 for operation between 20oF and 150oF. For installation at threaded valve flanges, the sleeves shall be half-length.
- C.** Insulating Washers: 1/8-inch thick laminated glass sheet material as per NEMA LI-1 G10 for operation between 20oF and 150oF.
- D.** Steel Washers: 1/8-inch thick cadmium plated steel to be placed between the nut and the insulating washer.

## **2.12 External Coating for Buried Non-Mortar Coated Surfaces**

- A.** Wax Tape System: All buried ferrous pipe and fitting surfaces such as flanges, valves, couplings, and adapters that do not have a factory applied coating shall be wrapped with a petrolatum wax tape coating in accordance with AWWA C-217 (with plastic outer wrap) and these specifications. No bare metallic surfaces shall be backfilled or buried.
- B.** Primer: The flange and bolt surfaces shall be prime coated with a blend of petrolatum, plasticizer, inert fillers, and corrosion inhibitor having a paste-like consistency. The primer shall be Trenton Wax-Tape Primer, Denso Paste, or equivalent.
- C.** Wax Tape: Flange covering material shall be a synthetic felt tape saturated with a blend of petrolatum, plasticizers, and corrosion inhibitors that is easily formable over irregular surfaces. A compatible petrolatum filler should be used to smooth over irregular surfaces. The Wax-Tape shall be Trenton #1 Wax-Tape, Densyl Tape wrap, or equivalent.
- D.** Outer Covering: The primed and wax-tape wrapped flange shall be wrapped with a plastic tape covering consisting of three (3) layers of 1.5 mil, polyvinylidene chloride or metallocene resin material. The outer covering shall be Trenton Poly-Ply or equivalent

## **2.13 Exothermic Weld Kit**

- A.** Wire Connections: Wire-to-metal connections shall be made by the exothermic welding process. Weld alloy shall be for steel pipe. It is the CONTRACTOR's responsibility to determine the manufacturer's recommended weld charge size for metallic surfaces.

## **2.14 Weld Caps and Primer**

- A.** Weld Caps: Exothermic welds shall be sealed with a pre-fabricated plastic cap filled with formable mastic compound on a base of elastomeric tape. Weld caps shall be Royston Handy Cap or equivalent.
- B.** Weld Primer: Weld cap primer shall be an elastomer-resin based corrosion resistant primer for underground services such as Royston Roybond Primer 747 or equivalent.

## **2.15 Weld Coating**

- A.** Coating: All exothermic weld caps shall be over-coated with a cold-applied fast-drying mastic consisting of bituminous resin and solvents per MIL-C-18480B. Use Koppers Bitumastic 50 or 505, Tnemec 40-H-413, Tape-coat TC Mastic or 3M Scotch Clad 244. Apply to at least 25 mils thickness.

## **2.16 Plastic Warning Tape**

- A.** Tape: Plastic warning tape for all cable trenches shall be a minimum of four (4) mils thick and six-inches (6) wide, inert plastic film designed for prolonged use underground. The tape shall have the words "Caution: Cathodic Protection Cable Below" or similar, clearly visible along its entire length

## **PART 3 – EXECUTION**

### **3.1 Anode Storage**

- A.** Anode Handling and Storage: Care must be taken to prevent damage or bending of the anodes during shipment, handling and storage. The contractor shall store the anodes at ground level on 3 wood 4x4s equally spaced until they are ready to be installed. Lead wires and hardware (stainless steel thimbles, u-bolts, etc.) shall be neatly bundled and stored with the anodes.
- B.** Weather Protection: Anodes shall be fully encased with two layers of 8-mil polyethylene sheet. Seal the wrap with tape.
- C.** Location: Anodes shall be stored in the location as directed by the City.

### **3.2 Hardware Installation Sequence**

- A.** Access Ports: Anode and reference cell access ports shall be installed and all cutting and welding shall be done before the tank is painted or coated.
- B.** Header Wire Hangers: Install all anode header wire suspension hardware after the roof is painted and coated but before the tank is put into service. Holes for insulated cable hangers shall be carefully placed so that there is minimum coating damage. Provide rubber or waterproof gasket between the insulator and the roof on the inside and between the metal washer and the roof on the outside.

- C.** Conduit, Wiring and Hardware: All remaining cathodic protection wiring, conduit and hardware (except for the anodes) including: the anode header and feed wire; anode pigtails and splice; hanger\insulators; conduit; tank penetrations; enclosures with all internal components; anode header-to-feed wire splice; and supporting hardware is to be installed and approved before the tank is put into service.
- D.** Anode Pigtails: The Contractor shall splice anode pigtails to the header wire as shown in the Drawings. The pigtail shall be long enough to loop up through the access port and extend beyond the port by 30-inches minimum. The pigtail shall be secured to the stainless steel clevis and porcelain roller for easy access when the anodes are installed at a later date.
- E.** Anode Lead Wire Termination: The exact length of cable from the epoxy anode cap to the thimble shall be determined in the field. Note that the bottom tip of the anode is suspended 7 feet off of the tank bottom. The Contractor shall allow enough anode lead wire to extend above the roof by 30-inches minimum after the anode is suspended.
- F.** Splice: All wire splices shall be watertight and suitable for long-term exposure to moist and humid conditions. Copper conductor connections shall be made with a brass crimp connector. The watertight covering shall consist of several layers of butyl rubber electrical putty and at least 6 layers of half-lapped vinyl electrical tape as shown in the Drawings. Alternate splice methods, such as splice kits, will be considered and must be approved by the Engineer before use.

### **3.3 Anode and Reference Cell Port Assembly**

- A.** Location: The approximate location of the anode and reference cell port assemblies is shown on the Drawings. Final locations shall be determined in the field after the new roof is in place. The port locations shall be adjusted to avoid roof structural components. Reference cells and reference cell ports shall be placed as close as possible to the mid-point between the two closest anodes. The Contractor shall record final port locations on as-built Drawings.
- B.** Roof Holes: Roof holes for anode and reference cell ports shall be cut in accordance with AWWA D100. No structural members shall be cut. All cut edges shall be ground smooth. Hole diameters shall be 5 inches for anode ports and 5 inches for the reference cell

ports.

- C. Coating Repairs: All cutting and welding shall be done prior to coating and painting the tank. Any damaged coating resulting from the installation of header wire hangers or any other cathodic protection component shall be hand cleaned with wire brushes and abrasive paper and fully coated with a material compatible with the tank coating or paint.

### **3.4 Anode Control Box**

- A. Junction Box: The anode control box shall be installed on the exterior tank wall with suitable brackets welded to the tank. All welded brackets must be painted with the tank exterior. Field route conduit to tank penetration and to ring wall penetration for exterior reference cells. Two tank test lead wires shall be welded to the tank bottom ring wall as shown on the Drawings and routed to the anode control box.

### **3.5 Wire, Cable and Conduit**

- A. Anode Pre-Assembly: All anode lead wires shall be connected to the anode by the anode supplier in accordance with the Drawings. Alternate lead wire connections can be submitted to the Engineer for consideration and approval.
- B. Header Wire and Tank Penetrations: The header wires shall be suspended from the tank roof from insulators. The header wire shall be spliced to form a continuous loop and shall be spliced to the anode feed wire from the anode junction box. The anode feed wire shall penetrate the tank shell above the high water line as shown in the Drawings. All wiring shall be done in accordance with the National Electrical Code NFPA 70.
- C. Wire Chafe Protection: Wire chafing shall be prevented by securing anode header, feed or pigtail wires to the roof structure at all points where the wire contacts the structure. A galvanized C-clamp shall be used for this purpose.
- D. Conduit: All conduit placed on the outside of the tank shall be spaced off the tank with clamps and non-metallic spacers as shown in the Drawings.
- E. Damaged Wire: Care shall be taken when handling and installing wire so that the insulation is not stretched, kinked or cut. If wire insulation is damaged during installation, it shall be repaired with a

fully watertight seal. Wire insulation repairs shall be observed and approved by the Engineer or City's Representative.

### **3.6 At-Grade Test Stations**

- A.** Location: At-grade corrosion monitoring test boxes shall be located as shown in the drawings. Test boxes shall be installed flush with pavement or slightly raised (1 inch) in unpaved areas.
- B.** Test Box Bottom: Native soil shall be accessible in the bottom of all test boxes. The test boxes shall not be filled with sand, gravel, rocks, concrete, or any other foreign material.
- C.** Test Lead Attachment: Test leads shall be attached to the pipe using the exothermic weld process. An 18-inch length of slack wire shall be coiled at each weld and inside each test box.
- D.** Concrete Pad: A 24-inch square by 6-inch thick concrete pad is required around each at-grade test station that is not located in a paved area. Reinforce the pad with No. 4 rebar as indicated in the drawings

### **3.7 Cable Trenching**

- A.** Test Lead Trench: Horizontal test or anode lead runs shall be placed in a 36-inch trench
- B.** Wire Handling: Wire leads shall not be stretched or kinked. Care shall be taken when installing wire and backfilling. If wire insulation is damaged during installation, it shall be rejected and replaced completely at the CONTRACTOR's expense. All rejected wire shall be removed from the job site at the close of each workday.
- C.** Plastic Warning Tape: Plastic warning tape shall be installed in all wire trenches and 12 inches below finished grade.
- D.** Buried Wire Splicing: Buried Wire splices are not permitted

### **3.8 Wire to Metal Connection**

- A.** Connection Method: All connections of lead wires to the pipe shall be made by the exothermic weld method. Deviations from this connection method require the written approval of the ENGINEER.
- B.** Weld Charge Size: It is the CONTRACTOR's responsibility to ensure

that the manufacturer's recommended weld charge size is used.

- C.** Preparation of Wire: Do not deform cable. Remove only enough insulation from the cable to allow for the exothermic weld.
- D.** Preparation of Metal: Remove all coating, dirt, grime and grease from the metal structure by wire brushing. Clean the structure to a bright, shiny surface free of all serious pits and flaws by using a file. The surface area of the structure must be absolutely dry.
- E.** Wire Position: The wire is to be held at a 30-degree angle to the surface when welding. Only one wire shall be attached with each weld.
- F.** Testing of Completed Welds: After the weld has cooled, the weld shall be tested by striking the weld with a 2-lb hammer while pulling firmly on the wire. All unsound welds shall be cleaned, re-welded, and re-tested. All weld slag shall be removed.
- G.** Coating of Welds: The area to be coated shall be clean and completely dry. Apply a primer specifically intended for use with an elastomeric weld cap. Apply the weld cap and a bituminous mastic coating material to all exposed areas around the cap in accordance with the manufacturer's recommendations. The coating shall overlap the structure coating by a minimum of 3 inches.
- H.** Mortar Repair: Coating voids shall be filled with cement grout.

#### **PART 4 – INSPECTION**

The Contractor's Corrosion Engineer shall submit his/her proposed test procedures to the Engineer at least five (5) days in advance of the time that the cathodic protection system testing is scheduled. The Engineer or the Owner's representative shall witness all testing at their discretion. All test data shall be submitted to the Engineer within seven (7) days of the completion of the testing. All testing shall be conducted under the supervision of a qualified Corrosion Engineer who is retained by the Contractor. All deficiencies found to be due to faulty materials or workmanship shall be repaired or replaced by the Contractor and at his/her expense.

##### **4.1 Test Leads**

- A.** It is the CONTRACTOR's responsibility to test all test leads.
- B.** TEST METHOD. All completed wire connection welds shall be

tested by striking the weld with a 2-lb hammer while pulling firmly on the wire. Welds failing this test shall be re-welded and re-tested. Wire welds shall be spot tested by the Engineer. After backfilling the pipe, all test lead pairs shall be tested using a standard ohmmeter.

- C. ACCEPTANCE. The resistance between each pair of test leads shall not exceed 150% of the total wire resistance as determined from published wire data.

#### **4.2 Test Lead Trenching**

- A. The Engineer, at his or her discretion, shall inspect wire trenches and backfill material and methods.
- B. TEST METHOD. The depth, trench bottom, padding, and backfill material shall be visually inspected prior to backfilling.
- C. ACCEPTANCE. Conformance with specifications.

#### **4.3 Baseline Corrosion Protection Measurements (Pipeline)**

- A. The Contractor's Corrosion Engineer shall obtain baseline (native) pipe-to-soil potentials at all corrosion test stations.
- B. TEST METHOD. The installed corrosion protection system testing shall include: native (static) pipe-to-soil potentials using a copper/copper sulfate reference electrode and test lead to test lead resistance measurements.
- C. ACCEPTANCE. All test data shall be submitted, in a typed 8-1/2 X 11 inch report to the Engineer for acceptance and before the project is considered complete.

#### **4.4 Flange Isolation Kits**

- A. Responsibility: Insulating flanges shall be inspected and tested by the Contractor's Corrosion Engineer and in the presence of the Engineer. Buried flange isolation kits shall be inspected and tested prior to wax tape coating and prior to backfilling.
- B. Test Method: The assembled flange shall be tested using a Gas Electronics Model 601 Insulation Checker specifically design for testing insulating flanges, or approved equal. The testing shall be done by a qualified Corrosion Engineer, retained by the Contractor, and accepted by the Engineer. NACE SP0286 may be used to determine the effectiveness and acceptance of the flange isolation

kit.

- C. Acceptance: The installation of the insulating flange kit shall be considered complete when the testing device indicates no shorts or partial shorts are present. The Contractor shall provide assistance in finding any and all shorts or shorted bolts. All disassembly and reassembly necessary for acceptance shall be done at the Contractor's expense.

#### **4.5 Compliance with Specifications**

- A. Deficiencies or omissions in materials or workmanship found by these tests shall be rectified at the Contractor's expense. Deficiencies shall include but are not limited to: broken leads, improper or unclean trenches, lack of 18-inch or slack wire in test boxes; improperly mounted test boxes; improper anode installations, improper test box installations (including concrete pads around the test box), and other deficiencies associated with the workmanship, installation, and non-functioning equipment.

#### **4.6 Completion of Work**

- A. General: The work shall not be considered complete until the installation is inspected and accepted by the City. The inspection shall consist of a visual examination and measurements for compliance with the Drawings and these Specifications. Any material or work found not to be in compliance with the Drawings or Specifications shall be repaired or replaced by the Contractor at no cost to the City. The work shall not be complete until it is approved in accordance with the provisions of these Specifications.

#### **4.7 Cathodic Protection Performance Testing (Reservoir)**

- A. All performance testing shall be done by the Contractor's Corrosion Engineer. The City will witness the testing at their discretion and must be notified at least 3 days in advance of the testing. The Engineer shall be notified when all cathodic protection facilities have been installed. The contractor must also coordinate the installation and the initial testing of the cathodic protection system with the City when the CP system is activated after the one year coating warranty period.
- B. After the initial cathodic protection system performance testing has been completed, the Contractor shall disconnect the anode header cable inside of the anode control box such that the anodes and cathodic protection system are de-activated. The cathodic

protection system shall remain de-activated for the entire coating warranty period (typically 1 year). After the coating warranty inspection, the anodes shall be re-connected, by the Contractor, and the cathodic protection system shall be adjusted (through the anode control box circuit) to comply with the protected levels described in NACE SP019.

#### **4.8 Clean Up**

- A.** All debris, tools and storage materials shall be removed from the tank roof and from the premises when the work is complete. Anode port caps shall be installed. Any cost incurred by the City to clean up debris or materials resulting from this work shall be back charged to the Contractor.

### **PART 5 – MESUREMENT AND PAYMENT**

- 5.1** Refer to Section 01210, Measurement and Payment

**\*\* END OF SECTION \*\***

**SECTION 13111**  
**CATHODIC PROTECTION SYSTEM**  
**REHABILITATION OF EXISTING TANK 2A-06 (ALTERNATIVE 1)**

**PART 1 - GENERAL**

**1.1 Summary**

- A.** The CONTRACTOR shall remove and replace existing impressed current cathodic protection system components inside of Tank 2A-06. The Tank's diameter is 85 feet and a height of 24 feet, nominal capacity 1 million gallons. The existing system is impressed current cathodic protection type, and consist of 14 wire type suspended anodes, one reference anode, rectifier and control box.
- B.** All work furnished shall be in accordance with AWWA D104, NSF 61 and these specifications.
- C.** The scope of work includes the following:
  - 1.** Replace all mounting hardware, wire and wire splices.
  - 2.** Remove, store and re-install existing wire anodes, rectifier and control box. Reconnect rectifier to AC power supply.
  - 3.** Replace permanent reference cell with new reference cell.
  - 4.** Re-commission existing system to ensure proper functioning.
  - 5.** Turn off system upon successful re-commissioning.
  - 6.** Turn on system after successful warranty inspection.

**1.2 References**

- A.** National Association of Corrosion Engineers (NACE).

**1.3 Submittals**

- A.** Submittals: Comply with Section 01330.
- B.** Submit qualifications showing NACE certification as required herein.
- C.** Submit Catalog Cuts for new materials intended to use for rehabilitation of CP system.

## **1.4 Qualifications**

- A.** Testing: Performed by a Cathodic Protection Specialist.
- B.** Cathodic Protection Specialist defined as one of the following:
  - 1.** NACE certified Cathodic Protection Specialist or Corrosion Specialist;
  - 2.** Registered Professional Corrosion Engineer.

## **PART 2 - PRODUCTS**

### **2.1 Permanent Reference Cell**

- A.** To match existing cell;
- B.** GMC Staperm Copper-Copper sulfate, CU-2-FW or approved equal
- C.** Minimum 15-year service life.

### **2.2 Wire and Cable**

- A.** Wire and cable shall conform to Specification Section 13110-2.7.
- B.** All wiring within the tank shall be insulated to prevent copper conductor to water contact. All wiring on the exterior of the tank shall be insulated and run in rigid conduit.

### **2.3 Hardware**

- A.** All hardware used in conjunction with the system shall be protected against corrosion.
- B.** Wire hangers and connection hardware shall conform to Specification Section 13110-2.8.

## **PART 3 - EXECUTION**

### **3.1 Preparation for Rehabilitation of Tank**

- A.** Deactivate existing impressed current system.
- B.** Document materials, locations, dimensions in order to re-install in same layout.
- C.** Remove existing CP system components inside tank.

- D.** Store existing anodes in dry, clean, sealed bags, marked with date and location of tank from which anodes are taken in an indoor location.

### **3.2 Installation**

- A.** Reinstall materials and equipment in accordance with recommendations of manufacturer.
- B.** Provide access handholes for the anodes as indicated in the drawings (drawing CP-2). Coordinate location of handholes and conduit penetrations with roof manufacturer.
- C.** Provide and install wire hangers and connection hardware.

### **3.3 Performance**

- A.** All work shall be in accordance with the following requirements:
  - 1.** Components of the cathodic protection system shall be installed to match existing system.
  - 2.** Welding, cutting and coating shall be in accordance with AWWA Standards D100, D102 and D105.
  - 3.** Welding of steel coupling, anchors and mounting brackets required for CP system shall be performed prior to coating the tank.
  - 4.** Materials and equipment shall be inspected prior to installation. Any defective components shall be repaired or replaced.
  - 5.** Electrical work shall be in accordance with the National Electrical Code.
  - 6.** Electrical connections within the tank shall be sealed to prevent water migration.
  - 7.** The rectifier shall be mounted at the convenient height (eye level) above grade for monitoring and service purposes.

### **3.4 Energizing and Testing**

- A.** The energizing and start-up services shall be performed in accordance with AWWA D104 Section 5.2. The start-up service shall be coordinated with the Engineer.
- B.** Perform testing by a Cathodic Protection Specialist employed by Contractor to ensure proper operation.

- C. Deactivate after testing for warranty period.
- D. Reactivate after warranty period, prior to final project completion.

**\*\*END OF SECTION\*\***

**SECTION 13211**

**TANK DISINFECTION**

**PART 1 – GENERAL**

**1.1 Requirement**

- A.** The CONTRACTOR shall perform all cleaning, flushing, testing, and disinfection, including conveyance of test water from source to point of use, and including all disposal thereof, complete and acceptable for Tank 2A, and appurtenant piping as specified herein and in accordance with the requirements of the contract documents.

**1.2 Related Work Specified Elsewhere**

- A.** The work of the following Sections applies to the Work of this Section.
- B.** Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

Measurement and Payment	Section 01210
Submittals	Section 01330
Protective Coatings for Steel Water Tank	Section 09950
Welded Steel Tanks for Water Storage	Section 13311

**1.3 Contractor Submittals**

- A.** The CONTRACTOR shall submit a minimum 7-day advance written notice of the proposed testing schedule for review and concurrence of the ENGINEER. The CONTRACTOR's proposed plans for water conveyance, control, backflow prevention, and disposal shall also be submitted in writing.

**PART 2 – PRODUCTS**

**2.1 Materials Requirements**

- A.** Temporary valves, bulkheads, or other water control equipment and materials, shall be as determined by the CONTRACTOR subject to the ENGINEER's review. No materials shall be used which would be injurious to the construction or its future function.
- B.** All materials that will come into contact with potable water must be

NSF 61 certified.

## **PART 3 – EXECUTION**

### **3.1 General**

- A.** Water for testing and disinfection shall be furnished by the CONTRACTOR. The CONTRACTOR shall make all necessary provisions for conveying the water from the source to the points of use.
- B.** Tank 2A-06 and their appurtenant pressure piping shall be tested and disinfected. Disinfection shall be accomplished by chlorination. Chlorine dosages shall be as required by ADEQ Bulletin 8 and AWWA C652. All chlorinating operations shall be performed in the presence of the ENGINEER.
- C.** Testing and disinfecting operations shall be combined.
- D.** Disinfection operations shall be scheduled by the CONTRACTOR as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the WORK is accepted by the OWNER. Bacteriological testing shall be performed by a certified testing laboratory approved by the OWNER and at the expense of the CONTRACTOR. Results of the bacteriological testing shall be satisfactory with the Arizona Department of Environmental Quality.
- E.** Protective coatings shall be applied before all testing and disinfection operations have been completed.
- F.** Release of water from structures, after testing and disinfection have been completed, shall be as approved by the ENGINEER.

### **3.2 Preliminary Cleaning and Flushing**

- A.** Prior to both testing and disinfection, Tank 2A-06 shall be cleaned by thoroughly hosing down all surfaces with a high pressure hose and nozzle of sufficient size to deliver a minimum flow of 50 gpm.

### **3.3 Disinfection of Reservoir and Appurtenant Pipelines**

- A.** Disinfection of Tank 2A-06 shall meet the requirements of ADEQ Bulletin 8, Method One and AWWA C652 Method Two. A strong chlorine solution (200 mg/L available chlorine) shall be sprayed on all interior surfaces of the tank. The solution shall thoroughly coat all interior surfaces of the tank, including the inlet/outlet piping.

- B.** Drain piping shall be coated so that it will have a minimum chlorine concentration of 10 mg/L when filled with water.
- C.** The disinfected surfaces shall remain in contact with the strong chlorine solution for at least 30 min, after which potable water shall be admitted, the drain piping purged of the 10 mg/L chlorinated water, and the storage facility then filled to its overflow level.
- D.** Following this procedure and subject to satisfactory bacteriological testing and acceptable aesthetic quality, the water may be delivered to the distribution system.

#### **PART 4 – MEASUREMENT AND PAYMENT**

**4.1** Refer to Section 01210, Measurement and Payment

**\*\* END OF SECTION \*\***

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## **SECTION 13212**

### **REHABILITATION WELDED STEEL WATER TANKS**

#### **PART 1 – GENERAL**

##### **1.1 Description**

- A.** This specification covers the work required to rehabilitate 1 MG Steel Welded Water Tank 2A-06 (Alternatives 1A and 1B).
- B.** This is “turnkey” project. The CONTRACTOR shall provide all work, labor, materials, appliances, tools, equipment and services necessary for or incidental to perform all of the operations encompassed by the work of this Specifications, complete as specified herein.
- C.** Inadvertent omission of any necessary items of work, material, or equipment shall not negate the CONTRACTOR’S responsibility to provide these items at no additional cost to the OWNER.
- D.** The Tank 2A was constructed in 1999. The fabrication drawings are provided in Appendix B. The OWNER does not guarantee completeness or accuracy of these drawings.
- E.** Tank Industrial Consultants (TIC) conducted field evaluation of the Tank 2A. The Report summarizing TIC findings dated April 16, 2015 is provided in Appendix C.
- F.** Tank is currently out of service and empty.
- G.** The structural integrity of roof structure of Tank 2A-06 is compromised. Contractor shall secure roof structure and proceed with extreme caution before entering the tank.

##### **1.2 Scope**

- A.** The rehabilitation work consist of the following:
  - 1.** Roof: Remove roof structure including all structural components, access hatch and vents, and construct new aluminum dome roof per Specification Section 05162 (Alternative 1A), or steel roof (Alternative 1B), roof appurtenances including access hatches, vents and safety railing. Modify tank’s steel shell as required to accommodate new roof.

2. Floor: Remove floor and construct new floor including oil impregnated sand cushion.
3. Tank piping: remove inlet, outlet and overflow piping and construct new piping and appurtenances. Connect to the existing water system.
4. Exterior ladder: remove existing exterior ladder and construct new ladder compatible with new roof structure.
5. Water Level indicator: Provide and install new water level indicator compatible with new roof structure.
6. Exterior: The exterior of the Tank 2A shall be prepared and painted according to Specification 09950 with exception of aluminum roof. If Alternative 1A is selected do not paint aluminum roof.
7. Interior: The interior of the Tank 2A shall be inspected, repaired as required, prepared and painted according to Specification 09950. If Alternative 1A is selected do not paint aluminum roof.
8. Corrosion protection: Remove, and after tank rehabilitation work is completed, re-install Corrosion Protection System per Section 13111.
9. Electrical and Instrumentation: Reconnect existing electrical appurtenances as shown in the drawings, provide new receptacles.
10. Testing and Disinfection: Upon completion of painting, test Tank 2A per Specification Section 13311.3.8 (as applicable), and disinfect per Specification Section 13211.

### **1.3 Quality Assurance**

- A. All work shall be accomplished in accordance with the coating manufacturer's requirements and all relevant OSHA, AWWA and State Standards.
- B. Welding procedures and welding operators shall have been qualified in accordance with AWWA D100 Standard. All butt joints shall be complete penetration and fusion of joints. All completed welds shall be free of slag and all finish steel surfaces free from weld spatters.

- C. Work accomplished in the absence of prescribed inspection may be required to be removed and replaced under proper inspection. The entire cost of removal and replacement, including the cost of all materials shall be borne by the Contractor, regardless of whether the work removed is found to be defective or not. Work covered up without approval of the ENGINEER, shall, upon order of the ENGINEER, be uncovered to the extent required. The CONTRACTOR shall bear the entire cost of accomplishing all the work and furnishing all the materials necessary for the removal of the covering and its subsequent replacement, as directed and approved by the ENGINEER.

#### **1.4 Safety and Health Requirements**

- A. Grounding: Welding leads and related equipment shall be grounded to prevent accumulation of charges of static electricity
- B. Protective Clothing: During cutting, burning and welding operations, workmen shall wear gloves, eye shields and other protective clothing. If working with lead or other heavy metals, regulations regarding handling of exposed clothing shall be strictly enforced.
- C. Fire: Appropriate type fire abatement devices shall be provided by CONTRACTOR, and be readily available at the jobsite during all operations.

#### **1.5 Guarantee**

- A. The CONTRACTOR shall warranty the tank for a period of one (1) year. The tank shall be inspected by the ENGINEER after a period of 11 months after the Notice of Acceptance of the work is filed. Refer to Section 09950 for additional requirements.
- B. The CONTRACTOR shall make all repairs and replacements promptly, upon receipt of the written orders for same from the ENGINEER. If the CONTRACTOR fails to make the repairs and replacements promptly, the OWNER may do the work and the CONTRACTOR and his Surety shall be liable to the OWNER of the cost thereof.

#### **1.6 Submittals**

- A. Submit the following in accordance with Specification Section 01330:

1. Structural calculation for new roof, new floor plate and shell modifications.
2. Fabrication and erection drawings for all work.
3. All necessary information for the fabrication, including filler metal for welds, of the component part of the structure, presented on drawings to conform to recognized standard practice, AISC Manual Part 5, and AWS Code.
4. Drawings showing each piece marked for identification to correspond to erection drawings.
5. Manufacturer's literature on products including, but not limited to hardware and protective coatings.

## **PART 2 – MATERIALS**

### **2.1 General**

- A. All materials specified are those, which have been evaluated for the specific use. Any proposed substitutions must be submitted to the ENGINEER prior to the bid opening. All steel plate components shall be fabricated from new ASTM A36 material. CONTRACTOR shall provide certified mill test reports for all steel plate.
- B. All coating and paint materials shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable materials must be stored to conform to Federal, State, and local safety codes for flammable materials. At all times coatings or paints shall be protected from freezing.

## **PART 3 – EXECUTION**

### **3.1 General**

- A. All work shall be executed in accordance with the requirements of the American Water Works Association Standard D100, API 650 and API 653 latest revision and these specifications. Where the foregoing standards, recommendations, and specifications are conflicting, said conflicts shall be brought to the attention of the ENGINEER.
- B. All work shall be executed by skilled craftsmen qualified to accomplish the required work in a manner comparable with the best standards of practice. Resumes of personnel to be

used on the project shall be submitted upon Notice of Award. Continuity of personnel shall be maintained and transfers of key personnel shall be coordinated with the ENGINEER.

- C.** The CONTRACTOR shall provide a Project Superintendent to be at the work site during all operations. The superintendent shall have the authority to sign any change orders, pay estimates coordinate work and make other decisions pertaining to the execution of their contract.
- D.** All equipment, piping, and surfaces of the reservoirs shall be protected from all damage and dust or other deleterious material infiltration during the operations of the Contractor. Any items damaged by the operations of the CONTRACTOR shall be replaced in kind or acceptably repaired to the satisfaction of the ENGINEER by the CONTRACTOR at no cost to the OWNER. All work shall be made accessible to the ENGINEER at all times.
- E.** The OWNER may use own forces, engage full-time independent inspection services, or perform inspections intermittently. The CONTRACTOR is to supervise the job properly between inspections.
- F.** The ENGINEER shall inspect the cleaning of pitted areas prior to welding and following post-weld repair applications.
- G.** Any burrs, weld spatter, sharp edges, corners, unused brackets or rough welds that would cause difficulty in achieving a defect-free paint system shall be chipped or ground smooth in conformance to NACE Standard RP0178-2003. It is not the intent to have the welds or "scars" ground "flush". The object of the grinding is to eliminate sharp edges, corners, and overlaps to provide a surface for the application of a uniform thickness of coating or paint without voids or other defects.
- H.** Where it is necessary to abrasively blast clean or chemically strip coated or painted areas prior to, and after, any welding operations, work will be coordinated with the ENGINEER.
- I.** The CONTRACTOR's equipment shall be designed for installation of materials specified and shall be maintained in first class working condition. Contractor's equipment shall be subject to approval of the ENGINEER.
- J.** The CONTRACTOR shall provide, at his own expense, all necessary power, lighting, ventilation and scaffolding required for his

operations under the contract.

### **3.2 Modifications and Repair**

- A.** Roof. If Alternative 1A is selected by the OWNER, provide and install Aluminum Roof per Specification Section 05162. If Alternative 1B is selected by the OWNER provide and install steel roof in accordance with AWWA D100 and these specifications.
- 1.** CONTRACTOR shall evaluate structural strength of existing tank structure to support proposed roof structure, and provide design of modifications as required.
  - 2.** Design of stiffening ring (if required) shall be in accordance with API 650.
  - 3.** Steel roof (Alternative 1B) design should provide smooth interior surfaces. Internal girders, rafters or other support system members are not allowed. Seal weld all interior roof plate joints, perimeter joints and tee joints if used. Columns (if used) shall be circular with section properties not less than those of a 6-inch standard weight pipe section. The column baseplate shall not be welded to the floor plates but held in position by angles or other stops welded only to the floor plates at diagonal corners of the column base. Provide full filler plate seal welded under baseplate to provide uniform bearing where column baseplate overlaps a lap seam in the floor plates. Columns location shall not interfere with roof vents.  
  
In areas where steel deformation is a potential, caulk the open joint with nonsag elastomeric sealant. Elastomeric sealant shall be suitable for moist and chlorine environment. The roof shall be designed to bear the weight of a person when walking on any portion of the roof's surface.
  - 4.** Design of roof and all modifications to the existing tank is CONTRACTOR responsibility. Design and structural calculations shall be done by a registered in Arizona structural engineer.
- B.** Tank Shell. Modify as required to accommodate new roof. Inspect inside tank's shell after coating removal. Excessively pitted (more than 1/16-inch) areas shall be covered with a metal 1/4" thick plate. Plate shall extend beyond pitted area with a 100% fillet weld around perimeter of plate. Smaller pits repair with epoxy filler

per paint manufacturer recommendations. Provide side vents as indicated on the plans.

- C.** Tank Floor. Remove existing floor plate and install new one (min thickness ¼-inch). Recompact floor subgrade and provide 6-inch oil impregnated sand cushion as shown on the plans. Floor removal shall be in accordance with API 653.
- D.** Tank Appurtenances:
  - 1.** Inlet, outlet, overflow piping – see Contract Drawings.
  - 2.** Exterior Ladder – see Contract Drawings and Specification Section 05500
  - 3.** Clog resistant Atmospheric Tank Vent – see Contract Drawings and Specification Section 15910.
  - 4.** Access Hatch – see Contract Drawings.
  - 5.** Access Manway – see Contract Drawings
  - 6.** Level Gauge – Water level indicator shall be float-actuated level gauging system consisting of a target sliding vertically over an aluminum gauge board graduated in feet and inches with numerals at each foot. Use Type 316 stainless steel for the float, cable, and guide wires. Provide brackets, pipe and pulleys. Equip indicator with a Type 316 stainless steel pull chain. Acceptable products: Shand & Jurs Model 92302, Varec Figure No. 6700, or equal. Design of level gauge shall be appropriate for the selected roof alternative.
- E.** Lining and Coatings – see Specification Section 09950.
- F.** Corrosion Protection – see Contract Drawings and Specification Section 13110.
- G.** Electrical and Instrumentation – see plans and Division 16 of Technical Specification.

### **3.3 Cleanup**

- A.** Upon completion of the work, all staging, erection brackets, scaffolding and debris shall be removed from the tank and site and disposed in a manner approved by the ENGINEER. The entire jobsite shall be left in a clean condition.

**PART 4 – MEASUREMENT AND PAYMENT**

**4.1** Refer to Specification Section 01210, Measurement and Payment.

**\*\* END OF SECTION\*\***

## **SECTION 13311**

### **WELDED STEEL TANKS FOR WATER STORAGE**

#### **PART 1 – GENERAL**

##### **1.1 Requirement**

- A.** Under these specifications the CONTRACTOR shall be required to design, furnish, deliver, erect, and coat a welded steel tank with a aluminum dome type roof or steel roof as selected per bid option, and foundation consisting of a concrete ringwall footing and tank cushion material, and includes all appurtenances hereinafter described in these specifications in accordance with AWWA D100, latest edition.

##### **1.2 Related Work Specified Elsewhere**

- A.** The work of the following Sections applies to the Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

Measurement and Payment	Section 01210
Submittals	Section 01330
Earthwork	Section 02200
Cement Mortar Lined and Coated Steel Pipe and Specials	Section 02651
Concrete Formwork	Section 03100
Reinforcement Steel	Section 03200
Concrete	Section 03300
Miscellaneous Metals	Section 05500
Impermeable Vapor Barrier	Section 07150
Protective Coatings	Section 09900
Protective Coatings for Steel Water Tank	Section 09950
Corrosion Protection for Steel Tanks Internals and CML&C Steel Pipeline	Section 13110
Tank Disinfection	Section 13211
General Piping Systems and Appurtenances	Section 15000

### 1.3 Reference Standards

- A.** The publications listed below form part of this Specification to the extent referenced and are referred to in the text by the basic designation only. Except as otherwise indicated, the current editions of the following commercial standards apply to the Work of this Section:

AWWA C200	Steel Water Pipe – 6 in (150 mm) and Larger
AWWA C504	Rubber Seated Butterfly Valves, 3”-72”
AWWA D100	Welded Carbon Steel Tanks for Water Storage
AWWA D102	Coating Steel Water-Storage Tanks

### 1.4 References

- A.** “Geotechnical Evaluation Tank 2A, Lake Havasu City, Arizona”, by Western Technologies, Inc. dated February 1, 2016. The geotechnical report is provided for information purposes to assist on bidding. It is the responsibility of the CONTRACTOR to perform field investigations. Geotechnical Report is provided in Appendix A.

### 1.5 Submittals

- A.** The CONTRACTOR shall furnish submittals in accordance with the requirements of Section 01330 "Submittals", and the following:
- B.** After award, but prior to fabrication, the following shall be submitted:
- 1.** Tank and foundation design and calculations signed by a Structural Engineer registered in the State of Arizona. These calculations shall be submitted to the ENGINEER for review and comment, and for authorization to proceed.
  - 2.** All shop and erection drawings of tank and accessories, including anchor bolts (if used), signed by a Structural Engineer registered in the State of Arizona. Shop drawings shall include dimensional drawings, welding data tabulation, accessory list with fabrication details, catalog cuts and descriptions of

standard manufactured items.

- C. Mill test reports of all steel materials with a certification of compliance with ASTM or other AWWA D100 required specifications.
- D. Report of all required testing results, including vacuum testing, radiographs, coatings and welder certification for each welder within a week after his employment.
- E. Certificate of compliance with AWWA D100.
- F. Field inspection report per Section 11.2 of AWWA D100 at the conclusion of the work.

## **1.6 Quality Assurance**

- A. Materials. All materials and articles furnished by the CONTRACTOR and used for permanent installation in the work shall be new and shall conform to the respective specifications or brands herein designated and in the event the materials are not specified in detail in these specifications, the materials shall conform to the best standard construction practice as determined by the ENGINEER. All materials furnished shall be subject to rigid inspection and no material shall be used in the work until it has been inspected and accepted by the ENGINEER.

## **1.7 Job Conditions**

- A. Contractor's Equipment. The CONTRACTOR shall provide such modern equipment as may be necessary in the opinion of the ENGINEER to perform in a satisfactory and acceptable manner, and in accordance with the specifications, all the work required of the CONTRACTOR.
- B. Dust Abatement. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out protective measures wherever as often as necessary to prevent his operations from producing dust in amounts damaging to property or causing nuisance. The CONTRACTOR shall be responsible for any damage resulting from dust originating from his operations.

## **1.8 Guarantee**

- A.** The CONTRACTOR shall warranty the tank for a period of one (1) year. The tank shall be inspected by the ENGINEER after a period of 11 months after the Notice of Acceptance of the work is filed. Refer to Section 09950 for additional requirements.
- B.** The CONTRACTOR shall make all repairs and replacements promptly, upon receipt of the written orders for same from the ENGINEER. If the CONTRACTOR fails to make the repairs and replacements promptly, the OWNER may do the work and the CONTRACTOR and his Surety shall be liable to the OWNER of the cost thereof.

## **PART 2 – PRODUCTS**

### **2.1 Design Criteria**

- A.** Type: Ground Supported, Flat Bottom Reservoir.
- B.** Allowable Design Basis: AWWA D100, Section 13 (General Design).
- C.** Foundation: Reinforced concrete ring footing with oil-impregnated sand.
- D.** Nominal Capacity: 1,000,000 gallons
- E.** Fluid Specific Gravity: 1.0
- F.** High Water Level: 22.0 feet above Ringwall elevation.
- G.** Top of Ringwall Footing Elevation:        Approximate 997.0 feet MSL (see Note 2 drawing C-4).
- H.** Diameter: 86 feet
- I.** Overflow Elevation: 23.0 feet above Ringwall elevation.
- J.** Roof: Alternative 2A: Aluminum Dome Roof, Alternative 2B: Steel Roof, Roof Snow Load: 25 psf
- K.** Design Wind Load: 100 mph
- L.** Lowest One Day Mean Ambient Temperature: > 5 degrees F

- M.** Seismic Design:
- 1.** AWWA D100, Section 13 (Seismic Design of Water Storage Tanks)
  - 2.** Tank as an essential facility – Seismic Use Group III
  - 3.** Site Class: C
  - 4.** Spectral acceleration (short period) - 0.21g
  - 5.** Spectral acceleration (1-sec period) – 0.11g
  - 6.** Importance Factor  $I_E$ : 1.50
- N.** Allowable Soil Bearing Capacity: To be verified by the CONTRACTOR's geotechnical engineer (See Part 3.2) and to be approved by the ENGINEER.

## **2.2 Tank Design Standards**

- A.** The materials, design, fabrication and erection of the welded steel tank shall conform to the AWWA Standard for "Standard for Welded Carbon Steel Tanks for Water Storage" - ANSI/AWWA D100, latest revision.
- B.** All materials furnished by the tank manufacturer, which are in contact with the stored water shall be certified and listed by the National Sanitation Foundation (NSF) to meet ANSI/NSF Additives Standard No. 61. Certification of a coating type alone will not be sufficient to meet this requirement.
- C.** Aluminum roof (Alternative 2A) shall comply with AWWA D108 and Specification Section 05162.
- D.** Steel roof (Alternative 2B) design should provide smooth interior surfaces. Internal girders, rafters or other support system members are not allowed. Seal weld all interior roof plate joints, perimeter joints and tee joints if used. Columns (if used) shall be circular with section properties not less than those of a 6-inch standard weight pipe section. The column baseplate shall not be welded to the floor plates but held in position by angles or other stops welded only to the floor plates at diagonal corners of the column base. Provide full filler plate seal welded under baseplate to provide

uniform bearing where column baseplate overlaps a lap seam in the floor plates. Columns location shall not interfere with roof vents.

In areas where steel deformation is a potential, caulk the open joint with nonsag elastomeric sealant. Elastomeric sealant shall be suitable for moist and chlorine environment. The roof shall be designed to bear the weight of a person when walking on any portion of the roof's surface.

### **2.3 Oil-Impregnated Sand Cushion**

- A.** Oiled sand mixture shall consist of approximately 18 gallons of heavy-based petroleum oil per cubic yard of sand. The resistivity of the sand prior adding oil shall be greater than 3,000 ohm-cm when saturated with distilled or deionized water. Oiled sand mixture shall meet the AWWA D100 standard for oil-impregnated sand.
- B.** Sand shall has following gradation:

Sieve Size	Percent Passing
3/8 inch	100
No.4	93-100
No.8	61-99
No.16	52-78
No.30	28-52
No.50	13-31
No.100	1-12
No.200	0-7

- C.** In addition to above required grading analysis, the difference between total percentage passing the No. 16 sieve and the total percentage passing the No. 30 sieve shall be between 10 and 40, and the difference between the percentage passing No. 30 and No. 50 sieves shall be between 10 and 40.

### **2.4 Engineered Fill**

- A.** Engineered fill specified per the CONTRACTOR's geotechnical engineer when required, to meet the minimum design parameters specified in the approved tank manufacturer's submittal.

## **2.5 Concrete**

- A.** Concrete for construction of the reinforced concrete ring wall footing shall have a minimum 28-day compressive strength of 4000 psi and shall conform to the requirements of Section 03300 – Concrete Structures

## **2.6 Reinforcing Steel**

- A.** Reinforcing steel for construction of the reinforced concrete ring wall footing shall be Grade 60 and shall conform to the requirements of Section 03200 – Concrete Reinforcement

## **2.7 Expansion Joint Filler**

- A.** Preformed joint filler shall be non-extruding, resilient bituminous type per ASTM D1751, except do not use strips utilizing cork. Use cane or other cellular fibers uniformly saturated with asphalt.

## **2.8 Tank Materials**

- A.** The materials, design, fabrication, erection, and testing of the welded steel tank shall be in accordance with the latest revision of AWWA D100.
- B.** Steel plate shall conform to ASTM A36.
- C.** Steel pipe and fittings shall conform to Specification Section 02652.
- D.** Structural bolts shall conform to ASTM A307.
- E.** Welding electrodes shall be conform to ASTM 233 E60 or E70.

## **2.9 Accessories**

- A.** Appurtenances shall be per AWWA D100. All appurtenances shall be coated to match tank color, per Specifications Section 09950. The following items shall be furnished with each tank and fabricated in accordance with the Contract Drawings and the applicable sections of the latest revision of the specifications stated herein:
  - 1.** Manway. Hinged 30" diameter per AWWA D100,

outward swing.

- 2.** Cleanout/Manway. 30" "dog-house type" opposite shell manhole, outward swing.
- 3.** Overflow. Per the Contract Drawings.
- 4.** Inside Tank Ladder. None.
- 5.** Exterior Ladder. The exterior ladder shall be steel and shall be coated to match tank color, per Specifications Section 09950. Exterior ladder shall have fall prevention safety system per OSHA requirements and extend the full length of the ladder. Equip ladder with a hinged, locking vandal resistant door to prevent unauthorized access. Lockable entry device shall be coated to match tank. All rungs of the ladder shall have full welds on both sides of the rails and shall be heavy knurled to provide slip resistant surface and shall meet all OSHA requirements.
- 6.** Roof Hatch. Provide a roof hatch with a hinged cover, hasp for locking and safety net (2 required). Location per Contract Drawings.
- 7.** Roof Hatch Enclosure Railing. Per Contract Drawings, AWWA D100, OSHA conformed.
- 8.** Roof Vent. A circular-shaped non-clog roof vent per Contract Drawings and Specification Section 15910 (2 required).
- 9.** Tank Inlet-Outlet Piping. Steel piping for the tank inlet and outlet shall conform to the requirements of AWWA C200, Specification Section 02652 and Contract Drawings.
- 10.** Equipment Ports. Several equipment ports shall be located in the roof of the tank. See Contract Drawings (electrical and cathodic protection) for locations and sizes.
- 11.** Level Gauge – Water level indicator shall be float-actuated level gauging system consisting of a target sliding vertically over an aluminum gauge board graduated in feet and inches with numerals at each

foot. Use Type 316 stainless steel for the float, cable, and guide wires. Provide brackets, pipe and pulleys. Equip indicator with a Type 316 stainless steel pull chain. Acceptable products: Shand & Jurs Model 92302, Varec Figure No. 6700, or equal. Design of level gauge shall be appropriate for the selected roof alternative.

- 12.** Identification Plate. A manufacturer's nameplate shall list the tank serial number, tank diameter and height, and maximum design capacity. The nameplate shall be affixed to the tank exterior sidewall at a location approximately 5 feet from grade elevation in a position of unobstructed view.
- 13.** Sample Ports. Per Contract Drawings.
- 14.** Cathodic Protection. Cathodic protection shall be per the plans and Section 13110 – Galvanic Anode Cathodic Protection (Welded Steel Reservoir).
- 15.** SCADA and Electrical Equipment. Per Contract Drawings and Division 16 of the Technical Specifications.

### **2.10 Protective Coatings**

- A.** Tank coatings shall be accomplished in accordance with Section 09950 – Steel Reservoir Coating Systems.

### **2.11 Impermeable Vapor Membrane**

- A.** Impermeable Vapor Membrane shall be in accordance with Specification Section 07150.

## **PART 3 – EXECUTION**

### **3.1 Compliance With Regulations**

- A.** The CONTRACTOR shall familiarize himself and comply with all applicable state, county, and municipal rules and regulations pertaining to sanitation, fire protection, barriers, warning lights and signs, and with forced-ventilation requirements for coatings application and curing.

### **3.2 Tank Foundation**

- A.** Unless specified otherwise, the CONTRACTOR shall

construct the tank foundation to meet the requirements of AWWA D100, the plans, these specifications, and the geotechnical field conditions. The tank foundation includes the ringwall footing and soils under the tank structure.

- B.** Place concrete so top surface is smooth and lies within 1/8-inch of straight line in any 16-foot segment and all points are within 1/4-inch of true elevation.
- C.** Place preformed expansion joint filler on the top of ringwall and pipe encasement under the tank bottom sketch plate. Cut the exposed edge of the strips to a radius 1 inch greater than the sketch plate and butt together adjacent strips. After the tank shell has been constructed and painted, seal exposed expansion joint filler between the sketch plate and the top of the ringwall with polyurethane filler.
- D.** The tank foundation shall be designed by the CONTRACTOR's tank manufacturer to safely sustain the structure and its live loads, including seismic loads. A tank cushion consisting of a 6-inch layer of oil-impregnated sand, drain pipe and impermeable membrane shall be placed under the tank within the confines of the ringwall.
- E.** Tank foundation shall be based on the site specific soil bearing capacity as determined by the CONTRACTOR's registered geotechnical engineer, per this section. Preliminary geotechnical investigations were performed as referenced in Section 2.1 and are attached for reference.
- F.** It is the CONTRACTOR'S responsibility to ensure that the foundation design is based on the actual site specific soil characteristics encountered per the requirements of this section. Dimensions of concrete rings shown in the drawings are minimum dimensions.
- G.** The CONTRACTOR is required to have a geotechnical engineer registered in the state of Arizona visit the project site and inspect the soils upon which the tank foundation is to be placed. The geotechnical engineer shall determine if the soil conditions encountered meet the minimum soil requirements specified in the tank manufacturer's approved calculations. The CONTRACTOR shall not place any materials for the ringwall footing or any engineered fill until the geotechnical engineer has certified

in writing that the soil conditions encountered meet the minimum requirements specified in the tank manufacturer's calculations and the specifications, and that the exposed material is suitable for the tank foundation. The CONTRACTOR shall be responsible for all costs required for testing and inspection to certify that the soils are adequate.

### **3.3 Fabrication**

- A.** Fabricate tank and accessories to the maximum extent possible in the shop and deliver to the job as units ready for the installation. Edges shall be straight. Joints shall be closely made with metal against metal and shall be as invisible as possible.

### **3.4 Shop Testing**

- A.** Shop testing, including radiographic testing, shall comply with the requirements of AWWA D100. CONTRACTOR shall bear all costs for shop testing.

### **3.5 Shipment and Storage of Tank Members**

- A.** Load steel members for shipment to the project site using all reasonable precautions to prevent damage in transit. Do not bend, scrape, or overstress the steel members. Use spacers or separators between steel members and protect surfaces from damage and contaminants in transit by use of protective coverings or tarpaulins.
- B.** Upon arrival at the site, examine the load to verify that the spacers or separators are secure and will not shift when tension is released on the binding straps. Place steel members above the ground on platforms, skids, or other supports, and keep surfaces free from dirt, oil, grease, salts, and other foreign matter. Exercise additional care with shop primed steel members and protect surfaces from damage and scratches.

### **3.6 Tank Erection**

- A.** Erect framing in accordance with AWWA D100 and tank manufacturer's recommendations.

- B.** Verify that foundation, mechanical and electrical utilities, anchor bolts and other appurtenances are in correct position. Anchor bolts (if used) shall be tightened upon filling of the tank to the maximum water level and shall be torqued to the limits determined by the tank manufacturer.
- C.** Provide bracing for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

### **3.7 Painting and Coating**

- A.** Painting and coatings shall comply with the requirements of Section 09950 – Reservoir Coating Systems.

### **3.8 Field Testing and Disinfection**

- A.** General. Tank shall be tested in conformance with AWWA D100, latest edition.
- B.** Radiographic Tests. Prior to painting, tank's shell welds shall be radiographic tested by the CONTRACTOR in accordance with AWWA D100. The first 10 feet of each welder work shall be checked, and then obtain and evaluate a spot radiograph in each 50 feet of shell weld. CONTRACTOR shall bear all costs for testing. CONTRACTOR shall submit the results of the testing to the ENGINEER for approval and include in the report at job conclusion a record of the extent of repair of defective welds and the spot radiographs of the repaired joint. The ENGINEER will procure a third party firm to perform quality assurance testing after CONTRACTOR's testing is complete, and prior to coating. CONTRACTOR shall be responsible for all costs for any retesting, including retesting by the OWNER's third party firm, due to detection of defective welds.
- C.** Vacuum Tests. Prior to painting, all welded seams of the tank bottom and fillet weld between the shell and floor shall be vacuum tested by the CONTRACTOR. The vacuum testing box shall produce vacuum of at least 2 psi. CONTRACTOR shall perform this test in the presence of the ENGINEER, and shall submit the results of the test to the ENGINEER for approval.

- D. Repair of Defective Welds. All defective welds shall be repaired in accordance with AWWA D100. Repaired welds shall be retested using the test procedure originally used to identify the defect, and shall be paid for by the CONTRACTOR.
- E. Reservoir Coating Testing. Reservoir coatings shall be tested by the CONTRACTOR in accordance with the requirements of Section 09950-Reservoir Coating Systems, and AWWA D102.
- F. Hydrostatic (Leak) Testing. Following completion of erecting and painting of the tank, the structure shall be tested for liquid tightness by filling the tank to its overflow elevation. The hydrostatic test shall occur simultaneously with the disinfection test. The CONTRACTOR in accordance with the manufacturer's recommendations shall correct any leaks disclosed by this test, and re-test. If the tank is to be drained to correct the leak, disposal of test water shall be the responsibility of the CONTRACTOR.
- G. Tank Disinfection. Disinfection of the tank shall be in accordance with Section 13211.

#### **PART 4 – MEASUREMENT AND PAYMENT**

**4.1.** Refer to Section 01210, Measurement and Payment.

**\*\* END OF SECTION \*\***

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## **SECTION 15910**

### **CLOG-RESISTANT ATMOSPHERIC TANK VENT**

#### **PART 1 – GENERAL**

##### **1.1 Summary**

- A.** This specification covers the clog-resistant atmospheric tank vent that is to be installed at the center of the tank roof.

##### **1.2 Submittals**

- A.** Submit information from the vendor sufficient to indicate compliance with this specification.
- B.** Provide a pressure vs air flow rate curve.
- C.** Provide a vacuum vs. air flow rate curve.

#### **PART 2 – PRODUCTS**

- 2.1** Vent shall be of the pressure-vacuum-screened type described in AWWA D100, Section 7.5.
- 2.2** Vent shall have sufficient capacity to pass air so that the tank will not collapse, rupture, or fail at the following air flow rates:
  - A.** Air Flow leaving the tank through the vent: 4,000 scfm
  - B.** Air flow entering the tank through the vent: 7,000 scfm
- 2.3** The vent inlet diameter: min 24"
- 2.4** The vent shall be easily dismantled for cleaning.
- 2.5** The vent shall be screened with stainless steel 16 mesh screen to prevent the entrance of birds, insects, or contaminating materials.
- 2.6** In the event that the screen frosts over or becomes clogged with foreign material, a fail- safe system will be provided to relieve excess pressure or vacuum. The relief mechanism shall not be damaged by the occurrence and shall return automatically to the original operating position after the clogging is cleared.

- 2.7 The vent shall have a locking mechanism to prevent access to the tank.
- 2.8 The vent shall be aluminum construction.
- 2.9 Coat aluminum vent with shop applied fluoropolymer coating per Section 09900. Color to match finish color of the roof.
- 2.10 The vent shall be manufactured by Advance Tank Construction, or approved equal.

### **PART 3 – EXECUTION**

#### **3.1 General**

- A. Install per manufacturer's instructions.

### **PART 4 – MEASUREMENT AND PAYMENT**

- 4.1 Refer to Section 01210, Measurement and Payment.

**\*\* END OF SECTION \*\***

# **APPENDICES**

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# **APPENDIX A**





# GEOTECHNICAL EVALUATION REPORT

**TANK 2A REPLACEMENT**  
2938 Havasupai Boulevard  
Lake Havasu City, Arizona  
WT Reference No. 4156JZ003

**PREPARED FOR:**  
ATKINS  
3570 Carmel Mountain Road, Suite 300  
San Diego, California 86426  
Attn: Mr. Roman Obzejta, P.E.

February 1, 2016



Donald J. Spadola, P.E.  
Director of Geotechnical Services

Reviewed By: Craig P. Wiedeman, P.E.  
Senior Geotechnical Engineer





**Western  
Technologies Inc.**  
The Quality People  
Since 1955

1524 East Drinda Way, No. 113  
Fort Mohave, Arizona 86426  
(928) 758-8378 • fax 758-1666

February 1, 2016

ATKINS  
3570 Carmel Mountain Road, Suite 300  
San Diego, California 86426

Attn: Mr. Roman Obzejta, P.E.

Re: Geotechnical Evaluation  
Tank 2A Replacement  
2938 Havasupai Boulevard  
Lake Havasu City, Arizona

WT Job No. 4156/Z003

Western Technologies Inc. (WT) has completed the geotechnical evaluation for the proposed tank replacement. This study was performed in general accordance with our contract. The results of our evaluation, including the boring location diagram, boring logs, laboratory test results, and geotechnical recommendations are attached.

Please contact us if design conditions change, or if you have any questions concerning this report or any of our materials testing, special inspection, or consulting services. We look forward to working with you on future projects.

Sincerely,

**WESTERN TECHNOLOGIES INC.**  
Geotechnical Engineering Services

Donald J. Spadola, P.E.  
Director of Geotechnical Services

Copies to: Addressee (3)

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**APPENDIX A**

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**GEOTECHNICAL EVALUATION  
TANK 2A REPLACEMENT  
2938 HAVASUPAI BOULEVARD  
LAKE HAVASU CITY, ARIZONA  
WT REFERENCE NO. 4156JZ003**

**1.0 PURPOSE**

This report contains the results of our geotechnical evaluation for the proposed tank replacement. The purpose of our services is to provide information and recommendations regarding:

- Subsurface conditions
- Groundwater
- Geologic hazards
- Foundation design parameters
- Lateral earth pressures
- Seismic considerations
- Slabs-on-grade
- Drainage
- Corrosivity to concrete
- Excavation conditions
- Earthwork, including site preparation, fill placement, and suitability of existing soils for fill materials, and compaction

Results of the field exploration, field tests, and laboratory testing program are presented in the Appendices.

**2.0 PROJECT DESCRIPTION**

We understand that an existing water tank is being replaced by a new tank as shown on the attached Figure 1, Site Vicinity Map. The new tank will be 24 feet tall, 86 feet in diameter and of steel construction. It will be located in the area of an existing steel tank that is similar in size and construction. The existing tank and foundation will be completely removed and replaced by the new tank. We anticipate that the finished site grade will be within one foot of existing site grade, although final site grading plans were not available at the time of this report. Should any of this information not be correct, we should be notified immediately.

### 3.0 SCOPE OF SERVICES

#### 3.1 Field Exploration

Two (2) borings were drilled to a depth of approximately 7 feet below the existing site grade adjacent to the existing tank as shown on the attached Figure 2, Boring Location Diagram. Refusal was encountered in both borings. After initial refusal, each boring was moved 2 to 3 feet and restarted. A field log was prepared for each boring by a field engineer/geologist. These logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples. Final logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thicknesses, and the locations where samples were obtained.

The Unified Soil Classification System was used to classify soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria.

In addition, a refraction micro-tremor (ReMi) seismic test was performed to estimate the shear wave velocity profile at the site for assessment of the seismic site classification in accordance with AWWA D100, Section 13. The test was performed along a line as shown on the attached Figure 2, Boring Location Diagram. The array consisted of twelve 10-Hertz geophones spaced at approximately 25 feet on center. A discussion of the results from this survey is included in **Section 6.4**.

#### 3.2 Laboratory Analyses

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. Testing was performed in general accordance with applicable ASTM methods. The following tests were performed and the results are presented in Appendix B.

- Gradation
- Plasticity
- Corrosivity
- pH
- Resistivity

Test results were utilized in the development of the recommendations contained in this report.

### **3.3 Analyses and Report**

This geotechnical evaluation report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as required to satisfy the purpose previously described.

This report is for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

## **4.0 SITE CONDITIONS**

### **4.1 Surface**

The Site is an existing pump station in a residential area. The Site includes two steel water tanks and a pump station. The Site has been graded relatively flat and is enclosed by a chain-link fence.

### **4.2 Subsurface**

As presented on the boring logs, the materials encountered at the boring locations consisted of silty gravel with sand. The granular deposits were very dense in relative density and non-plastic. Soil moisture contents were slightly damp. Groundwater was not encountered in the borings. The logs in Appendix A show details of the subsurface conditions encountered during the field exploration.

### **4.3 Geologic Hazards**

No known or mapped earth subsidence fissures, due to regional groundwater withdrawal exist in the Site vicinity. No evidence has been noted of distress arising from areal subsidence due to regional groundwater withdrawal.

Observation of the ground surface indicated no readily discernible evidence of recent compaction faulting or fissuring. Compaction faults are generally accepted as features resulting from deep-seated differential consolidation of alluvial materials with dissimilar grain-size and compressibility characteristics. Fissures are understood to be the results of a subsurface erosion process occurring in tension fractures at or near the surface of uncemented, relatively fine-grained soils.

## **5.0 GEOTECHNICAL PROPERTIES**

### **5.1 Laboratory Tests**

Laboratory test results indicate that the site soils are non-plastic. Per the 2012 International Building Code, the on-site soils are not considered expansive. Due to the dense nature of the site soils, we were not able to obtain undisturbed samples suitable for compression testing. Based on our experience in the Site vicinity, the dense deposits will have a low compressibility potential in their undisturbed condition. Wetting of these soils could increase their compressibility.

### **5.2 Field Tests**

Existing subsoils located near and below anticipated shallow foundation level exhibited high resistance to penetration using the penetration test method D3550.

The boring logs included in this report are indicators of subsurface conditions only at the specific location and date noted. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

## **6.0 RECOMMENDATIONS**

### **6.1 General**

Recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0, and the assumption that the soil and subsurface conditions are those disclosed by the borings. Others may change the plans, final elevations, number and type of structures and foundation loads during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing. This report does not encompass

the effects, if any, of underlying geologic hazards and expresses no opinion regarding their effects on surface movements at the Site.

## **6.2 Foundations**

The new tank will be constructed at the location of one of the two existing tanks. The existing tank and foundation system will be completely removed prior to construction of the new tank. Care should be taken to ensure that soils disturbed by the tank removal operations are completely removed and replaced under engineering observation and testing prior to construction of the new tank foundation.

We anticipate that the new tank foundation will be a ring-type spread footing. Foundations should be at least 16 inches wide and should be established at least 18 inches below the bottom of the tank or lowest adjacent compacted finished grade, whichever depth is greater. Foundations established as recommended may be designed to impose a net dead plus live load bearing pressure of up to 3,000 pounds per square foot (psf).

Total settlement of the tank, established as recommended, should be less than one inch. Differential settlement should be less than ½ inch. The tank footing should be reinforced to reduce the potential for distress caused by differential foundation movements. Additional foundation movements could occur if water from any source infiltrates the foundation soils. Therefore, proper drainage should be provided in the final design and during construction.

Site preparation procedures and foundation excavations should be observed by the geotechnical engineer to assess that adequate bearing conditions exist and that recompaction of existing site soils and/or placement of imported engineered fill has been performed satisfactorily. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

## **6.3 Lateral Design Criteria**

Lateral loads can be resisted by soil friction and by the passive resistance of the soils. A coefficient of friction of 0.35 can be used between the concrete foundation and the supporting soils. The passive resistance of natural soils or properly compacted fill can be approximated by the pressure developed by a fluid with a density of 250 pounds per cubic foot (pcf). The passive pressure and the frictional resistance of the soils can be combined without reduction in determining the total lateral resistance.

#### **6.4 Seismic Considerations**

Based upon the obtained shear wave velocity profile (see Plate C-1), the average velocity, using the AWWA calculation method, between the approximate depths of 0 and 100 feet is estimated to be 2,332 feet per second. Based upon the calculated average shear wave velocity, the site may be assigned a C site classification. The shear wave velocity profile, dispersion curve and phase-frequency image generated from the seismic data obtained at the site are included in Appendix C.  $S_s$ , the spectral accelerations for short periods is 0.21g.  $S_1$  the spectral acceleration for a 1-second period is 0.11g.  $F_a$  and  $F_v$ , in accordance with Tables 26 and 27 are 1.20 and 1.68, respectively.

#### **6.5 Slab-on-Grade Support**

Slabs-on-grade should be supported on properly placed and compacted low expansive engineered fill material. For design of slabs-on-grade, we recommend using a modulus of subgrade reaction (k) of 250 pounds per cubic inch (pci) for recompacted on-site granular soils or imported fill material. The slab subgrade should be prepared by the procedures outlined in this report. A minimum 4 inch thick layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (water-cement ratio) could cause excessive shrinkage, cracking or curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

#### **6.6 Drainage**

The major potential cause of soil problems in the site vicinity is moisture increase in soils below structures. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the proposed structure. Infiltration of water into utility or foundation excavations must be prevented during construction.

In areas where paving does not immediately adjoin the tank, protective slopes should be provided with an outfall of not less than 5 percent for at least 10 feet from the tank perimeter. Backfill against footings and in utility line trenches should be well compacted and free of all construction debris to minimize the possibility of moisture infiltration. Planters and/or landscaping should not be constructed adjacent to the tank.

## **6.7 Corrosivity to Concrete**

The chemical test results indicate that the soils at the site classify as negligibly corrosive to concrete. We recommend that Type II Portland cement be utilized in all concrete in contact with site soils.

## **7.0 EARTHWORK**

### **7.1 General**

The validity of the conclusions contained in this report are based on compliance with the recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. If any unobserved and untested earthwork, trenching, or backfilling occurs, then the conclusions and recommendations in this report may not be relied on.

Although fills or underground facilities such as septic tanks, basements, and utilities were not observed, such features might be encountered during construction. These features should be handled in accordance with the recommendations of the geotechnical engineer and/or any applicable regulatory requirements. Any loose or disturbed soils resulting from demolition should be removed or recompacted as engineered fill and any excavations should be backfilled in accordance with recommendations presented herein.

### **7.2 Site Clearing**

Strip and remove all remnants of the existing tank foundation, any existing fill materials, vegetation, debris, and any other deleterious materials from the tank area. The tank area is defined as that area within the tank footprint plus 5 feet beyond the perimeter of the footprint. All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

### **7.3 Excavation**

We anticipate that excavations into the upper 7 feet of the site soils can be accomplished with conventional equipment. Boulders and/or cobbles may be present just below the surface. Excavations in granular material may be susceptible to cave-in and sloughing and may require support to maintain sidewalls.

#### 7.4 Foundation and Tank Pad Preparation

After site clearing operations are complete, proof-roll the base of the excavation to observe for any loose or otherwise unsuitable materials that may remain below the foundation level. Any soft, loose, disturbed or otherwise unsuitable material should be over-excavated and replaced with engineered fill material. Then place and compact, under engineering observation and testing, fill materials as necessary to reach final subbase elevation. Engineered fill consists of properly compacted on-site granular soils or imported low expansive fill material.

#### 7.5 Materials

a. Clean on-site soils with a maximum dimension of 6 inches or imported materials may be used as fill material for the following:

- foundation areas
- tank bottom areas
- concrete slab areas
- backfill

b. Imported soils should conform to the following:

- Gradation (ASTM C136): percent finer by weight

6" .....	100
4" .....	85-100
3/4" .....	70-100
No. 4 Sieve .....	50-100
No. 200 Sieve .....	30 (max)
- Maximum expansive potential (%)\* ..... 1.5
- Maximum soluble sulfates (%)..... 0.10

\* Measured on a sample compacted to approximately 95 percent of the ASTM D1557 maximum dry density at about 3 percent below optimum water content and then oven dried. The sample is then confined under a 100 psf surcharge and submerged.

- c. Base course should conform to applicable MAG, or other local governing specification.

**7.6 Placement and Compaction**

- a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.
- b. Uncompacted fill lifts should not exceed 8 inches.
- c. Materials should be compacted to the following:

**Minimum Percent  
Material Compaction (ASTM D1557)**

- On-site and imported soils, reworked and fill:
  - Below footings ..... 95
  - Below tank bottom ..... 95
  - Below slabs-on-grade..... 90
- Aggregate base:
  - Below tank bottom ..... 95
  - Below slabs-on-grade..... 90
- Miscellaneous backfill ..... 90

- d. On-site and imported soils with low expansive potential should be compacted with a moisture content that facilitates proper compaction to the required density.

**7.7 Compliance**

Recommendations for slabs-on-grade and foundations supported on compacted fills or prepared subgrade depend upon compliance with EARTHWORK recommendations. To assess compliance, observation and testing should be performed under the direction of a geotechnical engineer.

## **8.0 PLAN REVIEW**

Foundation and grading plans were not available at the time of this report. WT is available to review the final plans to determine if they are consistent with the recommendations presented in this report. WT can provide a cost for this additional service, if requested.

## **9.0 LIMITATIONS**

This report has been prepared assuming the project criteria described in Section 2.0. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, WT should be contacted in order to assess the effect that such variations may have on our conclusions and recommendations.

The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced borings. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and soil structure between borings, however variations can and often do exist. Whenever any deviation, difference or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report, and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid for the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall rely on this report without the express written authorization of WT.

## **10.0 CLOSURE**

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the location of the borings, and from laboratory tests. Work on your project was performed in accordance with generally accepted

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standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.



NORTH  
NOT TO SCALE

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**FIGURE 1. SITE VICINITY MAP**  
Tank 2A Replacement  
2938 Havasupai Boulevard  
Lake Havasu City, Arizona

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**LEGEND**

-  Approximate Boring Location
-  Approximate ReMi Test Location

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**FIGURE 2. BORING LOCATION DIAGRAM**  
 Tank 2A Replacement  
 2938 Havasupai Boulevard  
 Lake Havasu City, Arizona

WT Job No. 4156JZ003

<b>Allowable Soil Bearing Capacity</b>	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
<b>Backfill</b>	A specified material placed and compacted in a confined area.
<b>Base Course</b>	A layer of specified aggregate material placed on a subgrade or subbase.
<b>Base Course Grade</b>	Top of base course.
<b>Bench</b>	A horizontal surface in a sloped deposit.
<b>Caisson/Drilled Shaft</b>	A concrete foundation element cast in a circular excavation which may have an enlarged base (or belled caisson).
<b>Concrete Slabs-On-Grade</b>	A concrete surface layer cast directly upon base course, subbase or subgrade.
<b>Crushed Rock Base Course</b>	A base course composed of crushed rock of a specified gradation.
<b>Differential Settlement</b>	Unequal settlement between or within foundation elements of a structure.
<b>Engineered Fill</b>	Specified soil or aggregate material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
<b>Existing Fill</b>	Materials deposited through the action of man prior to exploration of the site.
<b>Existing Grade</b>	The ground surface at the time of field exploration.
<b>Expansive Potential</b>	The potential of a soil to expand (increase in volume) due to absorption of moisture.
<b>Fill</b>	Materials deposited by the actions of man.
<b>Finished Grade</b>	The final grade created as a part of the project.
<b>Gravel Base Course</b>	A base course composed of naturally occurring gravel with a specified gradation.
<b>Heave</b>	Upward movement.
<b>Native Grade</b>	The naturally occurring ground surface.
<b>Native Soil</b>	Naturally occurring on-site soil.
<b>Rock</b>	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
<b>Sand and Gravel Base Course</b>	A base course of sand and gravel of a specified gradation.
<b>Sand Base Course</b>	A base course composed primarily of sand of a specified gradation.
<b>Scarify</b>	To mechanically loosen soil or break down existing soil structure.
<b>Settlement</b>	Downward movement.
<b>Soil</b>	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
<b>Strip</b>	To remove from present location.
<b>Subbase</b>	A layer of specified material placed to form a layer between the subgrade and base course.
<b>Subbase Grade</b>	Top of subbase.
<b>Subgrade</b>	Prepared native soil surface.

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## DEFINITION OF TERMINOLOGY

PLATE

A-1

**COARSE-GRAINED SOILS**  
LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, MORE THAN 12% FINES	

**NOTE:** Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

**FINE-GRAINED SOILS**  
MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

**NOTE:** Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

**SOIL SIZES**

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	¾ in. – 3 in.
Fine	No. 4 – ¾ in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
Fines (Silt or Clay)	Below No. 200

**NOTE:** Only sizes smaller than three inches are used to classify soils

**CONSISTENCY**

CLAYS & SILTS	BLOWS PER FOOT
VERY SOFT	0 – 2
SOFT	3 – 4
FIRM	5 – 8
STIFF	9 – 15
VERY STIFF	16 – 30
HARD	OVER 30

**RELATIVE DENSITY**

SANDS & GRAVELS	BLOWS PER FOOT
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

**NOTE:** Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1½-inch ID) split-barrel sampler (ASTM D1586).

**PLASTICITY OF FINE GRAINED SOILS**

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

**DEFINITION OF WATER CONTENT**

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

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**METHOD OF CLASSIFICATION**

PLATE  
**A-2**

The number shown in "**BORING NO.**" refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features, or through the use of Global Positioning System (GPS) devices. The accuracy of GPS devices is somewhat variable.

"**DRILLING TYPE**" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger**, and the dimension presented is the outside diameter of the HSA used.

"**N**" in "**BLOW COUNTS**" refers to a 2-inch outside diameter split-barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows, or "blow count", of the hammer is recorded for each of three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2<sup>nd</sup> and 3<sup>rd</sup> increments) is defined as the Standard Penetration Test (SPT) "**N**"-Value. Refusal to penetration is considered more than 50 blows per 6 inches. (Ref. ASTM D1586).

"**R**" in "**BLOW COUNTS**" refers to a 3-inch outside diameter ring-lined split barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 12 inches is achieved or until refusal. The number of blows required to advance the sampler 12 inches is defined as the "**R**" blow count. The "**R**" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows per foot. (Ref. ASTM D3550).

"**CS**" in "**BLOWS/FT.**" refers to a 2½-in. outside diameter California style split-barrel sampler, lined with brass sleeves, driven into the ground with a 140-pound hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows of the hammer is recorded for each of the three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2<sup>nd</sup> and 3<sup>rd</sup> increments) is defined as the "**CS**" blow count. The "**CS**" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D 3550)

"**SAMPLE TYPE**" refers to the form of sample recovery, in which **N** = Split-barrel sample, **R** = Ring-lined sample, "**CS**" = California style split-barrel sample, **G** = Grab sample, **B** = Bucket sample, **C** = Core sample (ex. diamond bit rock coring).

"**DRY DENSITY (LBS/CU FT)**" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol "**NR**" indicates that no sample was recovered.

"**WATER (MOISTURE) CONTENT**" (% of Dry Wt.) refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"**USCS**" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D2487 and D2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the boring location. The transition between materials is approximate and may be more or less gradual than indicated.

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## BORING LOG NOTES

PLATE

A-3

DATE DRILLED: 1-8-16  
 LOCATION: See Figure 2  
 ELEVATION: Not measured

**Boring No. 1**

EQUIPMENT TYPE: CME-75  
 EXCAVATION TYPE: 8" HSA  
 FIELD ENGINEER: B. Dean

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	MOISTURE	CONSISTENCY
					1	GM		SILTY GRAVEL WITH SAND; fine to coarse sand and gravel, non-plastic, brown	slightly damp	very dense
		R		69	2					
					3					
					4					
		R		50/5"	5					
					6					
					7					
					8					
					9					
								Auger Refusal at 7 feet.		

- N- STANDARD PENETRATION TEST
- R- RING SAMPLE
- C- CORE: %RECOVERY/%RQD
- B- BAG
- BN- BULL NOSE

NOTES: Water not encountered.  
 Initial refusal at 7 feet. Boring restart with second refusal at 3 feet.  
 \*Disturbed sample



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PROJECT NO. 4156JZ003

PROJECT: Tank 2A Replacement  
**Boring Log**

PLATE  
**A-4**

DATE DRILLED: 1-8-16  
 LOCATION: See Figure 2  
 ELEVATION: Not measured

**Boring No. 2**

EQUIPMENT TYPE: CME-75  
 EXCAVATION TYPE: 8" HSA  
 FIELD ENGINEER: B. Dean

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	MOISTURE	CONSISTENCY
					1	GM		SILTY GRAVEL WITH SAND; fine to coarse sand and gravel, non-plastic, brown	slightly damp	very dense
*		R		72	2					
					3					
					4					
*		R		50/6"	5					
					6					
					7					
					8		Auger Refusal at 7 feet.			
					9					

- N- STANDARD PENETRATION TEST
- R- RING SAMPLE
- C- CORE: %RECOVERY/%RQD
- B- BAG
- BN- BULL NOSE

NOTES: Water not encountered.  
 Initial refusal at 7 feet. Boring restart with second refusal at 7 feet.  
 \*Disturbed sample



**WESTERN TECHNOLOGIES INC.**

PROJECT NO. 4156JZ003

PROJECT:

Tank 2A Replacement  
**Boring Log**

PLATE

**A-5**



**Western Technologies Inc.**  
The Quality People  
Since 1955

6633 West Post Road  
Las Vegas, NV 89118-2133  
(702) 798-8050

**PHYSICAL PROPERTIES OF SOILS & AGGREGATES**

Client **ATKINS**  
3570 CARMEL MOUNTAIN ROAD, SUITE 300  
SAN DIEGO, CA 86426

Date of Report **01-26-16**

Job No **4156JZ003**

Event / Invoice No. **1**

Lab No. **10560**

Authorized by **ROMAN OBZEJTA, PE**

Date **12-21-16**

Sampled by **WT/B. DEAN**

Date **01-06-16**

Submitted by **WT/B. DEAN**

Date **01-06-16**

Source / Location Designated by **WT/B. DEAN**

Date **01-06-16**

Project **TANK 2A REPLACEMENT**  
Location **2938 HAVASUPAI BLVD**  
Type / Use of Material **SILTY GRAVEL WITH SAND**  
Supplier / Source **NATIVE**  
Sample Source / Location **BORING 1 AT 0'-5"**  
Special Instructions

**TEST RESULTS**

SIEVE ANALYSIS : ASTM C136 FINER THAN NO. 200 : ASTM C117			LABORATORY COMPACTION CHARACTERISTICS :		METHOD			
SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION			SAMPLE PREPARATION: <input type="checkbox"/> WET <input type="checkbox"/> DRY			
4					DRY UNIT WEIGHT, LBF/FT <sup>3</sup>		RAMMER USED:	
3							<input type="checkbox"/> 2 IN. CIRCULAR FACE <input type="checkbox"/> OTHER	
2							<input type="checkbox"/> MECHANICAL <input type="checkbox"/> MANUAL	
1-1/2"	100						MAXIMUM DRY UNIT WEIGHT, LBF/FT <sup>3</sup> →	
1-1/4"	98						OPTIMUM WATER CONTENT, % →	
1"	98						OVERSIZE AGGREGATE	
3/4"	93						BULK SPECIFIC GRAVITY	
1/2"	82						ABSORPTION, %	
3/8"	74						% OVERSIZE IN LAB SAMPLE	
1/4"	62						SPECIFIC GRAVITY IN ZERO AIR VOID CURVE	
No.4	55							
8	45							
10	42							
16	37							
30	31							
40	28							
50	25							
100	19							
200	15							
TEST PROCEDURE			RESULT	SPECS	TEST PROCEDURE	RESULT	SPECS	
LIQUID & PLASTIC PROPERTIES : ASTM D4318					RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :			
METHOD B LIQUID LIMIT →			0		GRADING 100 REV, % LOSS →			
ESTIMATED % RETAINED ON NO 40 72 PLASTIC LIMIT →			0		GRADING 500 REV, % LOSS →			
SAMPLE AIR DRIED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO PLASTICITY INDEX →			0					
MOISTURE CONTENT : ASTM D2216					SPECIFIC GRAVITY :			
PORTION TESTED FULL % DRY WEIGHT →			3.8		MAX PARTICLE SIZE, IN SPECIFIC GRAVITY @ 20°C →			
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :					pH DETERMINATION :			
<input type="checkbox"/> EXPANSION <input type="checkbox"/> COMPRESSION, % →					pH →			
SURCHARGE, PSF MAXIMUM SWELL PRESSURE, KSF →					SOLUBLE SALTS :			
INITIAL WATER CONTENT, % DRY UNIT WEIGHT LBF/FT <sup>3</sup>					PPM →			
EXPANSION INDEX OF SOIL :					MINIMUM RESISTIVITY :			
INITIAL WATER CONTENT %					OHM-CM →			
INITIAL DRY UNIT WEIGHT LBF/FT <sup>3</sup>			EI →					
INITIAL DEGREE OF SATURATION					SOIL CLASSIFICATION : ASTM D2487 GROUP SYMBOL GM			
FINAL WATER CONTENT, %					NAME SILTY GRAVEL WITH SAND			

Comments :CHEMICAL ANALYSIS ON SEPERATE REPORT

Copies to : CLIENT (1)

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC MAKES NO OTHER WARRANTY OR REPRESENTATION EXPRESSED OR IMPLIED AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS

REVIEWED BY DUSTIN JOHNSON

(SIGNED COPY ON FILE)

PLATE B-1

## LABORATORY REPORT

**DATE:** January 19, 2016 **LABORATORY NO:** 16-0272  
**CLIENT:** Western Technologies, Inc. **PAGE:** 1 of 1  
 1524 E. Drinda Way #113  
 Fort Mohave, AZ 86426

**CLIENT PROJECT:** 4156J2003 **CLIENT PO #:** 4156P001

**ANALYST:** SW/LB

**Sampled By:** Client **Date Received:** 01/13/16  
**Date Sampled:** -- **Time Received:** 1010  
**Time Sampled:** --

**Sample ID:**

Analysis	Result	Unit	Method
Water Soluble Sulfate (SO <sub>4</sub> )	<0.01	%	SM 4500 E
Total Salts (Solubility)	0.05	%	SM2540B
Soluble Soil Chlorides	26.4	mg/kg	SM4500CFD
pH	9.83	S.U.	SM9045C
Resistivity	982	Ω-cm	ASTM G57

NOTES: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

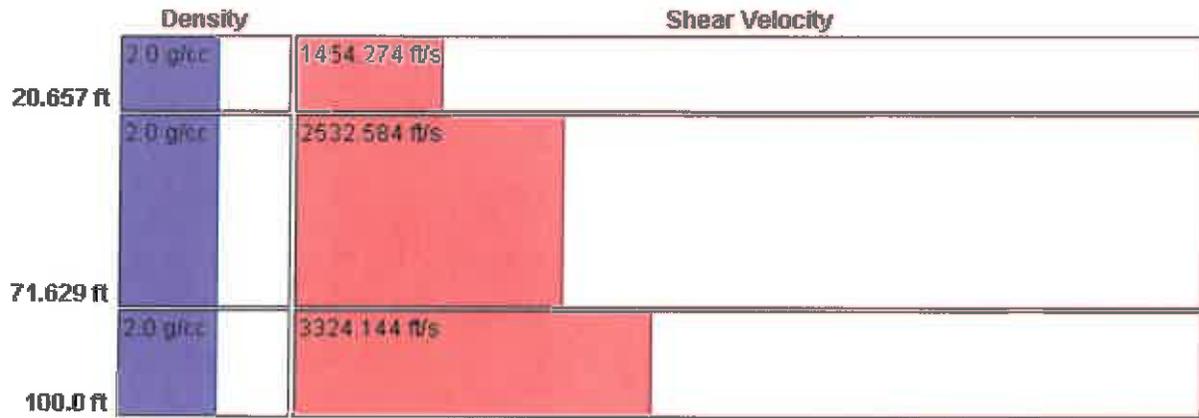
**REVIEWED BY:**



John Sloan  
 Laboratory Director  
 EPA: NV00930

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120  
 Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Line 1



Average Shear Velocity = 2332 ft/sec  
 IBC 2012/ASCE 7 Soil Site Class C



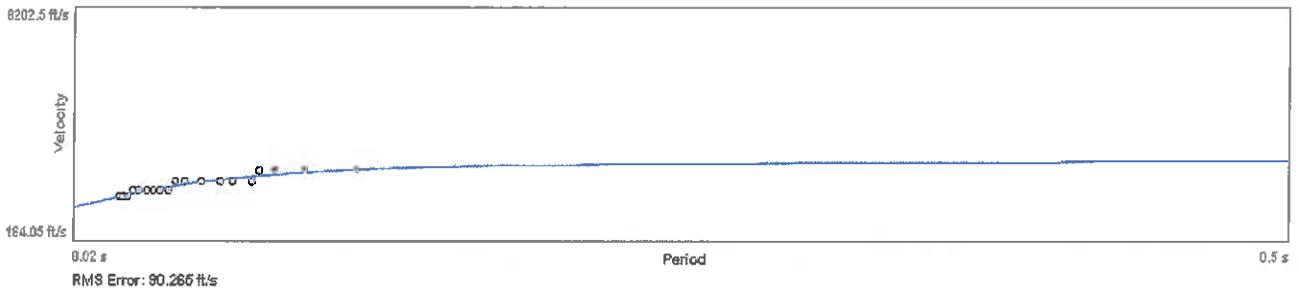
PROJECT: Tank 2A Replacement  
 JOB NO.: 4156JZ003

PLATE  
 C-1

**SHEAR WAVE VELOCITY PROFILE**

### Dispersion Curves: Picks and Fit

#### Line 1



Geotechnical  
Environmental  
Inspections  
Materials



**Western  
Technologies Inc.**  
The Quality People  
Since 1955  
wt-usa.com

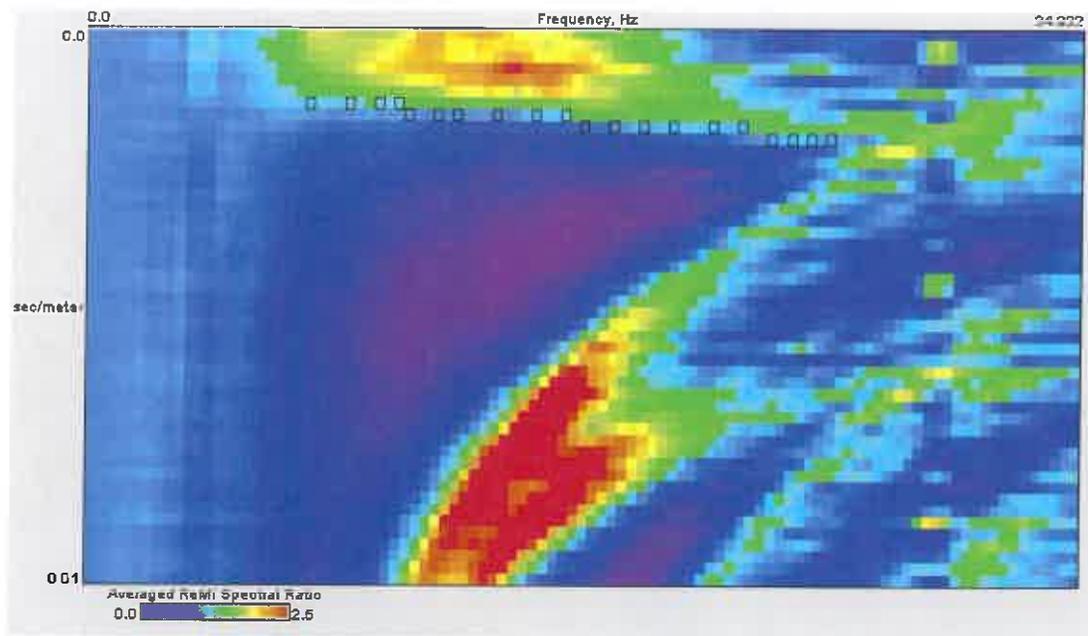
PROJECT: Tank 2A Replacement  
JOB NO.: 4156JZ003

PLATE  
C-2

**DISPERSION CURVE**

Phase-Frequency Image with Picks

Line 1



Geotechnical  
Environmental  
Inspections  
Materials



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The Quality People  
Since 1955  
wt-us.com

PROJECT: Tank 2A Replacement  
JOB NO.: 4156JZ003

**PHASE-FREQUENCY IMAGE**

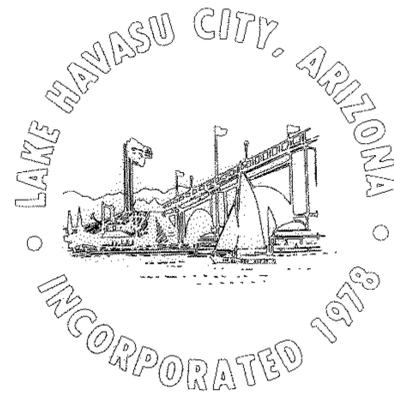
PLATE  
C-3

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# **APPENDIX B**







## LAKE HAVASU CITY - ARIZONA

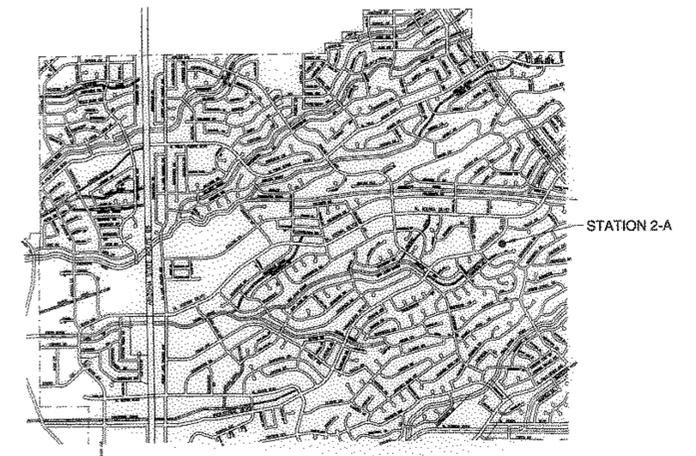
### STATION 2-A ONE MILLION GALLON RESERVOIR

PROJECT NO. W-182-99RB

### VOLUME II

### List of Contract Drawings

DRAWING NO.	TITLE
	COVER AND INDEX
P1	SITE PLAN
P2	MISCELLANEOUS DETAILS I
P3	MISCELLANEOUS DETAILS II

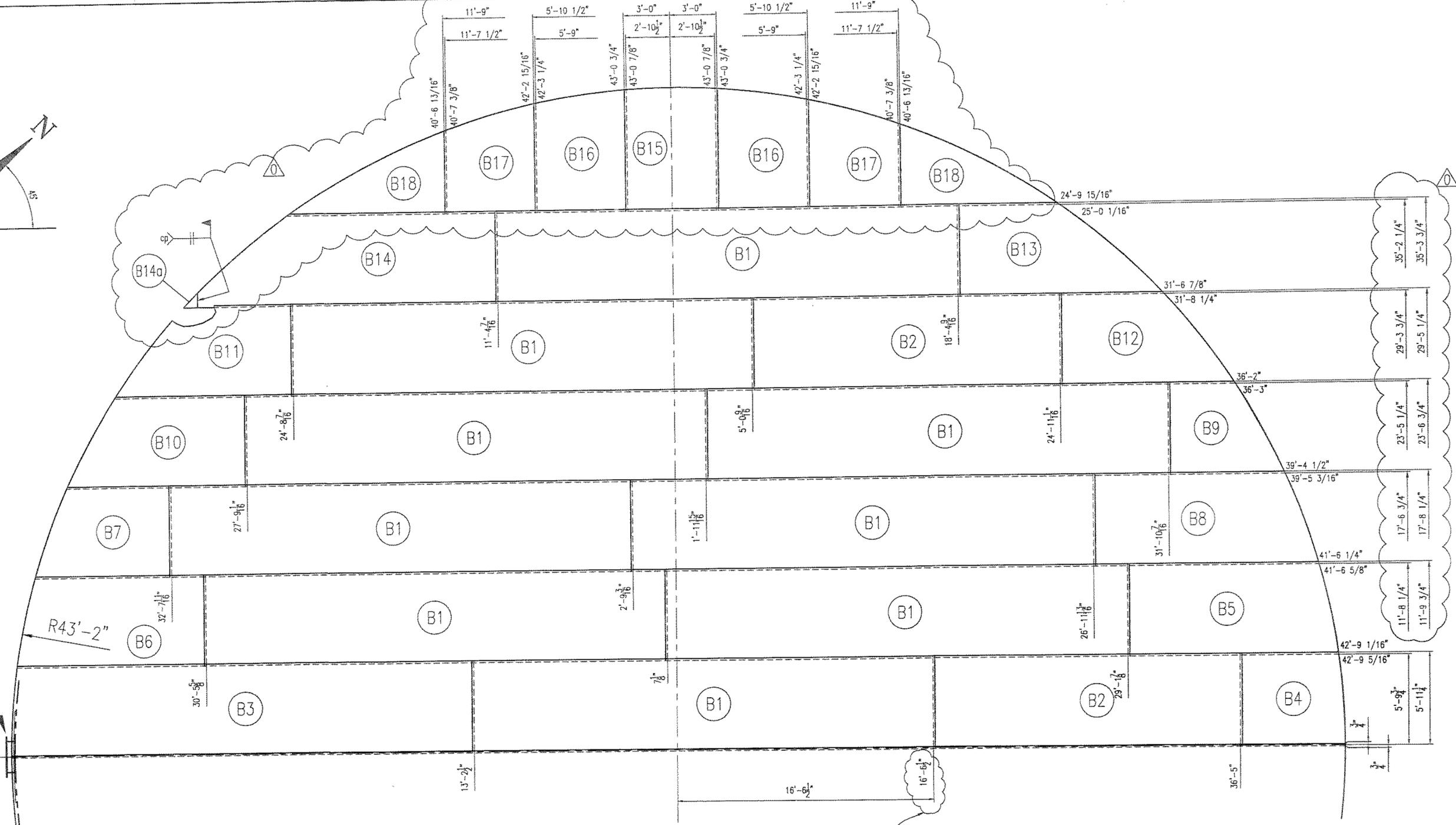
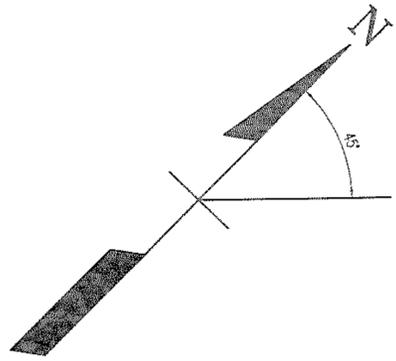


VICINITY MAP  
NOT TO SCALE



May 1999



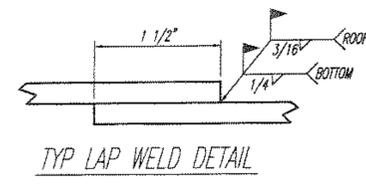


FIELD NOTE:  
 NOTE LOCATION OF CLEANOUT DOOR (MK 5A).  
 BOTTOM PLATE SEAMS SHOULD CROSS EDGE  
 OF BOTTOM REINFORCING PLATE OF CLEANOUT  
 DOOR AT AN ANGLE OF APPROX. 90°.

**BOTTOM LAYOUT**

(SEE DWG 2B FOR PLATE DETAILS AND NESTING DIAGRAMS)

FIELD NOTE:  
 DIMENSIONS SHOWN THUS  
 ARE TO CENTERLINE

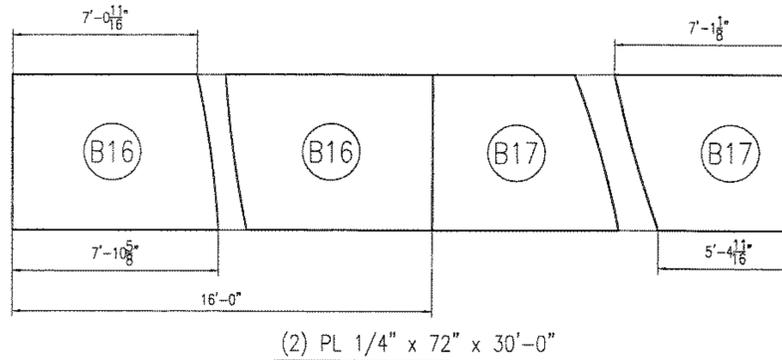
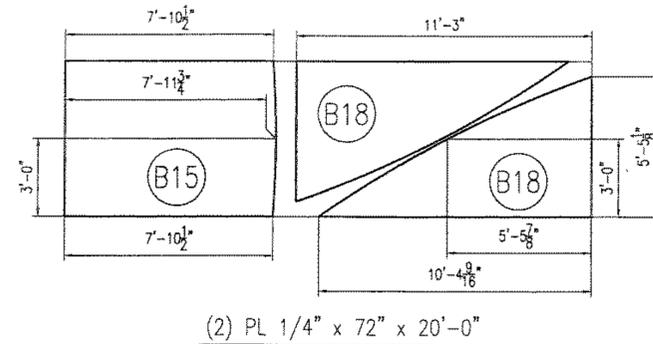
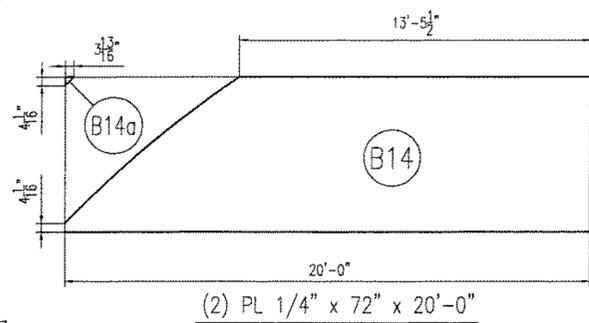
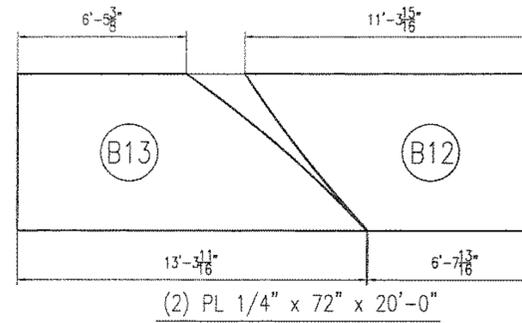
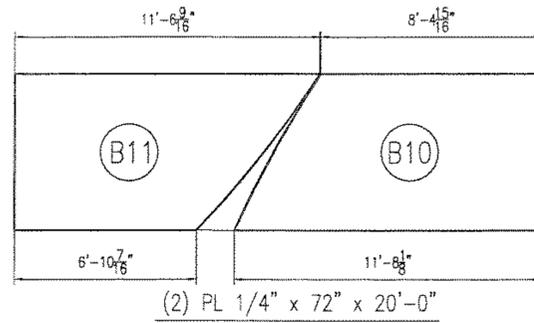
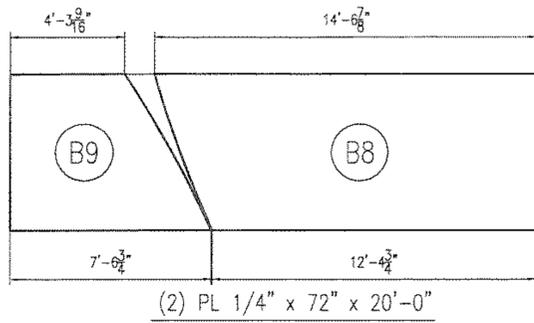
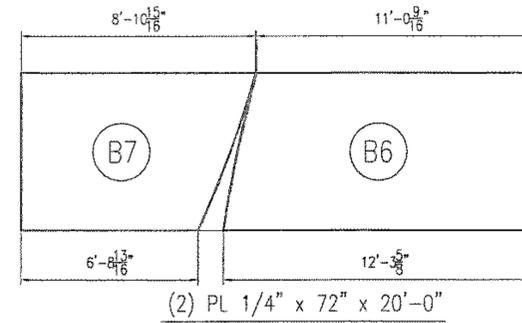
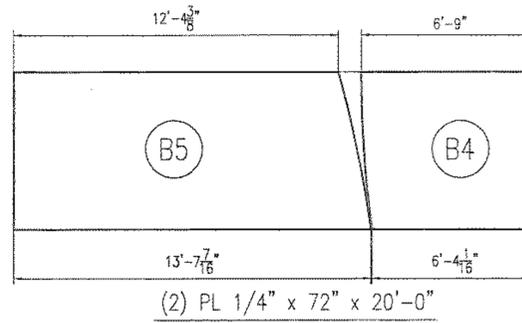
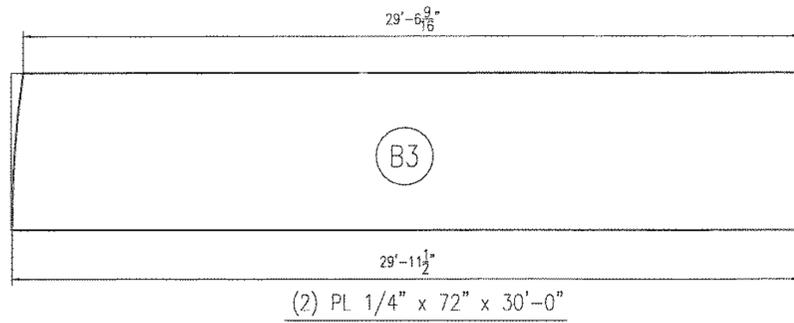


WORK THIS DRAWING WITH DRAWING 2B.

Revised B14 thru B18	MTB	△
Revised Layout Dimensions	9-10-99	△
ERECTOR DWG. REF.:		
DESIGN DWG. REF.:		
MADE BY: BAH	CHK'D BY: MTB	DATE: 8/2/99
DETAILS OF: BOTTOM AND ROOF LAYOUT		DRAWING NUMBER
STRUCTURE: 1,000,000 GAL WATER TANK		JOB NO. SHT. NO.
LOCATION: LAKE HAVASU CITY, ARIZONA		99-2133 2AB



For Approval



**MATERIAL REQUIRED**

**BOTTOM:**  
 (22) PL 1/4" x 72" x 30'-0" (Mk PL2A)  
 (18) PL 1/4" x 72" x 20'-0" (Mk PL2B)

**ROOF:**  
 (22) PL 3/16" x 72" x 30'-0" (Mk PL2C)  
 (18) PL 3/16" x 72" x 20'-0" (Mk PL2D)

**BOTTOM PLATE DETAILS AND NESTING DIAGRAMS**

(SEE DWG \_\_\_\_ FOR BOTTOM LAYOUT)

**BILL OF MATERIAL**

QTY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS
			FT.	IN.			
<b>BOTTOM PLATES</b>							
18	B1	PL 1/4 x 72	30	0			
4	B2	PL 1/4 x 72	20	0			
2	B3	C/F (2) PL 1/4 x 72	30	0			FIELD CUT (T)
2	B4	C/F (2) PL 1/4 x 72	20	0			
2	B5	C/W B5					
2	B6	C/F (2) PL 1/4 x 72	20	0			
2	B7	C/W B6					
2	B8	C/F (2) PL 1/4 x 72	20	0			
2	B9	C/W B8					
2	B10	C/F (2) PL 1/4 x 72	20	0			
2	B11	C/W B10					
2	B12	C/F (2) PL 1/4 x 72	20	0			
2	B13	C/W B12					
2	B14	C/F (2) PL 1/4 x 72	20	0			
2	B14a	C/W B14					
2	B15	C/F (2) PL 1/4 x 72	20	0			
2	B16	C/F (2) PL 1/4 x 72	30	0			
4	B17	C/W B16					
4	B18	C/W B15					FIELD CUT (T)
<b>ROOF PLATES</b>							
18	R1	PL 3/16 x 72	30	0			
4	R2	PL 3/16 x 72	20	0			
2	R3	C/F (2) PL 3/16 x 72	30	0			FIELD CUT (T)
2	R4	C/F (2) PL 3/16 x 72	20	0			
2	R5	C/W R5					
2	R6	C/F (2) PL 3/16 x 72	20	0			
2	R7	C/W R6					
2	R8	C/F (2) PL 3/16 x 72	20	0			
2	R9	C/W R8					
2	R10	C/F (2) PL 3/16 x 72	20	0			
2	R11	C/W R10					
2	R12	C/F (2) PL 3/16 x 72	20	0			
2	R13	C/W R12					
2	R14	C/F (2) PL 3/16 x 72	20	0			
2	R14a	C/W R14					
2	R15	C/F (2) PL 3/16 x 72	20	0			
2	R16	C/F (2) PL 3/16 x 72	30	0			
4	R17	C/W R16					
4	R18	C/W R15					FIELD CUT (T)

THE FOLLOWING IS A SUMMARY OF THE PLATE REQUIRED TO CUT THE ROOF AND BOTTOM

22	PL2A	PL 1/4 x 72	30	0			
18	PL2B	PL 1/4 x 72	20	0			
22	PL2C	PL 3/16 x 72	30	0			
18	PL2D	PL 3/16 x 72	20	0			

TOTAL WEIGHT THIS SHEET:

**SHOP NOTES**

1. WORK THIS DRAWING WITH DRAWING 2AB.

ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.

Revised B14 thru B18  
 Added PL2A thru PL2D

ERECTOR DRAWING REFERENCE: Dwg 1

DESIGN DRAWING REFERENCE:

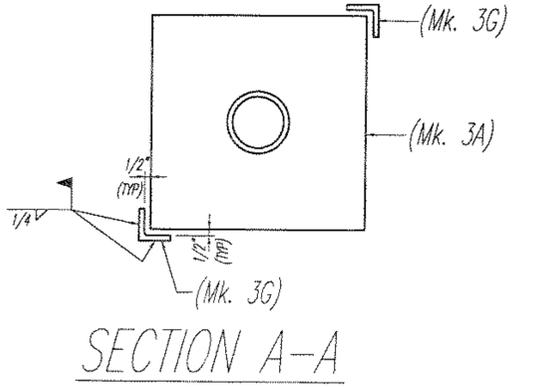
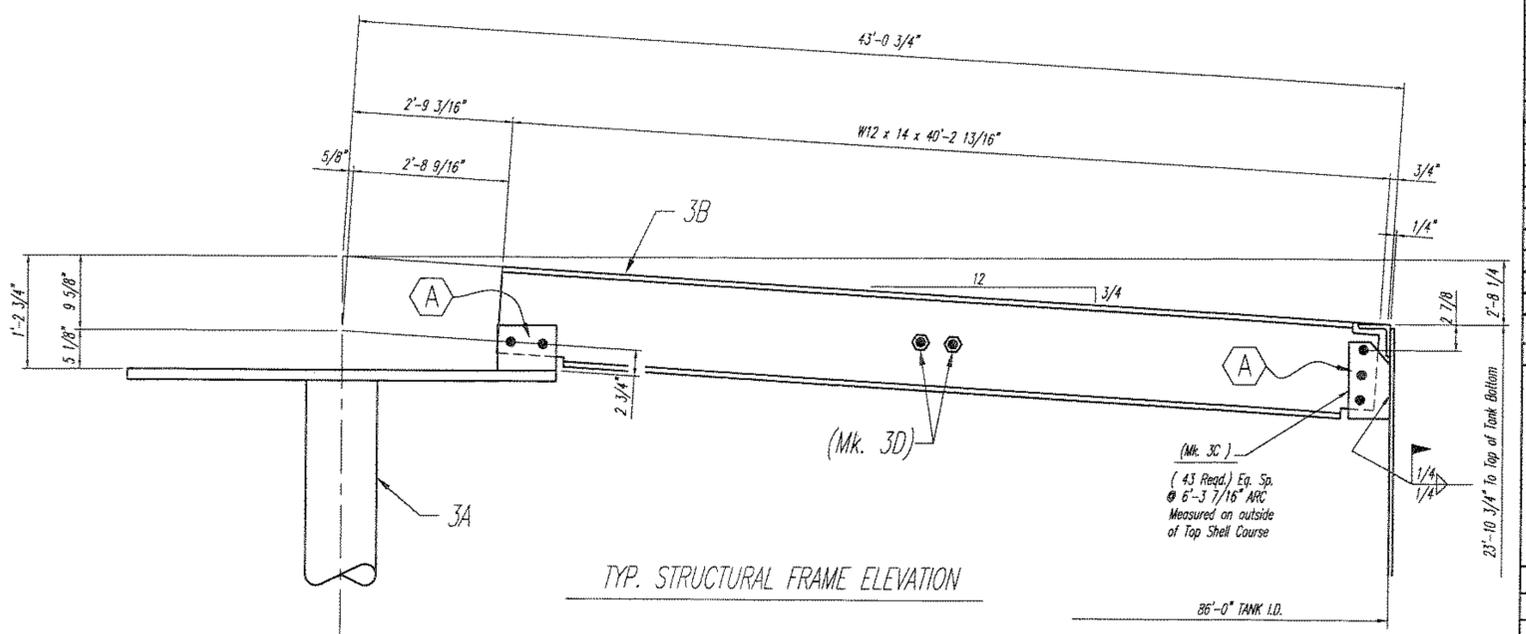
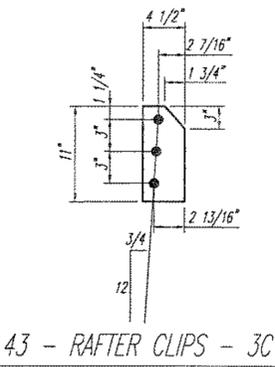
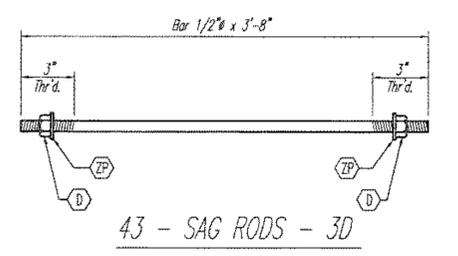
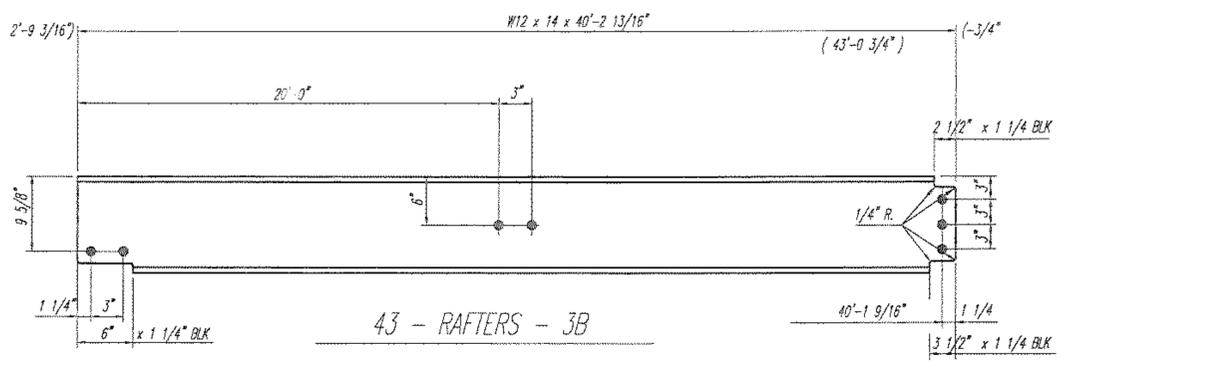
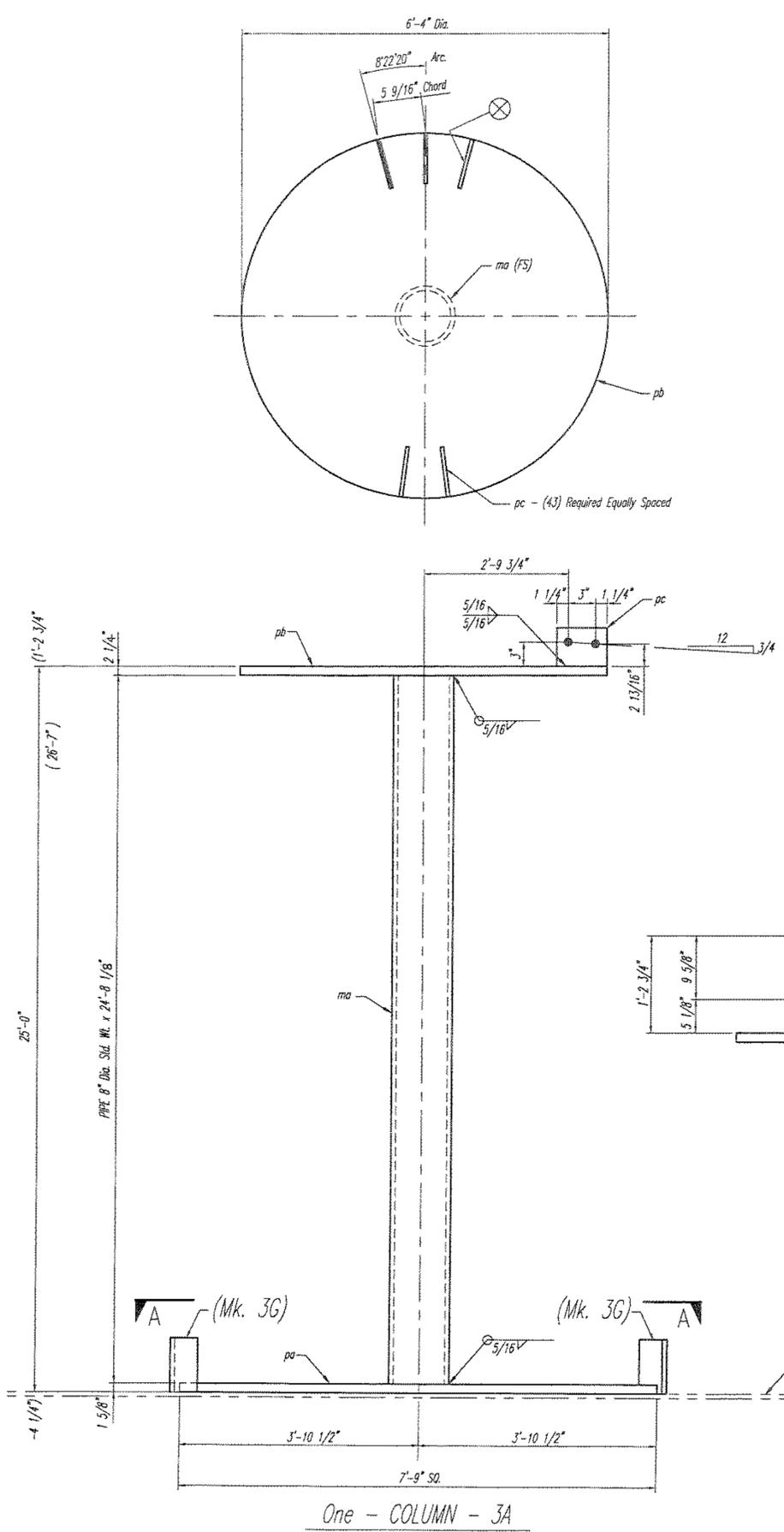
ALL MATERIAL TO BE ASTM A-36

RELEASED FOR FABRICATION BY \_\_\_\_\_ DATE \_\_\_\_\_

CLEAN: SSPC-SP2  
 PAINT: FIELD CLEAN AND PAINT PER SPECIFICATIONS



MADE BY: BAH	CHECKED BY: MTB	DATE: 8/2/99	M	C	H	SEQ.	REV		
DETAILS OF: BOTTOM AND ROOF NESTING DIAGRAMS							JOB NUMBER	FAB.	SHEET NUMBER
STRUCTURE: 1,000,000 GAL WATER TANK							99-2133	GP	2B
LOCATION: LAKE HAVASU CITY, ARIZONA									



BILL OF MATERIAL									
ADVANCE BILL MARK	QUANTITY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS	
				FT.	IN.				
ONE	3A		COLUMN						
1	ma		PIPE 8" STD WT	24	8 1/8			(A-53 GrB)	
1	pa		PL 1 5/8 x 93	7	9				
1	pb		PL 2 1/4 x 31.5 SQ. FT. (6" DIA.)						
43	pc		Bar 3/8 x 4 1/2	0	5 1/2				
43	3B		W12 x 14	40	2 13/16				
43	3C		Bar 3/8 x 4 1/2	0	11				(1)
43	3D		BAR 1/2"	3	8				THRO 2 ENDS
86	(D)		1/2" HEX NUT						(A-563)
86	(F)		5/8" FLAT WASHER						(STL.)

- THE FOLLOWING ITEMS ARE PLAIN MATERIAL
- |     |     |  |                                |   |       |  |  |                 |
|-----|-----|--|--------------------------------|---|-------|--|--|-----------------|
| 5   | 3F  |  | L2 1/2 x 2 1/2 x 3/16 x 20'-0" |   |       |  |  | SEE DWG. # 4    |
| 2   | 3G  |  | L3 x 3 x 1/4                   | 0 | 6     |  |  |                 |
| ONE | FB3 |  | FIELD BOLTS                    |   |       |  |  |                 |
| 215 | (A) |  | 5/8" M-BOLTS                   | 0 | 1 1/2 |  |  | W / NUT (A-307) |
- TOTAL WEIGHT THIS SHEET: \_\_\_\_\_

SHOP NOTES

- BEAMS AND COLUMNS THAT BECOME BENT OR DISTORTED DURING SHIPPING, HANDLING, PUNCHING, WELDING, ETC. MUST BE STRAIGHTENED.
- PIECE MARK LEFT HAND END ON NEAR SIDE OF MEMBER AS DETAIL.
- COLUMN PIECE MARK IS TO APPEAR ON THE BOTTOM OF THE BASE PLATE AND ON THE SAME COLUMN FACE AS THE DIRECTION MARK NEAR THE COLUMN BASE.
- ⊗ INDICATES PAINT STRIPE SIDE; MARK ⊗ IN AREA ADJACENT TO CONNECTION FOR FIELD USE.
- RD\* INDICATES RUNNING DIMENSIONS FROM THIS POINT.
- ALL FULL PENETRATION WELDS SHALL BE UT TESTED IN ACCORDANCE WITH AWS D1.1. UNLESS DIRECTED OTHERWISE BY CONTRACT SPECIFICATIONS.
- WELDING TO CONFORM TO AWS SPECIFICATIONS. ELECTRODES: E70XX - LOW HYDROGEN

ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.

REVISER PER APPL. \_\_\_\_\_ DATE: 9-11-99

ERECTOR DRAWING REFERENCE: DWG. 1

DESIGN DRAWING REFERENCE: \_\_\_\_\_

ALL MATERIAL TO BE ASTM A-36 U.N.

RELEASED FOR FABRICATION BY \_\_\_\_\_ DATE \_\_\_\_\_

PAINT: FIELD CLEAN AND PAINT PER SPECIFICATIONS

APPROVAL / REVIEW AUTHORITY: \_\_\_\_\_

IT REPRESENTS OUR INTERPRETATION OF THE INTENT OF THE CONTRACT DOCUMENTS. HOWEVER, THE STEEL FABRICATOR AND THE STRUCTURAL STEEL DETAILER ASSUME NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION SHOWN ON THE CONTRACT DOCUMENTS AND/OR ARCHITECTURAL AND STRUCTURAL DESIGN DRAWINGS. THE RESPONSIBILITY OF THE BUYER.

UNLESS NOTED TO THE CONTRARY, ON THIS DRAWING, WHEN IT IS RETURNED FROM APPROVAL IT WILL BE ASSUMED THAT ALL INFORMATION SHOWN HEREON HAS THE APPROVAL OF THE APPROVAL / REVIEW AUTHORITY. SUBSEQUENT CHANGES TO INFORMATION SHOWN ON THESE DRAWINGS AFTER FIRST SUBMISSION SHALL BE CONSIDERED AS CONTRACT CHANGES.

MADE BY: MTB CHECKED BY: AB DATE: 8/2/99 M C H SEQ. REV. 0

DETAILS OF: STRUCTURAL FRAME

STRUCTURE: 1,000,000 GAL WATER TANK

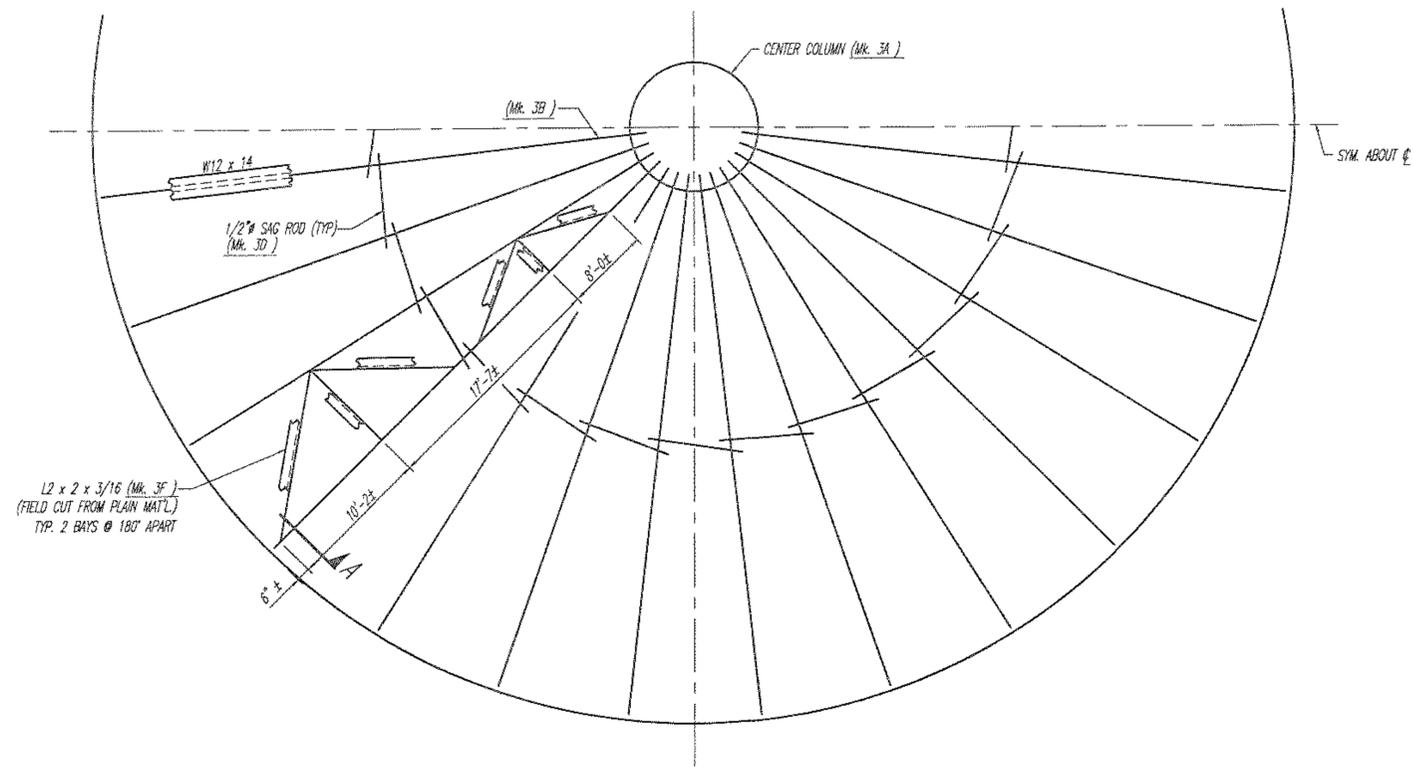
LOCATION: LAKE HAVASU CITY, ARIZONA

JOB NUMBER: 99-2133

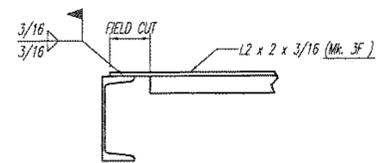
FAB. SHEET NUMBER: GP 3



For Approval



PLAN VIEW OF ROOF STRUCTURE

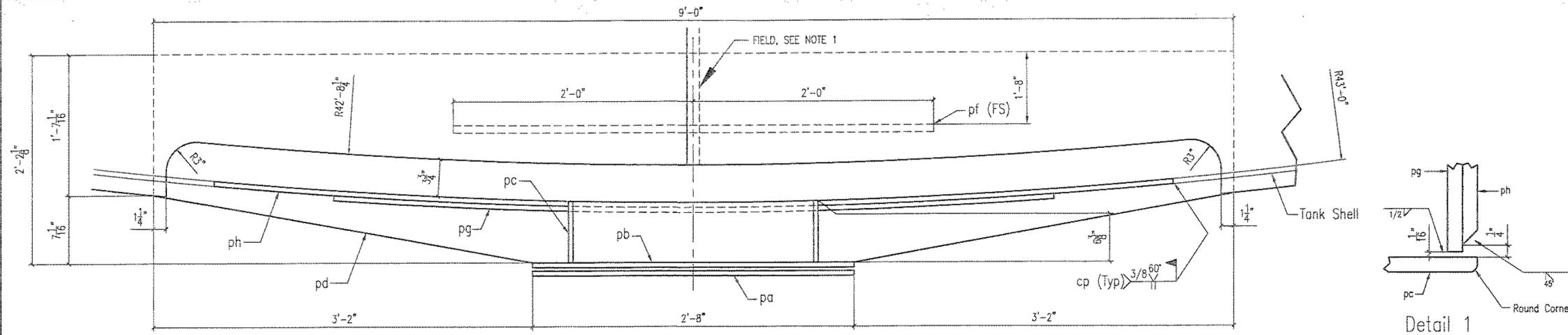


SECTION A

△	△
△	△
△	△
ERECTION DWG. REF.: DWG 1 & 3	
DESIGN DWG. REF.:	
MADE BY: MTB	CHK'D BY: AB
DATE: 8/2/99	
DRAWING NUMBER	
DETAILS OF: BRACING @ ROOF STRUCTURE	JOB NO. 99-2133
STRUCTURE: 1,000,000 GAL. WATER TANK	SHT. NO. 4
LOCATION: LAKE HAVASU CITY, ARIZONA	△

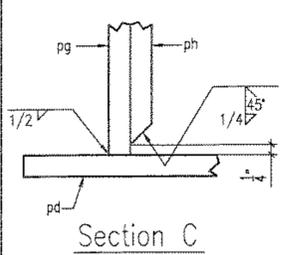


For Approval

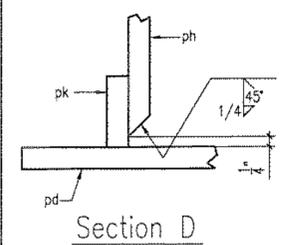


Section A-A

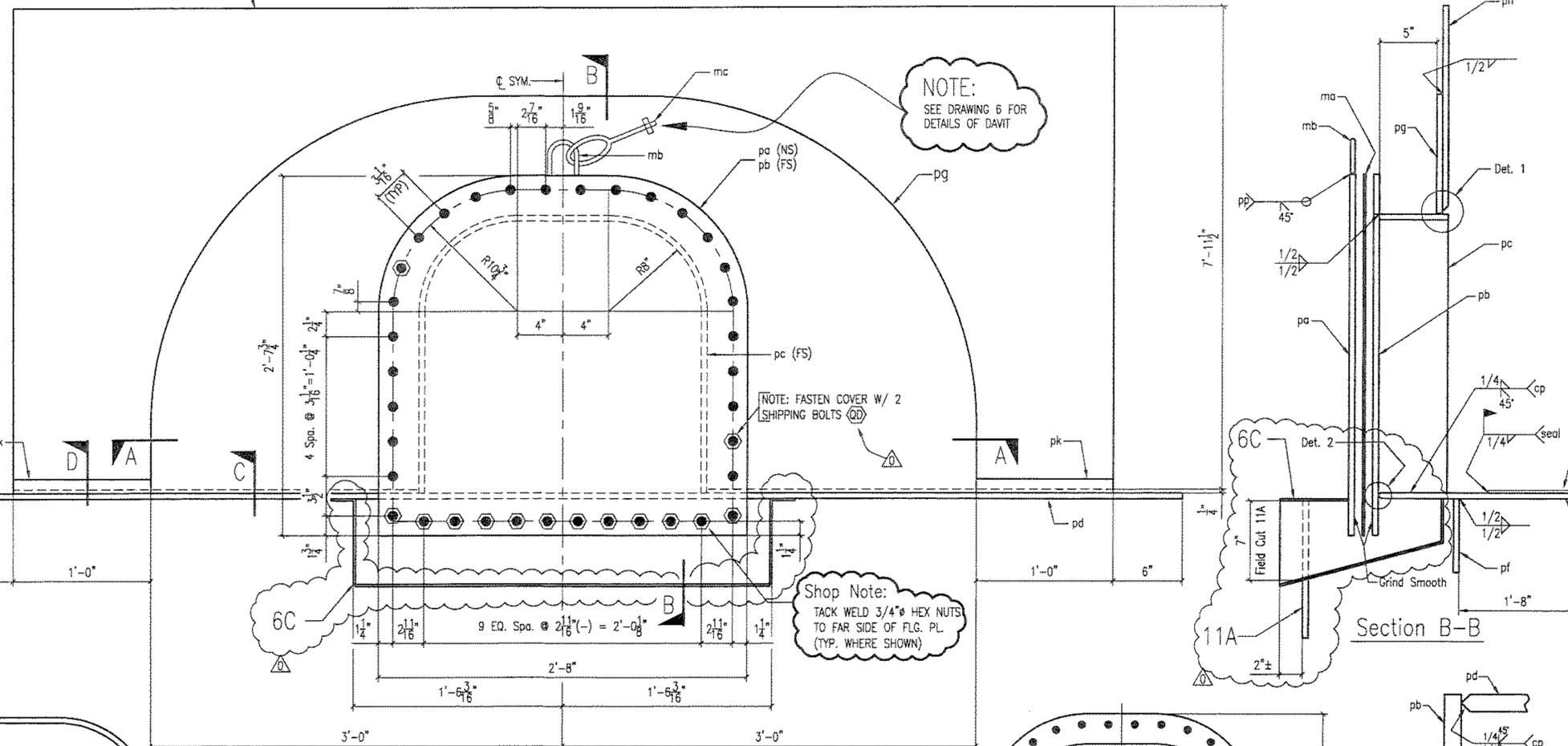
Detail 1



Section C



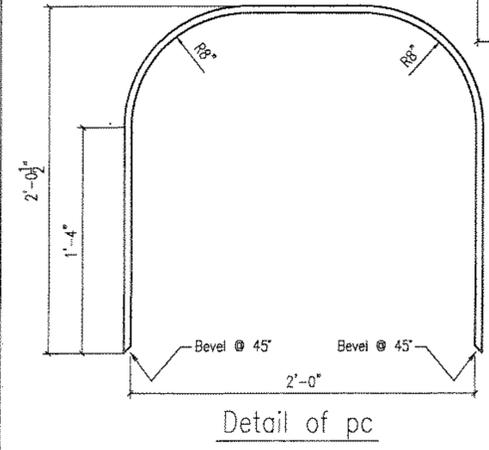
Section D



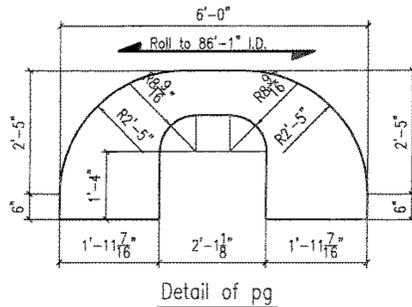
ONE - FLUSH TYPE CLEANOUT DOOR - 5A

Section B-B

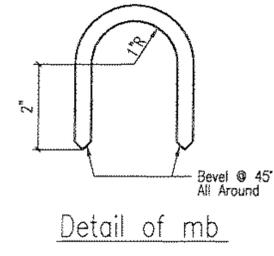
Detail 2



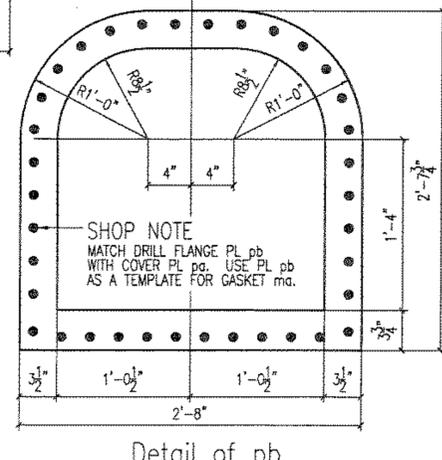
Detail of pc



Detail of pg

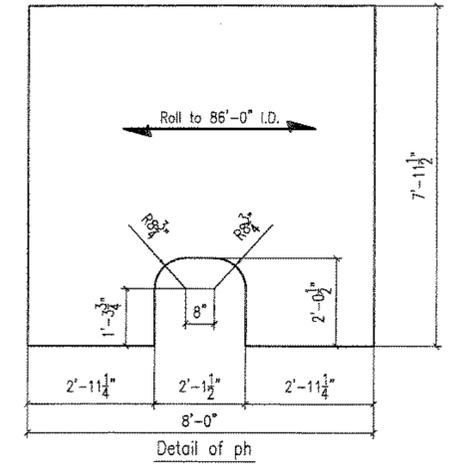


Detail of mb



Detail of pb

ADVISE BILL MARK	QUANTITY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS
				FT.	IN.			
ONE	5A		FLUSH TYPE CLEANOUT DOOR (SEE NOTE 2)					
1	pg		PL 1/2" x 6.63 SQ.FT.					(1)
1	pb		PL 1/2" x 2.59 SQ.FT.					(1)
1	pc		PL 1/2" x 6 3/8	5	5 15/16			BEND
1	pd		PL 1/2" x 17.61 SQ.FT.					(1)
1	pf		Bar 3/4 x 12	4	0			(1)
1	pg		PL 3/4" x 10.93 SQ.FT.					(1)
1	ph		PL 1/2 x 95 1/2	8	0			(1)
2	pk		Bar 3/8 x 1	1	0			
1	ma		GASKET 1/2" x 2.59 SQ.FT.					(RUBBER)
1	mb		BAR 3/8"	0	7 3/4			BEND
1	mc		3/8" EYE BOLT	0	4 1/4			W/Nut (GALV)
								(McMaster # 3016T35 or EQ)
12	(C)		3/4" HEX NUTS					(A-563)
2	(D)		3/4" M-Bolt	0	2 1/2			W/Nuts (A-307)
ONE	FB5		FIELD BOLTS					
24	(C)		3/4" M-Bolts	0	2 1/4			W/Nuts (A-307)
12	(C)		3/4" M-Bolts	0	2 1/4			WO/Nuts (A-307)
TOTAL WEIGHT THIS SHEET:								



Detail of ph

**SHOP NOTES**

- FIELD NOTE: BOTTOM PLATE SEAMS SHOULD CROSS EDGE OF BOTTOM REINFORCING PLATE OF CLEANOUT DOOR AT AN ANGLE OF APPROX. 90°. SEE DWG. 2AB
- STRESS RELIEVE PER THE LATEST ISSUE OF API-650.
- ROUND ALL CORNER ON CLEAN OUT DOOR.

ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.

Revised Per Approval: MTB 9-10-99

ERECTOR DRAWING REFERENCE: DWG. 1

DESIGN DRAWING REFERENCE:

ALL MATERIAL TO BE ASTM A-36 U.N.

RELEASED FOR FABRICATION BY: \_\_\_\_\_ DATE: \_\_\_\_\_

PAINT: FIELD CLEAN AND PAINT PER SPECIFICATIONS

OPEN HOLES: 13/16"

MADE BY: MTB CHECKED BY: AB DATE: 8/2/99

DETAILS OF: 24" x 24" FLUSH TYPE CLEANOUT DOOR

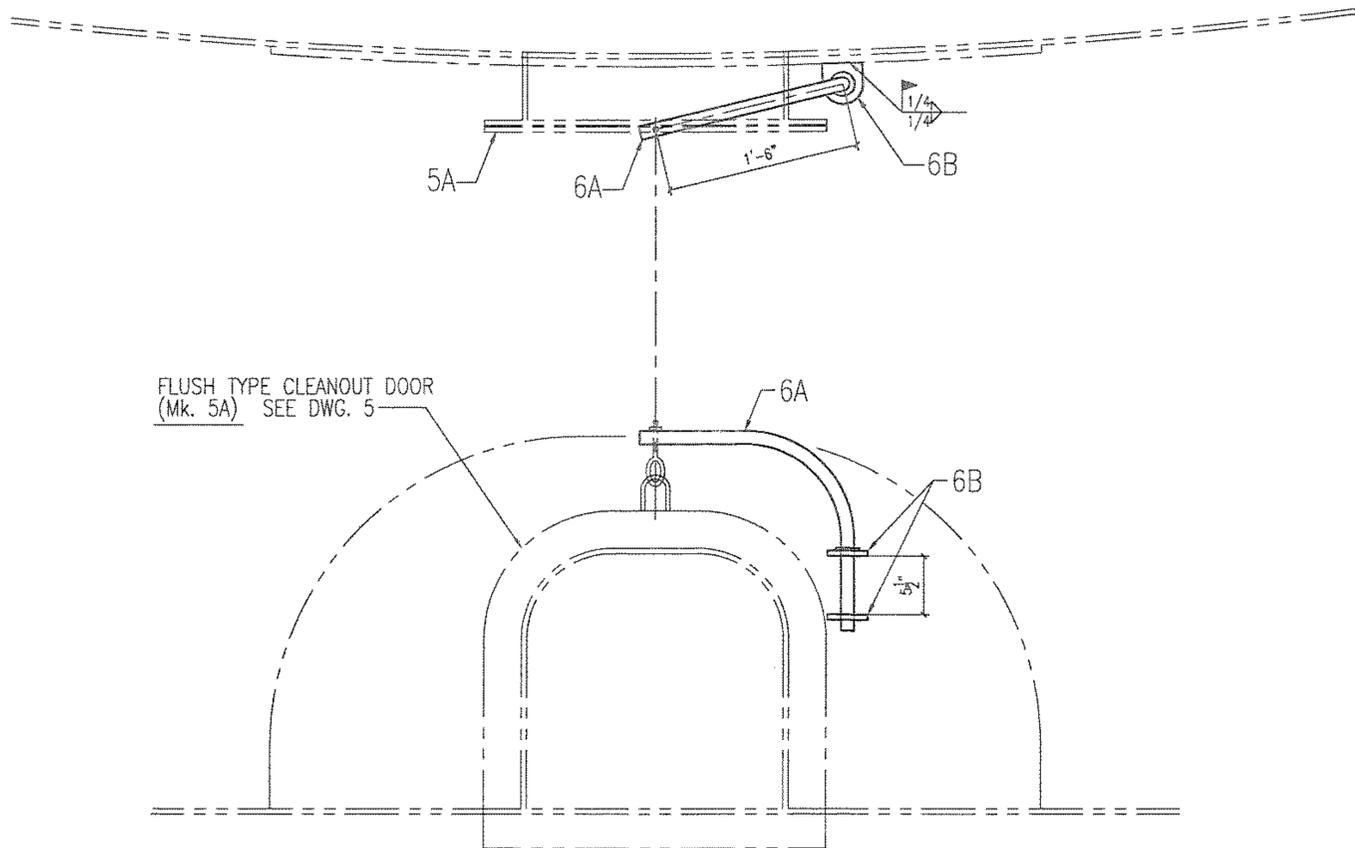
STRUCTURE: 1,000,000 GAL WATER TANK

LOCATION: LAKE HAVASU CITY, ARIZONA

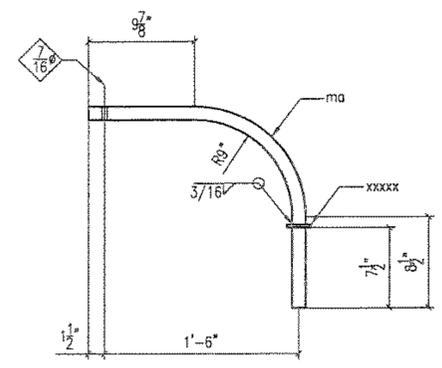
JOB NUMBER: 99-2133

FAB. SHEET NUMBER: GP 5

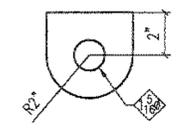
For Approval



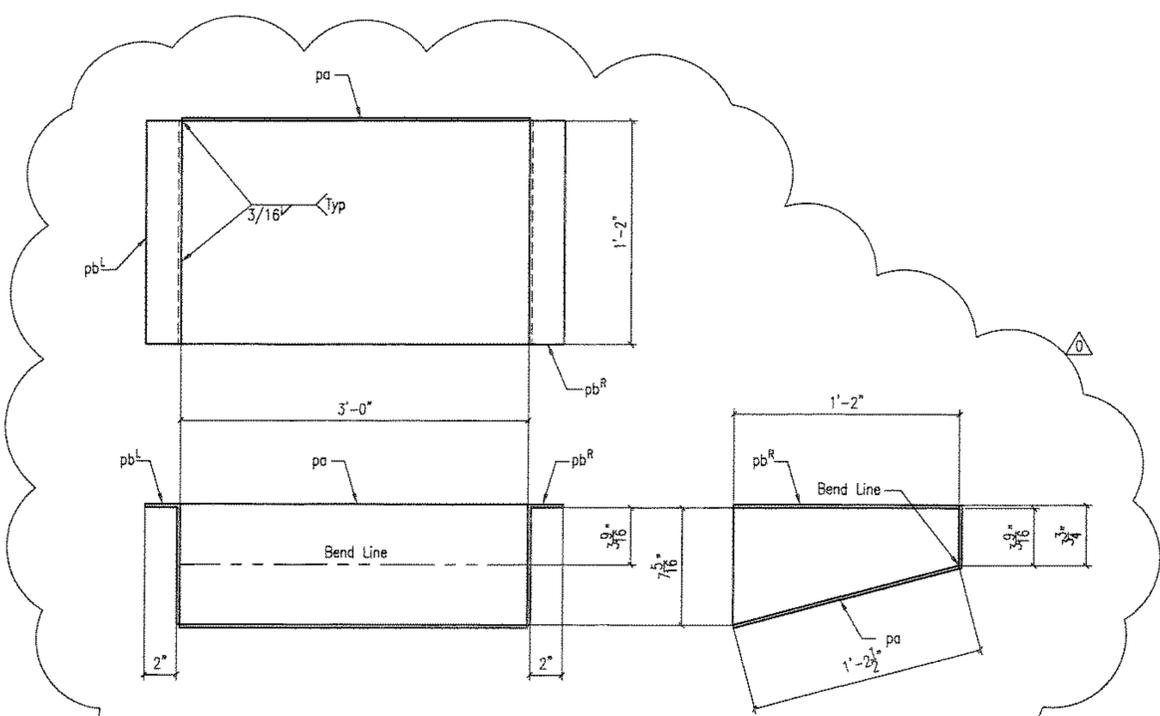
DAVIT ASSEMBLY FOR FLUSH TYPE CLEANOUT DOOR



ONE - DAVIT ARM - 6A



2 - PLATES - 6B



One - Trough - 6C

BILL OF MATERIAL

APPROXIMATE BILL MARK	QUANTITY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS
				FT.	IN.			
ONE	1	6A	DAVIT ASSEMBLY					
	1	ma	Bar 1 1/4"	2	9 1/2			Bend
	1	xxxxxx	1 1/4" Flat Washer					
	2	6B	Bar 1/2" x 2	0	3			Ⓢ
One	1	6C	Trough					
	1	pa	PL 3/16 x 18 1/16	3	0			Bend
	1	pb <sup>R</sup>	PL 3/16 x 9 5/16	1	2			Ⓢ Bend

TOTAL WEIGHT THIS SHEET:

SHOP NOTES

ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.

Revised Per Approval MTB 9-10-99

ERECTOR DRAWING REFERENCE: DWG. 5

DESIGN DRAWING REFERENCE:

ALL MATERIAL TO BE ASTM A-36 U.N.

RELEASED FOR FABRICATION BY \_\_\_\_\_ DATE \_\_\_\_\_

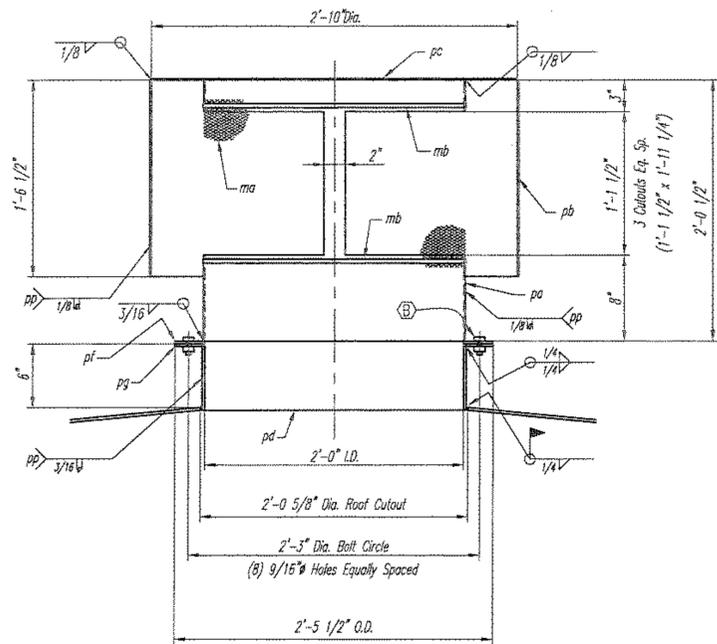
PAINT: FIELD CLEAN AND PAINT PER SPECIFICATIONS

OPEN HOLES: NOTED

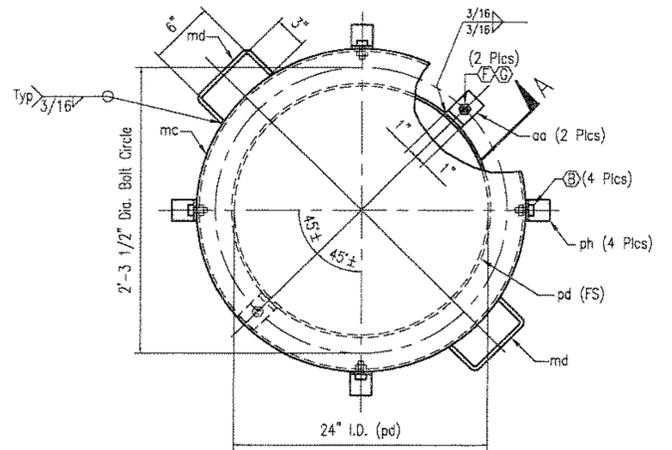


For Approval

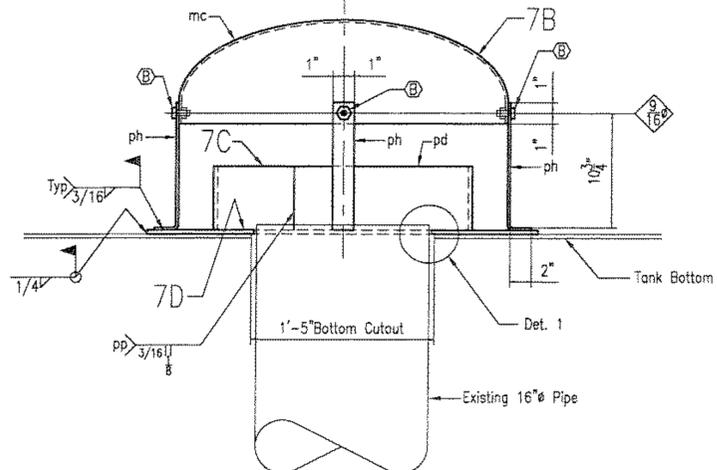
MADE BY: MTB	CHECKED BY: AB	DATE: 8/2/99	M	C	H	SEQ.	REV		
DETAILS OF: DAVIT ASSEMBLY							JOB NUMBER	FAB.	SHEET NUMBER
STRUCTURE: 1,000,000 GAL WATER TANK							99-2133	GP	6
LOCATION: LAKE HAVASU CITY, ARIZONA									



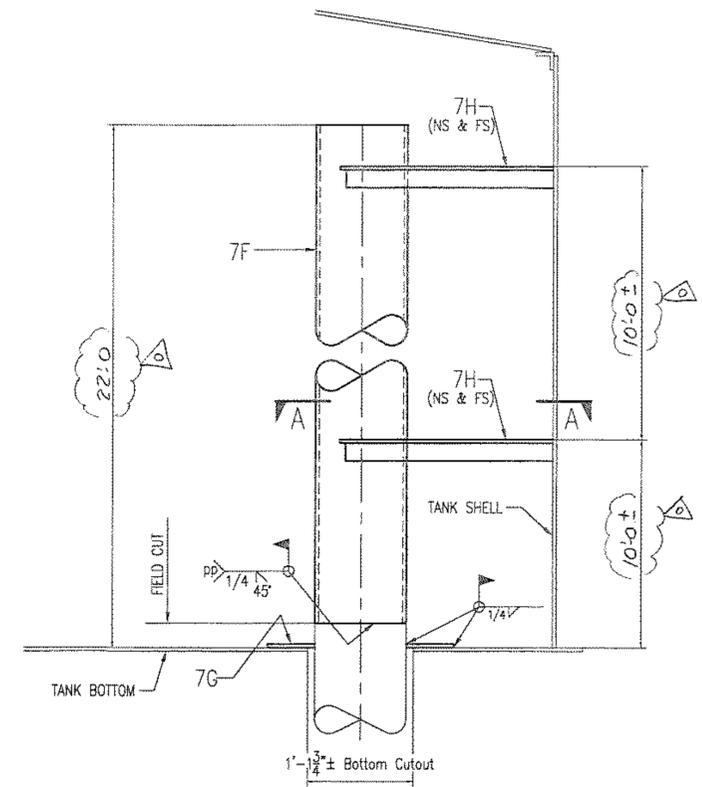
One - 24"  $\phi$  Vent - 7A



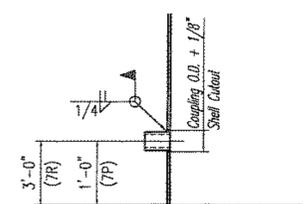
24" I.D. (pd)



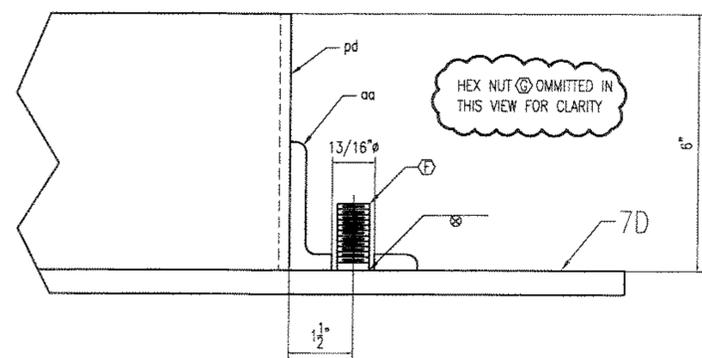
- 2 - 16"  $\phi$  INLET/OUTLET - 7B
- 2 - 24"  $\phi$  SILT STOP - 7C
- 2 - REINFORCING PAD - 7D



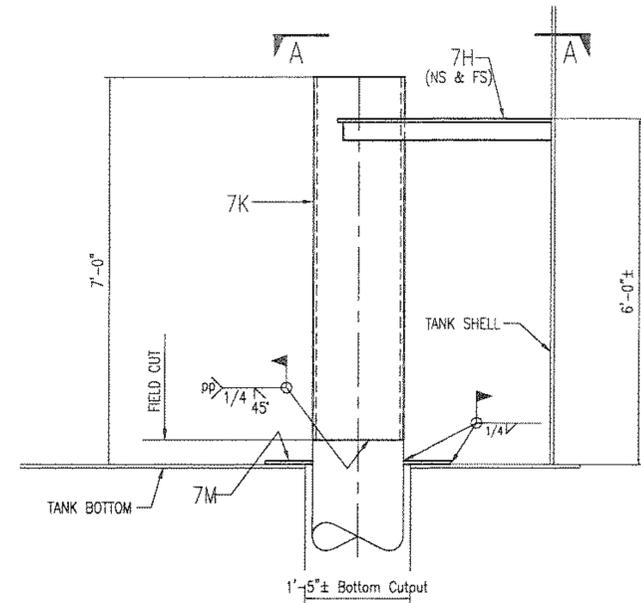
- ONE - 12"  $\phi$  PIPE - 7F
- ONE - REINFORCING PAD - 7G



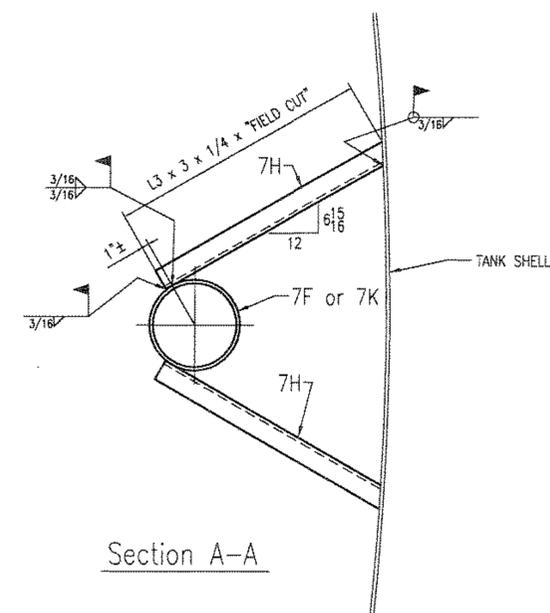
- 2 - Shell Coupling - 7P
- One - Shell Coupling - 7R



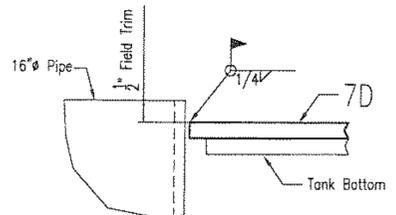
Section A



- ONE - 16"  $\phi$  PIPE - 7K
- ONE - REINFORCING PAD - 7M



Section A-A



Detail 1

BILL OF MATERIAL

ADVANCE BILL MARK	QUANTITY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS
				FT.	IN.			
ONE	7A		24" $\phi$ ROOF VENT					
1	pa		PL 10 Ga x 24 1/2	6	3 13/16			Roll to 24" I.D.
1	pb		PL 10 Ga x 18 1/2	8	11 1/4			Roll to 2'-10" I.D.
1	pc		PL 10 Ga x 6.31 SQ FT					(2'-10" O.D.)
1	pd		Bar 1/4" x 6	6	4 3/16			Roll to 24" I.D.
1	pf		PL 1/4x 1.60 SQ FT					(2'-5 1/2" O.D. x 2'-0" I.D.)
1	pg		PL 1/4x 1.47 SQ FT					(2'-5 1/2" O.D. x 2'-0 1/2" I.D.)
1	ma		16x16 Mesh 16"	6	6			(COPPER)
2	mb		Std. Band W/Clamp					(STN STL)
2	(B)		1/2" $\phi$ M Bolts	0	1 1/4			(A-307) W/Nuts
2	7B		16" $\phi$ INLET/OUTLET					
2	mca		30" I.D. x 1/4" Wall Semi Elliptical Head (2" Min Straight Flange)					
4	ph		Bar 1/4" x 2	1	1 3/4			Bend
4	(B)							
2	md		Bar 3/8"	1	0			Bend
2	7C		SILT STOP					
2	pd							
4	aa		L3 x 3 x 1/4	0	2			
2	7D		PL 1/4" x 5.65 SQ FT					(3'-0" O.D. x 1'-4 1/8" I.D.)
4	(F)		Thr'd Stud 1/2"	0	1"			(NELSON)
4	(G)		1/2" $\phi$ HEX NUT					(A-563)
ONE	7F		PIPE 12" $\phi$ STD WT	22	0 $\pm$			(A-53) Plain Mat'l
ONE	7G		PL 1/4" x 3.37 SQ FT					(2'-4" O.D. x 1'-0 7/8" I.D.)
ONE	7H		L3 x 3 x 1/4	40	L/F			Plain Mat'l
ONE	7K		PIPE 16" $\phi$ STD WT	7	0 $\pm$			(A-53) Plain Mat'l
ONE	7M		PL 1/4" x 4.45 SQ FT					(1'-9" O.D. x 1'-4 1/2" I.D.)
2	7P		1" $\phi$ 3000# COUPLING					(A-105)
ONE	7R		1" $\phi$ 3000# COUPLING					(A-105)
One	FB7		FIELD BOLTS					
8	(B)		1/2" $\phi$ M Bolts	0	1 1/4			(A-307) W/Nuts

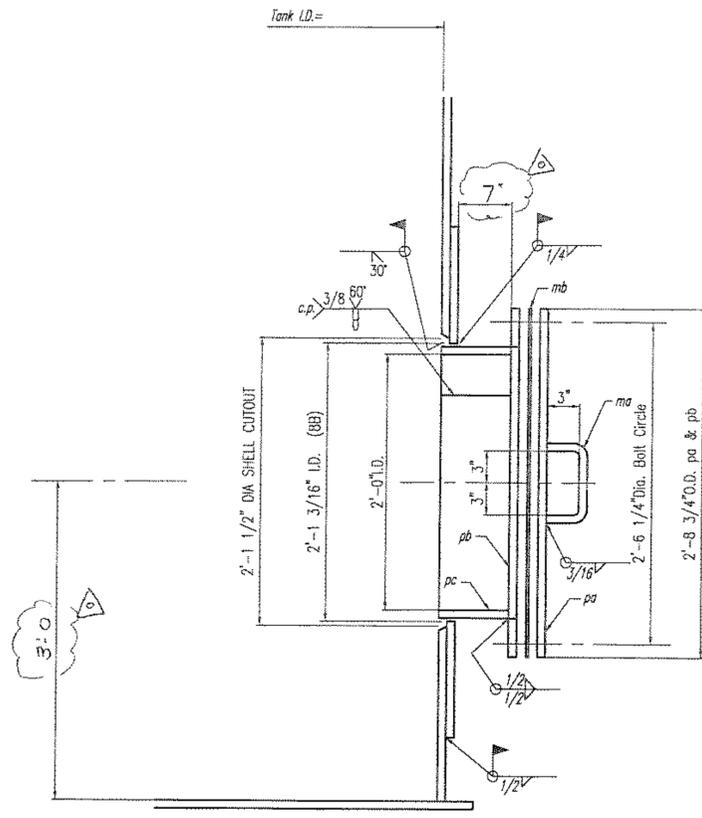
TOTAL WEIGHT THIS SHEET:

SHOP NOTES

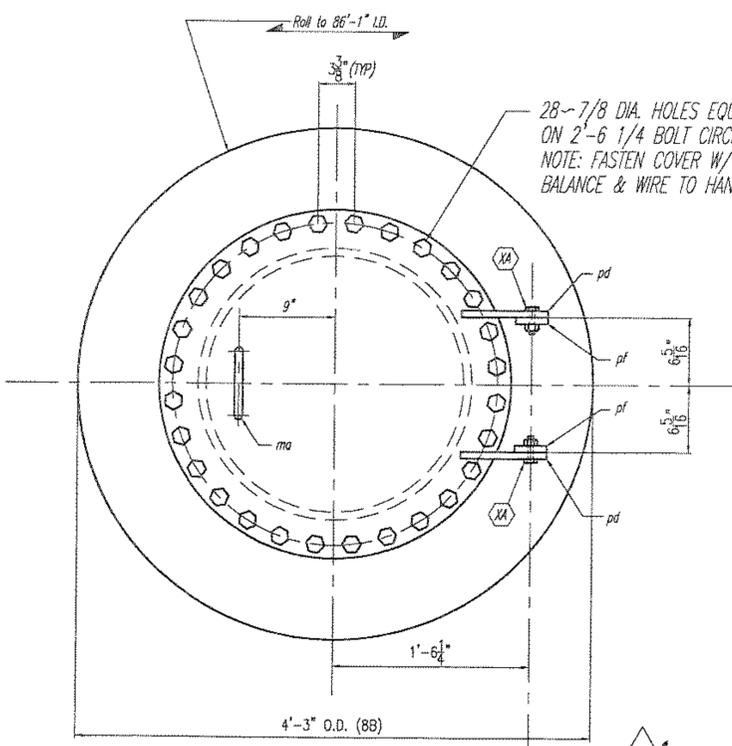
ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.  
 REVISIONS PER APPR. MTE 9-11-95  
 ERECTION DRAWING REFERENCE:  
 DESIGN DRAWING REFERENCE:  
 ALL MATERIAL TO BE ASTM A-36 U.N.  
 RELEASED FOR FABRICATION BY \_\_\_\_\_ DATE \_\_\_\_\_  
 PAINT: FIELD CLEAN AND PAINT PER SPECIFICATIONS  
 OPEN HOLES: NOTED

APPROVAL / REVIEW AUTHORITY:  
 PLEASE REVIEW THIS DRAWING CAREFULLY.  
 I HEREBY CERTIFY THAT I AM THE DESIGNER OF THIS DRAWING AND I AM RESPONSIBLE FOR THE ACCURACY OF THE INFORMATION SHOWN ON THE CONTRACT DOCUMENTS AND FOR ARCHITECTURAL AND STRUCTURAL DESIGN DRAWINGS. THIS IS THE RESPONSIBILITY OF THE BUYER.  
 UNLESS NOTED TO THE CONTRARY ON THIS DRAWING, WHEN IT IS RETURNED FROM APPROVAL, IT WILL BE ASSUMED THAT ALL INFORMATION SHOWN HEREIN HAS THE VERIFICATION OF THE APPROVAL / REVIEW AUTHORITY. UNLESS NOTED OTHERWISE, CHANGES TO INFORMATION SHOWN ON THESE DRAWINGS AFTER FIRST SUBMISSION WILL BE CONSIDERED AS CONTRACT CHANGES.  
 MADE BY: MTE CHECKED BY: AB DATE: 8/2/99 M C H SEQ. REV.  $\Delta$   
 DETAILS OF: FITTINGS  
 STRUCTURE: 1,000,000 GAL WATER TANK  
 LOCATION: LAKE HAVASU CITY, ARIZONA  
 JOB NUMBER: 99-2133 FAB. CP SHEET NUMBER: 7

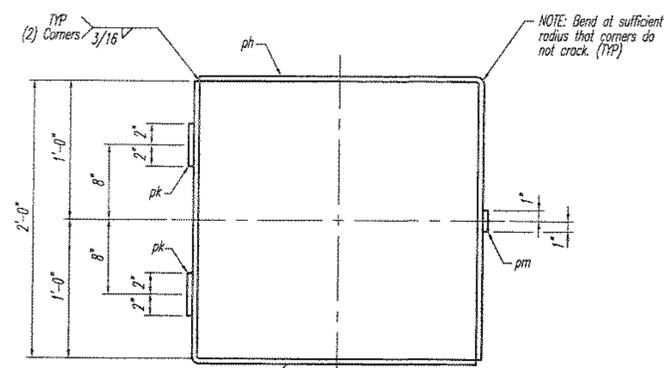
For Approval



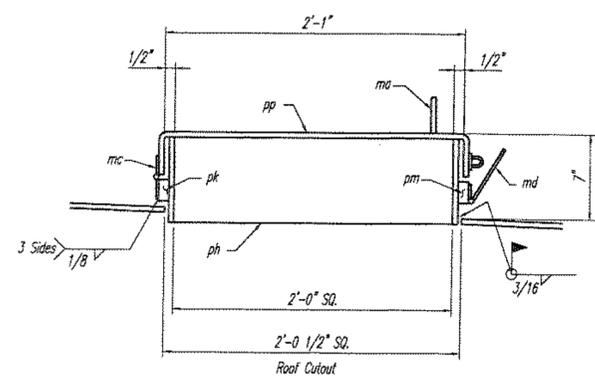
ONE - 24" Dia. Shell Manhole - 5A  
 ONE - Reinforcing Plate - 5B



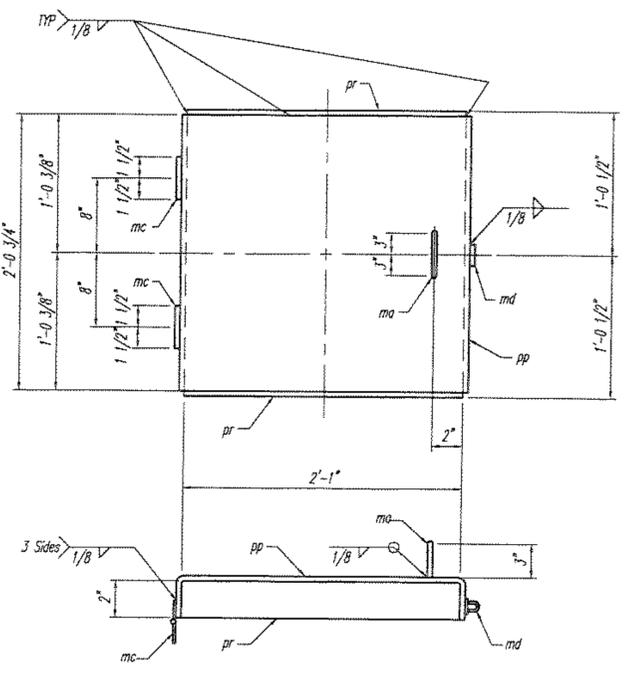
28-7/8 DIA. HOLES EQUALLY SPACED ON 2'-6 1/4 BOLT CIRCLE STRADDLING C.  
 NOTE: FASTEN COVER W/ 2 FIELD BOLTS. BAG BALANCE & WIRE TO HANDLE. (QC)



Roof Hatch Flange Detail



- 24" SQ. Roof Hatch -



Roof Hatch Cover Detail

ADVANCE BILL MARK	QUANTITY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS
				FT.	IN.			
ONE	BA		24" Shell Manhole					
1	pa		PL 1/2 x 5.85 SQ. FT.					(32 3/4" Dia.)
1	pb		PL 1/2 x 2.58 SQ. FT.					(32 3/4" O.D. x 25" LD.)
1	pc		PL 1/2 x 8 1/8	6	5			Roll to 24" I.D.
2	pd		Bar 1/2 x 3	0	8			(1)
2	pe		Bar 1/2 x 3	0	11 3/8			
1	ma		Bar 3/8 #	1	0			BEND
1	mb		1/8" Gasket 32 3/4 O.D. x 24 I.D.					(RUBBER)
			(See Shop Note)					
2	oc		3/4 # M.Bolts	0	2 1/4			w/nuts (A-307)
2	xa		1/2 # M.Bolts	0	1 3/4			w/nuts (A-307)
ONE	BB		PL 1/2 x 10.78 SQ. FT.					Roll to 86"-1" I.D.
			(4'-3" O.D. x 2'-1 3/16" LD.)					
			SHOP NOTE					
			Gasket mb to have (28) 7/8" # holes					
			Eq. Sp. on 2'-6 1/4" Dia. Bolt Circle					
ONE	BC		24" SQ. ROOF HATCH					
2	ph		PL 3/16 x 7	4	0			Bend
2	pk		Bar 1/2 x 2	0	4			
1	pm		Bar 1/2 x 2	0	2			
1	pp		PL 10 Ga. x 24 3/4	2	5			Bend
2	pr		PL 10 Ga. x 2	2	1			
2	mc		3 x 3 Blank Hinge					McMaster # 1623423 or EQ.
1	md		Safety Hasp					McMaster # 154542 or EQ.
1	ma							
ONE	FBB		FIELD BOLTS					
28	OC		3/4 # M.Bolts	0	2 1/4			w/nuts (A-307)

TOTAL WEIGHT THIS SHEET: \_\_\_\_\_

SHOP NOTES

ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.

REVISER PER APP. MFB 9-11-99

ERECTOR DRAWING REFERENCE: \_\_\_\_\_

DESIGN DRAWING REFERENCE: \_\_\_\_\_

ALL MATERIAL TO BE ASTM A-36 U.N.

RELEASED FOR FABRICATION BY \_\_\_\_\_ DATE \_\_\_\_\_

PAINT: FIELD CLEAN AND PAINT PER SPECIFICATIONS

OPEN HOLES: 13/16" U.N.

APPROVAL / REVIEW AUTHORITY: \_\_\_\_\_

PLEASE REVIEW THIS DRAWING CAREFULLY.

IT REPRESENTS AN INTERPRETATION OF THE INTENT OF THE CONTRACT DOCUMENTS. HOWEVER, THE STEEL FABRICATOR AND THE STRUCTURAL STEEL DETAILER ASSUME NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION SHOWN ON THE CONTRACT DOCUMENTS AND/OR ARCHITECTURAL AND STRUCTURAL DESIGN DRAWINGS. THIS IS THE RESPONSIBILITY OF THE BIDDING CONTRACTOR.

UNLESS NOTED TO THE CONTRARY, IN THIS DRAWING, WHEN IT IS REQUIRED FROM APPROVAL, IT WILL BE ASSUMED THAT ALL INFORMATION SHOWN HEREIN HAS THE AFFIRMATION OF THE APPROVAL / REVIEW AUTHORITY. SUBSEQUENT CHANGES TO INFORMATION SHOWN ON THESE DRAWINGS AFTER FIRST SUBMISSION WILL BE CONSIDERED AS CONTRACT CHANGE.

MADE BY: MFB CHECKED BY: AB DATE: 8/2/99 M C H SEQ. REV. (1)

DETAILS OF: 24" SHELL AND ROOF MANHOLES

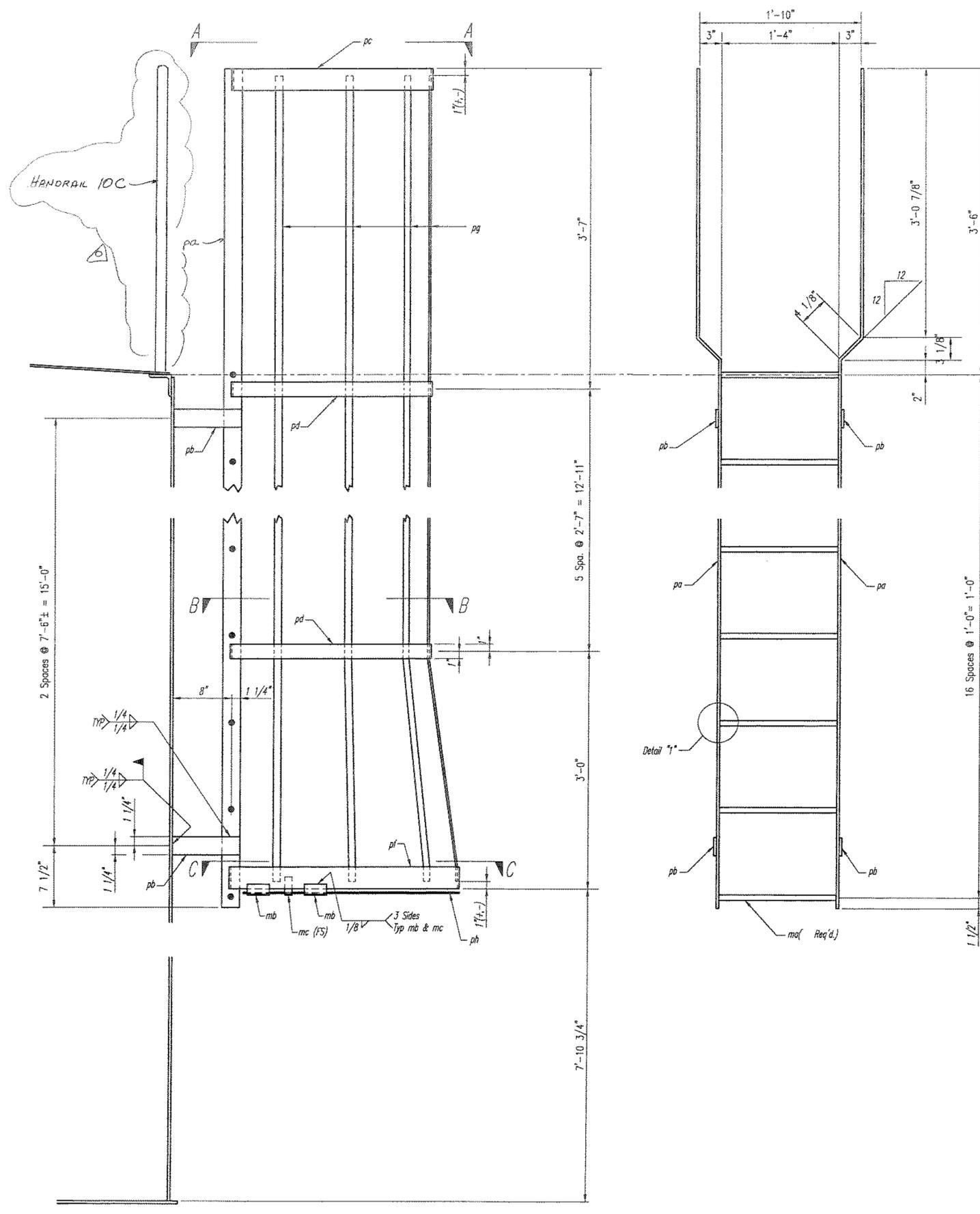
STRUCTURE: 1,000,000 GAL WATER TANK

LOCATION: LAKE HAVASU CITY, ARIZONA

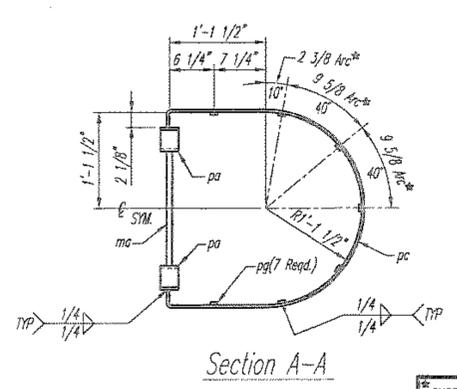
JOB NUMBER: 99-2133 FAB. SHEET NUMBER: GP 8

For Approval

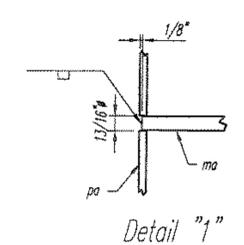
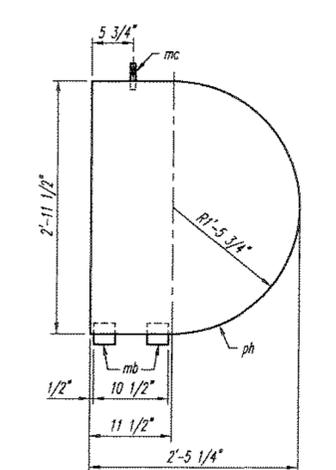
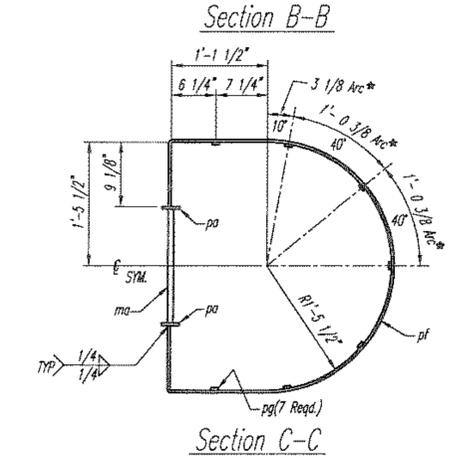
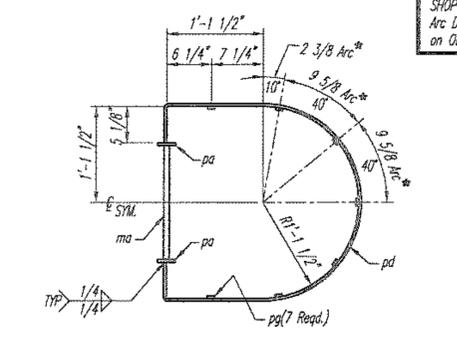




One - Exterior Caged Ladder - 9A



SHOP NOTE:  
Arc Dimensions measured on Outside of pc, pd or pf.



BILL OF MATERIAL									
QUANTITY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS	APPROVAL	
			FT.	IN.				DATE	BY
One	9A	Exterior Caged Ladder							
2	pa	Bar 3/8" x 2 1/2"	19	8 1/2"					Bend
6	pb	Bar 3/8" x 2 1/2"	0	9 1/4"					
1	pc	Bar 1/4" x 3"	6	2 1/16"					Bend
6	pd	Bar 1/4" x 3"	6	8"					Bend
1	pe	Bar 1/4" x 3"	8	4 5/8"					Bend
7	pf	Bar 1/4" x 1"	19	4"					
1	ph	PL 10 Co. x 29 1/4"	2	11 1/2"					(Comm. Qual.)
17	ma	Bar 3/4"	1	4 1/2"					
2	mb	3 x 3 Blank Hinge							McMaster # 1623423 or EQ.
									McMaster # 154542 or EQ.
1	mc	Safety Hasp							

TOTAL WEIGHT THIS SHEET: \_\_\_\_\_

**SHOP NOTES**

- Round all corners. Grind all sharp edges.

ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.

REVISIONS:

1	REVISOR	DATE	DESCRIPTION
1	MTB	7-11-99	REVISED PER APPL.

ERECTOR DRAWING REFERENCE: \_\_\_\_\_

DESIGN DRAWING REFERENCE: \_\_\_\_\_

ALL MATERIAL TO BE ASTM A-36

RELEASED FOR FABRICATION BY \_\_\_\_\_ DATE \_\_\_\_\_

PAINT: FIELD CLEAN AND PAINT PER SPECS. OPEN HOLES: 13/16" Ø

APPROVAL / REVIEW AUTHORITY: \_\_\_\_\_

PLEASE REVIEW THIS DRAWING CAREFULLY.

MADE BY: MTB CHECKED BY: AB DATE: 8/2/99

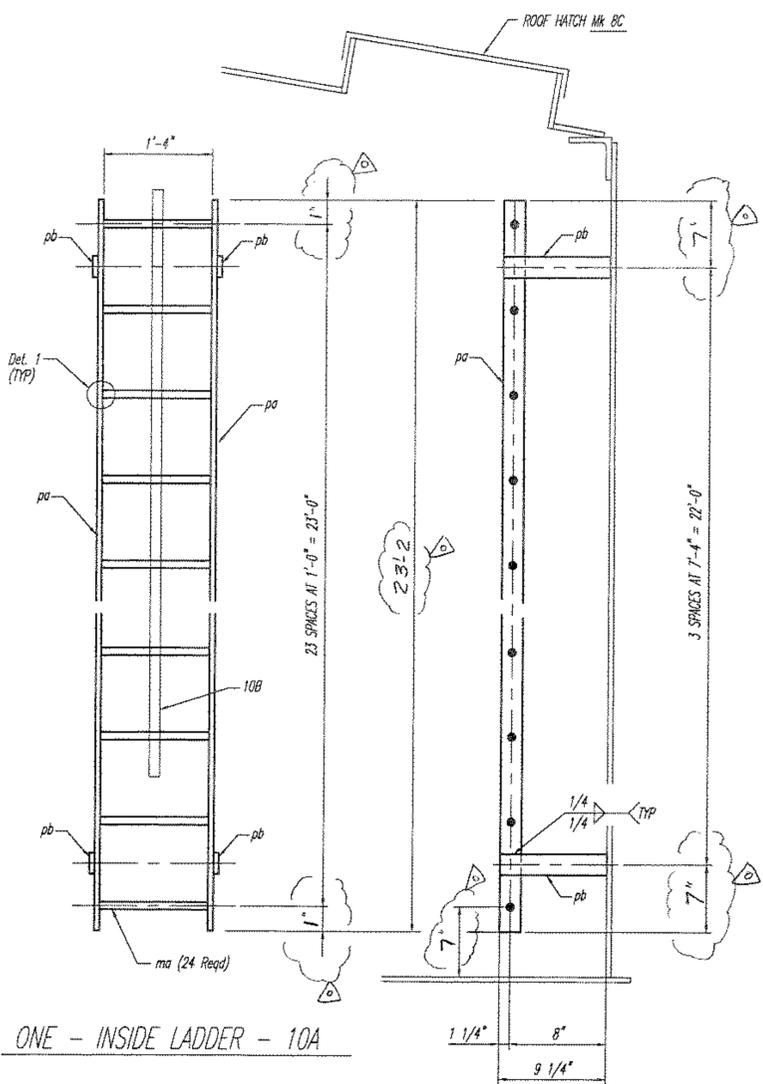
DETAILS OF: EXTERIOR CAGED LADDER

STRUCTURE: 1,000,000 GAL. WATER TANK

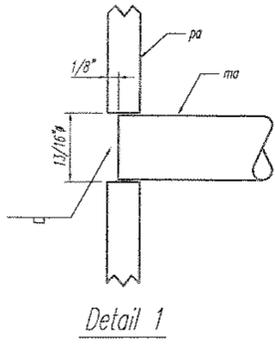
LOCATION: LAKE HAVASU CITY, AZ

JOB NUMBER	FAB.	SHEET NUMBER
99-2133	GP	9

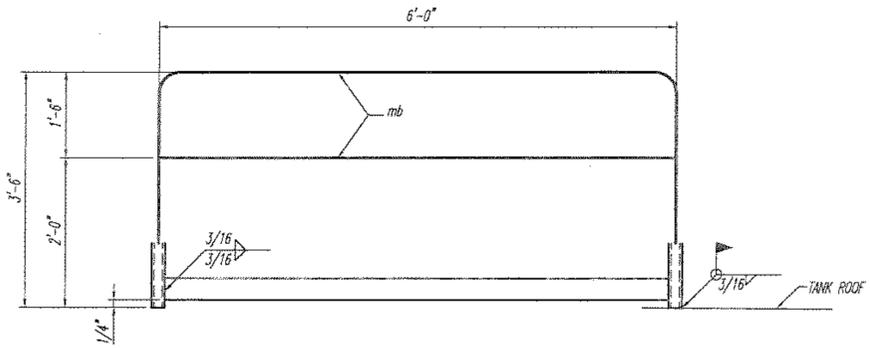
For Approval



ONE - INSIDE LADDER - 10A

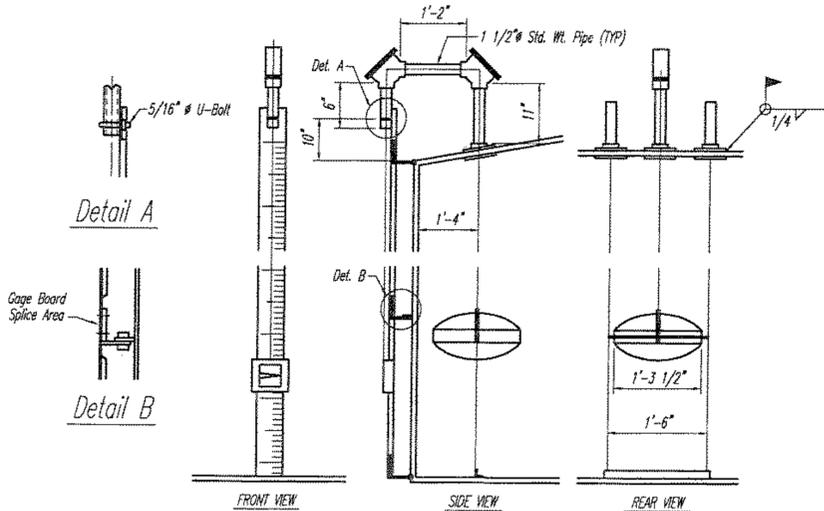


Detail 1



2 - ROOF HANDRAIL - 10C

**NOTE:**  
HANDRAIL TO BE ALL WELDED CONSTRUCTION. REMOVE ALL BURRS AND SHARP EDGES AND LEAVE SMOOTH TO TOUCH.



ONE - Liquid Level Indicator - 10D  
(From Tank Products Inc.)

BILL OF MATERIAL

ADVANCE BILL MARK	QUANTITY	MARK	DESCRIPTION	LENGTH		PROCESS	TOTAL WEIGHT	REMARKS
				FT.	IN.			
P L	ONE	10A	INSIDE LADDER					
	2	pa	Bar 3/8" x 2 1/2	23	2			
	6	pb	Bar 3/8" x 2 1/2	0	9 1/4			
	24	ma	Bar 3/4"	1	4 1/2			
	ONE	10B	SAF-T-CLIMB					
	1		SAF-T-NORCH RAIL	22	0			(CALV)
	1		SAF-T-LOK SLEEVE					
	5		LADDER RUNG CLAMPS					(CALV)
	1		SAF-T-BELT					
	1		SAF-T-NOTCH REMOVABLE EXTENSION KIT					
	2	10C	ROOF HANDRAIL	23	3			
	2	mb	Pipe 1 1/4" Std Wt.	20	L/F			
	2	pc	Bar 1/4 x 4	5	10 3/8			
	ONE	10D	LIQUID LEVEL INDICATOR (Tank Products Inc.) Tank Height = 24'-0" (NOM.) Tank Contents = Potable Water Roof Slope = 3/4" to 12"					

TOTAL WEIGHT THIS SHEET:

SHOP NOTES

1. Round all corners. Grind all sharp edges.

ALL MATERIAL THIS DRAWING IS CODE # \_\_\_\_\_ U.N.O.

REVISOR: MTB 9-11-99

ERECTOR DRAWING REFERENCE: DWG 1

ALL MATERIAL TO BE ASTM A-36

RELEASED FOR FABRICATION BY \_\_\_\_\_ DATE \_\_\_\_\_

PAINT: FIELD CLEAN AND PAINT PER SPECS. OPEN HOLES: 13/16" Ø

APPROVAL REVIEW AUTHORITY: \_\_\_\_\_  
PLEASE REVIEW THIS DRAWING CAREFULLY.  
I HEREBY CERTIFY THAT THE INTERPRETATION OF THE INTENT OF THE CONTRACT DOCUMENTS, INCLUDING THE STEEL FABRICATOR AND THE STRUCTURAL STEEL DETAILER, ASSUME NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION SHOWN ON THE CONTRACT DOCUMENTS AND FOR ARCHITECTURAL AND STRUCTURAL DESIGN DRAWINGS. THIS IS THE RESPONSIBILITY OF THE BUYER.  
UNLESS NOTED TO THE CONTRARY ON THIS DRAWING, WHEN IT IS ASSURED FROM APPROVAL IT WILL BE ASSUMED THAT ALL INFORMATION SHOWN HEREIN HAS THE AUTHORITY OF THE ARCHITECT. I HEREBY AUTHORIZE SUBSEQUENT CHANGES TO INFORMATION SHOWN ON THESE DRAWINGS AFTER FIRST SUBMISSION WILL BE CONSIDERED AS CONTRACT CHANGES.

MADE BY: MTB	CHECKED BY: AB	DATE: 8/2/99	M	C	H	SEQ.	REV	
DETAILS OF: INTERIOR LADDER							JOB NUMBER	FAB. SHEET NUMBER
STRUCTURE: 1,000,000 GAL. WATER TANK							99-2133	GP 10
LOCATION: LAKE HAVASU CITY, AZ								



For Approval



HAVASUPAI BOULEVARD

INSTALL NEW CHAINLINK FENCE SEE NOTE 4

CHAINLINK FENCE SEE NOTE 4

MATCH EXISTING FENCE

1,000,000 GALLON RESERVOIR  
EL. 997.0' (SEE NOTE 12)  
(SEE DETAILS, DWGS. P2 & P3)

246'

12" OVERFLOW

SEE DETAIL I, DWG. P3

16" OUTLET

27" AC W 998.25

998.5

16" AC W 16" AC

CONNECT TO EXISTING VALVES

EXISTING 1,000,000 GAL. RESERVOIR

EXISTING FENCE TO REMAIN IN PRESENT LOCATION

TRACT 2228  
PARCEL "A"

250,000 GAL. TANK (SEE NOTE 2)

16" PCCP

20" PCCP

SEE NOTE 3

16" INLET OUTLET

16" OUTLET

18"

MATCH EXISTING FENCE

REINSTALL EXISTING GATE AT THIS LOCATION

27"x16" SS TAPPING SLEEVE W/ VALVE AND THRUST BLOCK

EXISTING FENCE TO REMAIN IN PRESENT LOCATION

Scale For Microfilming  
Millimeters  
Inches

- NOTES:**
- ALL TANK PENETRATIONS SHALL BE STEEL PIPING AS SPECIFIED IN SECTION 4 OF THE TECHNICAL SPECIFICATIONS. ALL YARD PIPING SHALL BE RESTRAINED JOINT CEMENT MORTAR LINED D.I.P. PER ANSI/AWWA C110/A21.10 OR C153/A21.53 WITH A MINIMUM PRESSURE CLASS OF 150.
  - THE 250,000 GALLON STEEL TANK AND FOUNDATION SHALL BE DRAINED, DISMANTLED, AND REMOVED FROM THE SITE. REMOVE LEAD BASED PAINT AS SPECIFIED. CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL OF TANK.
  - ISOLATE AND PLUG PIPING CONNECTIONS TO THE EXISTING 250,000 GALLON TANK UNDERGROUND AT THE NEAREST VALVE FROM THE TANK.
  - INSTALL GALVANIZED CHAINLINK FENCE TO MATCH EXISTING. ANCHOR FENCE, INC. OR ALLIED TUBE AND CONDUIT CORPORATION. CITY HAS APPROX. 500 L.F. OF EXISTING FENCE AVAILABLE FOR USE AT THIS SITE. CONTRACTOR IS RESPONSIBLE TO DETERMINE SUITABILITY OF EXISTING FENCE, AND SHALL MAKE UP DIFFERENCE WITH NEW FENCE.
  - THE PUMP STATION AND EXISTING 1,000,000 GALLON RESERVOIR ARE TO REMAIN IN OPERATION AT ALL TIMES. ALL CONSTRUCTION AND VALVE OPERATION AT STATION 2-A SHALL BE COORDINATED WITH THE CITY.
  - RELOCATE RTU TELEMETRY AND CONTROL SYSTEM TO NEW 1,000,000 GALLON RESERVOIR. MOUNT PANEL ON TANK WITH UNISTRUT BRACKETS AND COAT ALL WELDS AS SPECIFIED. EXTEND ELECTRICAL CONDUIT AND WIRING FROM EXISTING 250,000 GALLON TANK TO NEW RESERVOIR.
  - RELOCATE PRESSURE TRANSMITTER FROM 250,000 GALLON TANK TO INTERIOR OF NEW RESERVOIR. POSITION TRANSMITTER 12" FROM TANK BOTTOM. PREPARE AND COAT ALL WELDS AS SPECIFIED.
  - ALL DESIGN AND CONSTRUCTION TO BE IN ACCORDANCE WITH THE LATEST REVISION OF AWWA D-100 AND ADEQ REQUIREMENTS.
  - ALL ROUGH SITE GRADING, EXCEPT REMOVAL OF EXISTING 250,000 GALLON TANK FOUNDATION, SHALL BE BY OTHERS. ROUGH GRADE WILL BE TO ± 6". CONTRACTOR IS RESPONSIBLE FOR ALL FINAL GRADING AND FOUNDATION CONSTRUCTION.
  - CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES ON THE SITE AND ADJUSTING AS NECESSARY TO CONSTRUCT THE PROJECT AS SHOWN.
  - ALL SIZES OF STRUCTURAL ELEMENTS ARE FOR GENERAL REFERENCE ONLY. STRUCTURAL ENGINEER SHALL PREPARE DETAILED DESIGN CALCULATIONS AND SHOP DRAWINGS FOR ALL TANK MEMBERS AND APPURTENANCES IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
  - FINISH FLOOR ELEVATION TO MATCH EXISTING 1,000,000 GAL. RESERVOIR
  - ALL REFERENCES TO THE "TANK BASE RING, STEEL BAND BASE RING, FOUNDATION RESTRAINING RING, ETC." IN THESE DRAWINGS SHALL BE CHANGED TO READ "RESERVOIR FOUNDATION". IF THE APPROVED DESIGN OF THE FOUNDATION IS FOR OTHER THAN A "STEEL BASE RING", ALL DIMENSIONS TO THE OUTER EDGE OF THE FOUNDATION SHALL BE ADJUSTED ACCORDINGLY TO FIT THE APPROVED FOUNDATION DESIGN.
  - EXISTING 0.25 MG RESERVOIR TO REMAIN IN SERVICE UNTIL NEW 1.0 MG RESERVOIR IS COMPLETED, TESTED AND ACCEPTED.



no.	date	by	revision
1	5/99	RBM	RELOCATED NEW TANK TO THE WEST

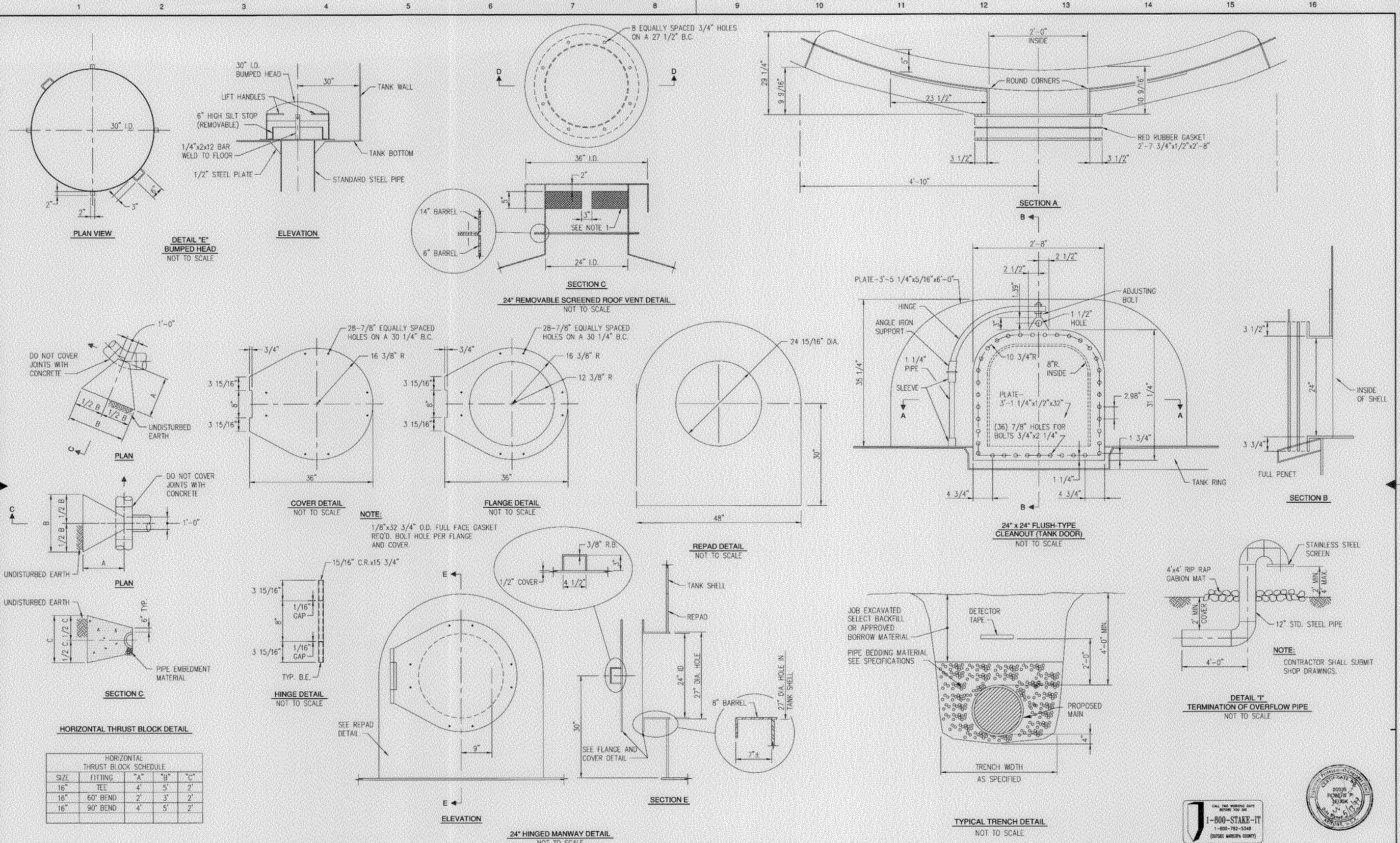


date	5-3-99	detailed	CF
designed	CF	checked	RPL



STATION 2-A ONE MILLION GALLON RESERVOIR	
project	W-182-99RB
contract	
drawing	P1 -
sheet	of sheets
EXISTE1.DWG	

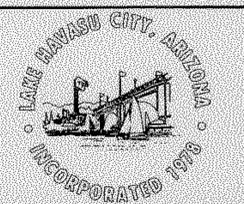




Scale For Micromillim  
Inches

no.	date	by	revision

date **JAN. 26, 1999**  
designed **J. BRUNNER**  
detailed **G. PORTER**  
checked



STATION 2-A  
ONE MILLION GALLON RESERVOIR  
MISCELLANEOUS DETAILS II

project W-182-99RB contract  
drawing **P3** rev.   
sheet of sheets  
file TANKDET2.dwg 02-19-1999 13:13 GDP



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# **APPENDIX C**

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# TANK INDUSTRY CONSULTANTS



## **EVALUATION OF THE 1,000,000 GALLON STEEL GROUND STORAGE TANK**

**“HAVASUPAI BOULEVARD TANK”  
LAKE HAVASU CITY, ARIZONA**

FOR

**ATKINS  
HENDERSON, NEVADA**

April 1, 2015

15.076.S1580.001

**TIC**  
**TANK**  
**INDUSTRY**  
**CONSULTANTS**  
**INC.**

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Indianapolis, Indiana 46214  
317 / 271-3100 - Phone  
317 / 271-3300 - FAX

Plainfield, Illinois  
815 / 556-8335

Pittsburgh, Pennsylvania  
412 / 262-1586

El Paso, Texas  
915 / 790-0790

Houston, Texas  
281 / 367-3511

April 16, 2015

**SUBJECT:**

The subject of this report is the field evaluation of the 1,000,000 gallon steel ground storage tank in Lake Havasu City, Arizona. The tank was owned by Lake Havasu City and was known as the "Havasupai Boulevard Tank." The field evaluation was performed on April 1, 2015 by Gregory P. Cannon and Malcom X. Crutchfield of Tank Industry Consultants. The Owner's representative on the site at the time of the field evaluation was Wayne Patenude. The column and rafter supported roof tank was of welded steel construction. According to information on the tank nameplate, the tank was built in 1999 by Schuff Steel Co. under contract number 99-2133, and had a capacity of 1,000,000 gallons. The tank nameplate also stated that the tank diameter was 86 ft, and the nominal shell height was 24 ft.

**OBJECTIVE:**

The purpose of this evaluation was to determine the condition of the tank interior, exterior, exposed foundation, and accessories. The purpose of this report is to present the findings of the evaluation and to make recommendations for recoating, repairing, corrosion protection, and maintenance. Budget estimates for the work, anticipated life of the coating and the structure, and the replacement cost of the tank are also included.

**AUTHORIZATION:**

This evaluation and report were authorized in the Subcontract for Professional Services for Atkins Project No. 1000036828 signed by and Heidi Dexheimer.

**EXECUTIVE SUMMARY:**

The exterior of the tank was in good overall condition with only minor corrosion and spot failures noted. The interior surfaces were in very poor condition with significant corrosion and metal loss noted on the roof rafters. Many of the roof rafters were twisted, bowed, and sagged from the metal loss. The rafters should be replaced as soon as possible. Tank Industry Consultants recommends that the interior of the tank be recoated in the next 6 months. **Tank Industry Consultants recommends that personnel not enter the tank until the rafters have been replaced.**

**Structural Deficiencies:** There were structural deficiencies on this tank.

- ◆ significant metal loss was observed on the roof rafters, and
- ◆ several rafters were bowed and twisted.

These deficiencies should be addressed as soon as possible to prevent the sudden and catastrophic failure of the roof rafters, leading to the collapse of the roof.

**ANSI/OSHA and Safety-Related Deficiencies:** There were OSHA and safety-related deficiencies on this tank. These deficiencies included:

- ◆ the exterior ladder safety cage depth was dimensionally too small (29 CFR 1910.27(d)(1)(i)),
- ◆ the exterior ladder safety cage width was dimensionally too small (29 CFR 1910.27(d)(1)(i)),
- ◆ the exterior ladder safety cage vertical bar spacing was dimensionally too large (29 CFR 1910.27(d)(1)(i)),
- ◆ conduit and coaxial cabling was attached to the exterior ladder brackets (29 CFR 1910.27(b)(2)),
- ◆ the roof was equipped with only one manhole (AWWA),
- ◆ the interior ladder head clearance was dimensionally too small (29 CFR 1910.27(c)(1)), and
- ◆ severe corrosion and metal loss were noted on the interior container ladder.

If the Owner wishes to fully comply with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

**AWWA and Operational Deficiencies:** There were sanitary and operating deficiencies on this tank as well. These deficiencies included:

- ◆ the roof manhole was not equipped with a lock,
- ◆ the roof vent was not of a clog-resistant design,
- ◆ the roof vent screening was not restrictive enough,
- ◆ the overflow pipe was located inside of the tank, and
- ◆ the overflow pipe was not equipped with an above ground air break.

These deficiencies should be corrected.

The safety-related, sanitary, and operating deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes.

## PHOTOGRAPHS:

Color photographs were taken of the visible portions of the foundation, the tank interior and exterior and are included as a part of this report. The significant photographs are keyed to the observations.

## NOMENCLATURE:

The terms used in describing the various components of steel water tanks are unique to the industry. In fact, the terms vary from firm to firm and from person to person. In an attempt to define the terms used in this report, a sketch of the general type of tank covered is included at the end of the narrative portion of this report. Each horizontal row of steel plates on the tank is referred to as a "shell ring" or "ring." To aid in referencing the shell rings, the bottom ring is referred to as shell ring #1 and the top ring is shell ring #3. **Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment.**

## ADHESION TESTS:

All adhesion tests performed during this evaluation were done in general accordance with ASTM D3359. The results are reported herein using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. A table of adhesion test results classification is included with this report following the sketch of the tank.

## HEAVY METALS TESTS:

Samples of the exterior and interior coating systems were sent to a laboratory for inductively coupled plasma-atomic emission spectrometry analyses. The test results were as follows:

	Cadmium		Chromium		Lead	
	mg/kg	percent	mg/kg	percent	mg/kg	percent
Exterior	<0.39	<0.000039%	<0.97	<0.000097%	5.8	0.00058%
Interior	<0.4	<0.00004%	<1	<0.0001%	2.6	0.00026%

Tank Industry Consultants performs this test only to determine if there is lead, cadmium, or chromium present in the coating samples. To limit damage to the existing coating, only small areas were tested. The small number of samples taken and the difficulty of retrieving all primer from the steel profile may cause the tests performed to not accurately represent the total coating system. Variations in thickness, types of coatings applied, and the interim cleaning and painting operations will also affect the actual readings. The reliability of the results is also dependent on the amount of primer included in the sample. The Consumer Product Safety Commission specifies that an amount greater than 0.06% lead is considered potentially hazardous. Additional testing to determine the amount of leachable contaminants present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting. Results from the laboratory analysis are included following the adhesion tables.

### ULTRASONIC THICKNESS MEASUREMENTS:

	(all readings were taken through coating)
Roof Plates:	0.209 in. to 0.213 in.
Shell:	
Ring #3:	0.286 in. to 0.289 in.
Ring #2:	0.358 in. to 0.362 in.
Ring #1:	0.526 in. to 0.530 in., bottom
Bottom Plate:	0.313 in. to 0.318 in.

### OBSERVATIONS:

#### A. Foundation and Site

##### SITE:

Size: approx. 275 ft x 375 ft

##### Fence:

Type: chain link, with 3 strands of barbed wire

Height: 6 ft

##### Gate:

Location: southwest corner of site

Width: 19 ft 6 in.

Locked: yes

##### Nearest Structures:

Type: ground storage tank

Direction: southeast

Distance: approx. 140 ft

Type: residence

Direction: west

Distance: approx. 175 ft

Type: residence  
Direction: south  
Distance: approx. 175 ft

Nearest Overhead Power Lines:

Direction: west  
Distance: approx. 50 ft

FOUNDATION:

Type: sand pad  
Retaining Ring:  
Size: 12 in. x 1/2 in., flat bar  
Distance From Shell: typ. 12 in.

VALVE VAULT: none

1. **Site Location:** The tank was located up an asphalt drive at 2938 Havasupai Boulevard in Lake Havasu City, Arizona. The site was located in a residential neighborhood with the nearest residences to the west and south of the site. Overhead power lines were located on the west side of the site. Access to the site was through a locked gate at the southwest corner of the site. (See photos 1-9)

2. **Site Conditions:** The tank site was covered with gravel and sand and appeared to be graded to provide adequate drainage away from the foundation. The tank site was fenced. The chain link fence was topped with barbed wire and was equipped with a gate at the southwest corner of the site. The fence appeared to be in good overall condition as no significant deficiencies were noted. A sign was located on the fence at the gate. An additional ground storage tank was located on the east side of the site. A high voltage cabinet was located on site to the southeast of the tank. A cathodic protection cabinet was located adjacent to the tank. Above ground piping was located to the southeast of the tank. (See photos 1-9)

3. **Foundation:** The tank was located on top of a sand pad, which was equipped with a steel flat bar retaining ring. The retaining ring was separated into sections which were bolted together. Moderate corrosion was observed on the retaining ring. Sand was located between the retaining ring and the tank. A large area of the sand had washed out on the west side of the tank. Vegetation had grown between the retaining ring and the bottom plate. Conduit and coaxial cabling were attached to the southeast side of the retaining ring. A SCADA cabinet was attached to unistrut brackets which were attached to the east side of the retaining ring. (See photos 11-13)

## **B. Exterior Surfaces**

DESCRIPTION:

Construction: welded steel  
Diameter: approx. 86 ft  
Shell Height: approx. 24 ft  
Shell Rings: 3  
Roof Type: column and rafter supported

NAMEPLATE:

Location: above shell manhole on west side of shell

SCHUFF STEEL COMPANY			
CODE	AWWA D100-96		
APPENDIX	STD	YEAR COMPLETED	1999
EDITION		REVISION NUMBER	
NOMINAL DIAMETER	86'-0"	NOMINAL HEIGHT	24'-0"
NOMINAL CAPACITY	1,000,000 GAL	DESIGN LIQUID LEVEL	22'-0"
DESIGN SPECIFIC GRAVITY	1	MAXIMUM OPERATING TEMP	AMBIENT
DESIGN PRESSURE	ATMOS	PARTIAL STRESS RELIEF	NONE
MANUFACTURERS SERIAL NO	99-2133	PURCHASER'S TANK NO	1
FABRICATED BY	SCHUFF STEEL CO		
ERECTED BY	SCHUFF STEEL CO		
SHELL COURSE	APPENDIX	MATERIAL	
1ST SHELL COURSE	STD	A-36	
2ND SHELL COURSE	STD	A-36	
3RD SHELL COURSE	STD	A-36	

ANCHOR BOLTS: none

BOTTOM PLATE PROJECTION: 1-1/8 in. to 3-1/4 in. from shell

SIGN: "N-2A-06 [1.0 MG]"

Location: south side of shell

Color: black

Brush Strokes: 1/2 in. and 1 in.

Letter Height: 3 in. and 6 in.

Letter Width: 2 in. and 3-3/4 in.

SHELL MANHOLES:

Number: 2

Location: west side of shell ring #1

Type: flanged and bolted

Size: 24 in. diameter

Neck: 8 in. projection from shell x 1/2 in. thick

Flange: 32-5/8 in. diameter x 1/2 in. thick

Bolts:

Number: 28

Size: 3/4 in. diameter x 2 in. long

Cover Plate:

Size: 32-3/4 in. diameter x 1/2 in. thick

Hinged: yes, exterior

Location: southwest side of shell ring #1  
Type: flanged and bolted, tombstone  
Size: 24 in. x 24-1/2 in.  
Neck: 6-1/2 in. projection from shell x 1/2 in. thick  
Flange: 3-1/2 in. x 1/2 in. thick  
Bolts:  
    Number: 36  
    Size: 3/4 in. diameter x 1/2 in. thick  
Cover Plate:  
    Size: 31-3/4 in. x 32 in. x 1/2 in. thick  
    Hinged: yes, exterior

**SHELL LADDER:**

Number of Rungs: 17  
Distance From Ground to Lowest Rung: 8 ft 7 in.  
Width: 16 in.  
Side Rails: 2-1/2 in. x 3/8 in., flat bar  
Rung Size: 3/4 in. diameter  
Spacing: 12 in. on center  
Toe Room: 8-1/4 in.  
Brackets:  
    Construction: welded  
    Size: 2-1/2 in. x 3/8 in., flat bar  
    Spacing: approx. 8 ft  
Safe-Climbing Device: none  
Safety Cage:  
    Depth: 26-1/2 in.  
    Width: 26-1/2 in.  
    Vertical Bars:  
        Size: 1 in. x 1/4 in., flat bar  
        Spacing: 9-1/2 in.  
    Horizontal Bars:  
        Size: 2 in. x 1/4 in., flat bar  
        Spacing: 31-1/4 in.  
Vandal Deterrent:  
    Type: hinged door at bottom of cage  
    Size: 29 in. x 36 in. x 1/8 in. thick  
    Locked: yes

**ROOF SAFETY RAILING:**

**Handrail:**

Height: 42-1/2 in. to 43 in.

Size: 1-5/8 in. diameter and 1-7/8 in. diameter

Uprights: 1-5/8 in. diameter and 1-7/8 in. diameter

Mid-Rail: 1-5/8 in. diameter and 2-1/2 in. x 3/16 in., flat bar

Toe Bar: 4 in. x 1/4 in., flat bar

**Access Openings:**

Number: 2

Widths: 21-1/2 in. and 31-1/2 in.

Closure Chains: yes

**ROOF OPENINGS:**

**Manhole:**

Size: 24 in. square

Type: hinged

Curb: 6 in. x 3/16 in.

Welded: exterior only

Overlap: 2 in. x 3/16 in.

Locked: no

**Roof Vent:**

Type: mushroom cover

Neck Height: 5-1/2 in.

Neck Diameter: 24 in.

Screen: 16 x 16 mesh

Cover: 36 in. diameter

**EXTERIOR COATING AND METAL CONDITION:**

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Underlying Coating	Rust		Typical	Deepest
Shell	6.7 mils to 15.3 mils	9 mils	Neg.	< 1/2%	3 S	Neg.	Neg.
Roof	6.3 mils to 10.4 mils	7.5 mils	Neg.	< 1/2%	4 S	Neg.	Neg.

Key to Table

Adhesion 5 (very good)  
 4 (good)  
 3 (fair)  
 2 (poor)  
 1 (very poor)  
 0 (very poor)

T = Topcoat to Underlying Coating

S = Primer to Steel

Neg. = negligible

1. **Exterior Coating Condition:** The coating on the exterior of the tank appeared to be in good overall condition and was providing adequate protection from corrosion to most of the underlying steel. The exterior coating exhibited good to fair adhesion to the steel. The coating appeared to be a polyurethane topcoated system.

2. **Bottom Plate:** The tank bottom plate extension appeared to be in fair condition at the time of the field evaluation. Widespread areas of corrosion were observed on the perimeter edge of the bottom plate and areas appeared to have been torch cut. Minor metal loss was observed on the perimeter edge of the bottom plate. (See photos 11, 13)

3. **Shell Condition:** The contour of the tank shell was good with only minor banding and flat spots observed on the shell. The coating appeared to be in good overall condition as only minor areas of coating failure were observed. The coating on the shell had chalked and faded and exhibited fair adhesion to the steel. Chips in the coating from rocks were observed. The shell was equipped with two 1-1/4 in. diameter couplings. Both of the couplings were located on the south side of the shell and one appeared to be for a SCADA system and the other appeared to have been used for a sample tap. A sign was located on shell ring #1 on the south side of the tank. Two other signs were located on the south and southeast side of the tank near the base. The signs were stenciled on the tank and were black. The signs appeared to be in fair condition as they were faded. (See photos 10, 17, 20-25)

4. **Water Level Indicating Device:** A target gage was located on the south side of the shell. The back board for the target gage appeared to be in poor condition as many of the numbers and hash marks had faded. The device appeared to be capable of operating properly at the time of the field evaluation. (See photos 18-19)

5. **Shell Manholes:** The tank was equipped with two flanged and bolted manholes. One of the manholes was circular and was located on the west side of the tank. The flush clean-out manhole was tombstone shaped and was located directly above the bottom plate on the southwest side of the tank. The shell plate around each of the manholes was equipped with a reinforcing plate. The manhole covers were equipped with exterior hinged supports. The cover on the flush clean-out manhole was equipped with a coupling and an exterior ball valve. The bolts on both of the manholes were not equipped with washers. (See photos 14-16)

6. **Exterior Shell Ladder:** There were safety and OSHA deficiencies noted: (1) the 26-1/2 in. depth of the ladder safety cage did not precisely meet the required 27 in. minimum, (2) the 26-1/2 in. width of the ladder safety cage did not precisely meet the required 27 in. minimum, (3) the 9-1/2 in. spacing of the safety cage vertical bars exceeded the maximum allowable spacing of 9 in., and (4) conduit and coaxial cabling were clamped to the ladder brackets. A ladder extended up the shell from near grade to the roof. The ladder terminals flared outward at the roof to provide an access opening for personnel. The ladder was not equipped with a safe-climbing device, but was equipped with a safety cage. The ladder was equipped with brackets which were welded to the ladder and were welded to the shell. The ladder and brackets appeared to be in good overall condition as only minor corrosion was observed. A hinged door vandal deterrent covered the base of the safety cage. The vandal deterrent was locked and appeared to be in adequate condition as only minor corrosion was noted. (See photos 26-29)

7. **Roof Safety Railing:** The roof was equipped with a safety railing at the roof access and surrounding the roof manhole. The safety railing was constructed of welded steel pipe and flat bar members. Only the safety railing along the roof perimeter was equipped with a toe bar. The safety railing appeared to be in good overall condition as no significant corrosion was observed. The access openings in the safety railing were equipped with removable closure chains. An antenna was attached to the west side of the safety railing. (See photos 29-32)

8. **Roof Condition:** The contour of the roof was irregular as peaks and flat areas were noted in the roof. Evidence of ponding was observed. The coating on the roof appeared to be in good overall condition as only minor areas of corrosion were noted. The coating on the roof exhibited good adhesion to the steel. The coating had chalked and faded, and debris was observed in the coating. Rocks were observed on the roof. (See photos 30, 33-36)

9. **Roof Manhole:** ~~There were safety-related, sanitary, AWWA, and operational deficiencies noted:~~ (1) the manhole cover was not locked, and (2) the roof was equipped with only one manhole. The roof was equipped with one manhole. The manhole was located on the south side of the tank and was equipped with a hinged cover. The roof manhole was not locked prior to or after this evaluation. The roof manhole was welded on the exterior only. (See photo 37)

10. **Roof Vent:** ~~There were sanitary and operational deficiencies noted:~~ (1) the roof vent was not of a clog-resistant design, and (2) the vent screening was not restrictive enough as gaps up to 1/2 in. were observed. The roof was equipped with a vent in the approximate center of the roof. The vent was bolted to a flanged opening. The roof vent appeared to be in poor condition as significant corrosion and metal loss were observed. The screening on the roof vent did not appear restrictive enough to prevent the ingress of insects into the tank as large gaps were observed. (See photos 32, 38-40)

### C. Interior Surfaces

#### ROOF SUPPORT SYSTEM:

##### Main Rafters:

Number: 43

Size: 12 in. x 4 in., I-beam

##### Shell Bracket:

Size: 4-1/2 in. x 11 in, flat bar x 3/8 in. thick

##### Bolts:

Number: 3 per bracket

Size: 3/4 in. diameter

##### Purlins:

Number: 43

Size: 7/8 in. diameter

Center Hub: approx. 6 ft diameter x 2 in. thick plate

##### Center Column:

Type: 8 in. diameter pipe

Base: 93 in. square x 1-1/2 in. thick plate

#### TOP SHELL ANGLE:

Size: 3 in. x 3 in. x 3/8 in.

Orientation: leg in

INTERIOR CONTAINER LADDER:

Number of Rungs: 24  
Width: 16 in.  
Rung Size: 3/4 in. diameter  
Spacing: 12 in. on center  
Side Rails: 2-1/2 in. x 3/8 in., flat bar  
Toe Room: 8-1/4 in.  
Head Clearance: 19 in.  
Brackets:  
    Construction: welded  
    Size: 2-1/2 in. x 3/8 in., flat bar  
    Spacing: approx. 7 ft 4 in.  
Safe-Climbing Device: notched-tubular rail

OVERFLOW PIPE:

Size: 12 in. diameter  
Visible Air Break: no  
Brackets:  
    Type: tandem  
    Size: 3 in. x 3 in. x 1/4 in., angle  
    Spacing: approx. 10 ft  
Inlet Type: open pipe  
Inlet Location: 24 in. below the roof-to-shell connection

CATHODIC PROTECTION:

Anodes:  
    Type: suspended wire  
    Number: 14  
Manufacturer: RTS  
Model Number: TASCA 20-05  
Serial Number: C-9900779  
Reference Electrode: adjacent to ladder

INTERIOR PIPING:

Inlet Pipe:  
    Size: 16 in. diameter  
    Projection: 7 ft 2 in. above floor  
Brackets:  
    Number: 1 set  
    Size: 3 in. x 3 in. x 1/4 in., angle  
Protective Cover: none

Outlet Pipe

Size: 16 in. diameter  
 Projection: 2 in. above floor  
 Protective Cover:  
     Size: 28 in. diameter  
     Removable: yes  
 Mud Ring:  
     Size: 24 in. diameter x 6 in. tall x 1/4 in. thick  
     Removable: yes

Drain Pipe:

Size: 16 in. diameter  
 Projection: 1/2 in. above floor  
 Protective Cover:  
     Size: 28 in. diameter  
     Removable: yes  
 Mud Ring:  
     Size: 24 in. diameter x 6 in. tall x 1/4 in. thick  
     Removable: yes

INTERIOR COATING AND METAL CONDITION:

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Primer	Rust		Typical	Deepest
Roof	7.1 mils to 11.2 mils	9 mils	Neg.	5%	4 S	Neg.	< 1/32 in.
Shell	11.4 mils to 22 mils	16.5 mils	Neg.	2%	2 S	Neg.	< 1/32 in.
Floor	9.2 mils to 19.5 mils	13 mils	Neg.	3%	2 S	1/32 in.	3/16 in.

Key to Table

Adhesion    5 (very good)    T = Topcoat to Underlying Coating    Neg. = negligible  
               4 (good)  
               3 (fair)            S = Primer to Steel  
               2 (poor)  
               1 (very poor)  
               0 (very poor)

1. **Interior Coating Condition:** The coating on the interior surfaces of the tank appeared to be in very poor condition. Significant corrosion and metal loss were observed on the interior surfaces. The coating exhibited good to poor adhesion to the steel.

2. **Roof Condition:** There were structural deficiencies noted: (1) significant corrosion was noted on the rafters, and (2) the rafters were bowed and twisted. The coating on the roof plates and roof support structure appeared to be in very poor condition. Significant corrosion and metal loss were observed on the roof rafters and center hub. The coating exhibited good adhesion to the steel. The roof support structure consisted of radial rafters, purlins, a center hub, and a center column. The roof rafters extended out from the center of the tank to the shell. The purlins were located approximately half way between the center of the tank and the shell and extended between the main rafters. The center hub was located below the roof vent and consisted of a large circular plate. The center hub was supported by the center column. Significant metal loss was noted on the rafter

ends and flanges. Many of the rafters had twisted or bowed while some of the rafters appeared to have shifted. Significant corrosion and metal loss was observed on the rafter-to-shell bracket and bolts. Wiring for a cathodic protection system was located in the roof of the tank. (See photos 41-51)

3. **Shell Condition:** The coating on the shell interior appeared to be in poor overall condition and had poor adhesion to the steel. The upper surfaces of the shell had been stained from mineral staining in the water. Blistering was widespread over the shell surfaces and appeared to be a result of solvent entrapment. Corrosion and metal loss were observed on the shell. Metal loss measurements taken during this evaluation indicated the deepest pit found measured approximately 1/32 in. deep. A top shell angle was located around the roof-to-shell connection. (See photos 45, 54)

4. **Water Level Indicating Device:** A float and guide wires for the water level indicating device were located on the inside of the tank adjacent to the shell ladder. The device appeared to be capable of operating properly at the time of the field evaluation. (See photo 64)

5. **Interior Container Ladder:** There were safety and OSHA deficiencies noted: **(1) the 19 in. head clearance did not meet the required 30 in. minimum, and (2) severe corrosion and metal loss was observed on the ladder brackets and rungs.** A ladder extended from the roof manhole down to the floor. The ladder was equipped with a galvanized notched-tubular rail safe-climbing device. The interior container ladder was welded to brackets which were welded to the shell. The interior container ladder and brackets appeared to be in poor condition as significant corrosion and metal loss were noted. **It is the opinion of Tank Industry Consultants that the interior container ladder should not be used for personnel access.** (See photos 56-57)

6. **Overflow Pipe:** There were sanitary and operational deficiencies noted: **(1) the overflow pipe was located on the interior of the tank, and (2) the overflow pipe was not equipped with an above ground air break.** The overflow pipe was located on the interior of the tank and appeared to be in adequate condition. The overflow pipe was equipped with one set of tandem angle brackets which were welded to the pipe and shell. The overflow pipe was equipped with an open pipe inlet. The location of the overflow inlet was such that the top capacity level was below the shell-to-roof connection. (See photos 52-53, 55)

7. **Bottom Plate Condition:** The coating on the tank bottom appeared to be in poor overall condition. The bottom plate coating exhibited poor adhesion to the steel. Corrosion and metal loss were observed on the bottom plate. Densely clustered blistering was observed. Spot coating failures had resulted in corrosion and pit depths of up to 3/16 in., and pit depth measurements of 1/32 in. were typical. (See photos 58-61)

8. **Interior Piping:** The tank was equipped with an inlet pipe, and outlet pipe, and a drain pipe. The inlet pipe extended approximately 7 ft above the floor and was equipped with one set of tandem angle brackets. The outlet pipe projected approximately two inches above the floor and was equipped with a protective cover and removable mud guard. The drain pipe projected approximately 1/2 in. above the floor and was equipped with a removable protective cover and removable mud guard. (See photos 62-63)

9. **Cathodic Protection:** The tank was equipped with a cathodic protection system. The system consisted suspended wire anodes. The cathodic protection anode system was supported from the roof of the tank. The wiring appeared to be intact. It did not appear that the system was operating

properly as areas of corrosion and metal loss were observed. The location of a reference electrode was adjacent to the ladder. (See photos 42-43)

## **RECOMMENDATIONS:**

### **A. Foundation and Site**

1. **Site Maintenance:** The areas between the shell and retaining ring should be filled with sand and should be monitored for further erosion. The vegetation growing between the bottom plate and the retaining ring should be removed. The gate should continue to be locked at all times to deter unauthorized entry and limit liability for the Owner. Caution should be used when working around the high voltage equipment on site.

2. **Tank and Site Security:** Water tanks have been defined by some courts under certain circumstances as attractive nuisances. As such, there may be a significant potential liability to the Owner for injury to persons on the tank and tank site, even if access is not authorized. Recent events have prompted the entire water industry to consider measures that inhibit intentional acts that could threaten the water supply. A review of the security requirements for the tank and site is recommended to confirm that the existing measures are consistent with the Owner's security requirements for their water system. Primary tank and site security should be focused on eliminating, preventing, and detecting unauthorized access to the tank. Such security measures might include routinely and periodically verifying all manholes and gates are locked. Other security measures might include installing no-trespass signs, installing new site lighting, adding motion detectors on the site, installing surveillance cameras, installing alarms on gates and tank manholes, and arranging more frequent site visits by law enforcement agencies.

### **B. Exterior Surfaces**

1. **Life of the Exterior Coating:** The exterior coating system appeared to be providing good protection to the majority of the steel surfaces. No significant areas of corrosion were noted on the exterior of the tank. Tank Industry Consultants believes that the exterior of the tank should not need to be painted for the next 6 years. However it would be more economical to have the exterior recoated when the interior is recoated. Due to the good to fair adhesion of the existing exterior coating, topcoating appears to be an option. The exterior coating system should be evaluated immediately prior to preparing specifications to determine if the coating adhesion is still adequate to accept a topcoat.

2. **Coating Testing:** Prior to preparation of specifications for the cleaning and coating of the exterior of the tank, samples of the exterior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Cleaning:** When the exterior is to be cleaned, all varieties of containment should be investigated. Containment of the wind-blown debris and paint droplets will be required.

4. **Recommended Coating System:**

a. **Spot Clean and Topcoat:** If the exterior is to be repainted within the next few years, then spot cleaning and topcoating the tank appears to be the recommended option. The typical life of a spot cleaned and topcoated system is approximately 7 to 8 years, but is highly dependent on previous surface preparation and the condition of the underlying coating system.

b. **Coating Application:** The entire exterior surfaces of the tank should be high-pressure washed to remove chalked coating, mildew, and contaminants. After washing, the damaged and rusted areas should be spot cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning, or SSPC-SP 11, Power Tool Cleaning to Bare Metal. All areas of excessive coating thickness and runs in the coating should be cleaned to the equivalent of an SSPC-SP 7, Brush-Off Blast Cleaning, to remove the excessive mils. The spot cleaned areas should receive a spot prime coat compatible with the present coating system. The entire exterior surfaces should then be intermediate coated and topcoated with a compatible coating system.

5. **Alternative Coating System:**

a. **Complete Cleaning and Repainting:** The optimum long-life coating system presently available for this site is an epoxy-polyurethane coating system. Properly formulated and applied polyurethanes have good resistance to condensation, mildew, and chipping. The polyurethanes also have excellent color and gloss retention and the longest expected service life of any of the common exterior tank coatings. The typical life of a properly applied epoxy-polyurethane coating system is approximately 15 to 20 years. These coatings are also presently manufactured to meet current VOC requirements.

b. **Coating Application:** The entire tank exterior should be cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning and have an epoxy-primed, epoxy intermediate and polyurethane finish coating system applied. However, care must be taken during the application of this particular coating system because this coating does have poor dry-fall characteristics, and potential damage to the surrounding property must be taken into consideration. The polyurethane coatings also require close monitoring of temperature and humidity during application.

6. **Effective Service Life:** Tank Industry Consultants defines the life of a coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the coating life the Owner should expect the coating to lose its gloss, start to chalk, show signs of weathering, and possibly some rust staining. Future touch-up may be required on isolated coating failures. If aesthetics are a concern, the Owner may have to topcoat the repainted tank prior to the end of the expected service life. However, future topcoating would be less expensive than complete cleaning and recoating and could delay the next complete cleaning and repainting for many years.

7. **Other Systems:** With air emission volatile organic compounds (VOC) restrictions being put in place around the nation, alternative coating systems may become available which would be viable options for this tank. The Owner should review the available systems prior to preparing specifications for the recoating project.

8. **Coating Curing:** It would be more economical to paint the tank exterior at the same time the interior is painted, since the tank must be drained while the exterior is painted, and the applied coatings cure. This will also reduce mobilization and observation costs.

9. **Rehabilitation Schedule:** To obtain the lowest possible prices for the work outlined in the recommendations, the Owner should have the specifications prepared and the work bid in the early fall, with the work scheduled to start in early winter.

10. **Grinding and Bracket Removal:** Any unused brackets or erection lugs should be removed prior to the exterior repainting. Any weld burrs, weld spatter, or erection scars should be ground off to provide a smooth surface for the application of the coating.

11. **Nameplate:** The tank nameplate should be removed for the cleaning and coating of the tank. The nameplate should be cleaned and reattached to the tank using the existing bracket.

12. **Electrical Apparatus:** All unused electrical conduit, antennas, fixtures, electrical metering equipment, cathodic protection apparatus, and control cabinets should be removed from the tank and tank site. All required equipment should be repaired and maintained in accordance with the National Electric Code (NEC).

13. **Existing Shell Manholes:** At the time of recoating and repairs, the gaskets for the shell manholes should be replaced. The bolts should be equipped with washers.

14. **Additional Shell Manhole:** The tank should be equipped with a second hinged shell manhole. The additional manhole and cover should be 30 in. in diameter, should be designed in accordance with current industry and safety standards, should be hinged, and should be located approximately 180 degrees from the existing 24 in. diameter shell manhole.

15. **Exterior Ladder:** The exterior ladder should be equipped with a safe-climbing device. To reduce cleaning and painting costs and future maintenance costs and because the existing safety cage was not OSHA compliant, the cage could be removed. The conduit should be relocated away from the ladder.

16. **Vandal Deterrent:** The addition of a more restrictive a vandal deterrent with side plates on both sides of the ladder would offer the Owner further protection from unauthorized access to the ladder and tank. A new vandal deterrent will be needed when the safety cage is removed.

17. **Clog-Resistant Vent:** The tank was not equipped with a clog-resistant vent. AWWA Standards recommend that all vents with screening against insects be designed to ensure "fail-safe" operation if the insect screens become occluded. Inadequate ventilation could cause a tank collapse if the tank is rapidly drained while the screen is occluded or frosted over. Therefore, a clog-resistant vent should be installed near the center of the roof. The vent should be designed so that it is removable in order to be able to properly access the interior roof structure ends for evaluation, repairing and recoating. Until such time as the vent can be replaced, a more restrictive screen should be installed immediately.

18. **Additional Roof Manhole:** OSHA and safety-related standards require a second roof manhole for emergency egress during coating and repairing operations. Therefore, a second roof manhole should be installed in the roof. The manhole and cover should be designed in accordance

with current industry and safety standards. The new roof manhole should be installed between roof structure to allow unrestricted use of the manhole. Both the new and the existing roof manholes should be locked at all times to prevent unauthorized access to the tank interior.

19. **Existing Roof Manhole:** The existing roof manhole should be equipped with a lock to prevent unauthorized access to the interior of the tank.

20. **Cathodic Protection Hand Holes:** All cathodic protection hand holes should have the covers repositioned and new gaskets installed. If a hanging anode system will not be used in the future, then the openings should be covered with welded steel patch plates when repainting the tank.

### C. Interior Surfaces

1. **Life of the Interior Coating:** The interior coating system appeared to be in generally very poor condition and not providing adequate corrosion protection. Significant metal loss was observed on the rafters which had led to deformation of the rafters. The rafters should be replaced as soon as possible, and additional bracing may be required. **Tank Industry Consultants recommends that personnel not enter the tank until the rafters have been replaced.** Tank Industry Consultants recommends that the interior surfaces be recoated within the next 6 months. It is recommended that when the interior is completely cleaned and repainted, an epoxy coating system should be used.

2. **Coating Testing:** Prior to preparation of specifications for the cleaning and coating of the interior of the tank, samples of the interior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

#### 3. **Recommended Interior Coating System:**

a. **Epoxy Coating System:** The optimum long-life coating system presently available for the interior of water tanks is a two-component epoxy coating system. A three-coat epoxy system is recommended for the interior of this tank. This coating system should meet the certification criteria of ANSI/NSF 61 and state department of health regulations.

b. **Coating Application:** When the interior is to be repainted, the entire tank interior should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied.

c. **Service Life:** The typical life of a properly formulated and applied epoxy coating system is approximately 12 to 15 years in immersion service. Tank Industry Consultants defines the life of a coating as the expected service life before repainting becomes necessary due to coating failure and corrosion. The Owner could extend the service life of the coating by installing, properly maintaining and operating a cathodic protection system to help protect the steel surfaces in areas which have experienced coating failure.

4. **Cathodic Protection:** When the tank is rehabilitated the brackets and fittings should be repaired or replaced if necessary.

5. **Pit Welding and Pit Filling:** After initial cleaning, all significant pitting which is found should be welded, and all pitting with rough edges that would make the pitting difficult to coat properly should be filled with a solventless epoxy seam sealer. (It was estimated that approximately 2 gallons of seam sealer will be required for pit repair.)

6. **Seam Sealing:** The existing roof manhole and existing roof vent intersections should be sealed with an epoxy seam sealer at the time of the interior recoating.

7. **Flexible Sealant:** The unwelded lapped roof seams should be sealed with a flexible sealant at the time of the interior recoating.

8. **Rough Edges:** All unused brackets should be removed from the interior and exterior surfaces at the time of the next recoating. Any weld burrs, spatter, scars or rough edges in the steel should be ground smooth to provide a better surface for coating. (It was estimated that approximately 50 man-hours of grinding will be required on the interior of the tank.)

9. **Overflow Pipe:** Overflow pipes on the interior of tanks are exposed to the potential of accelerated corrosion and metal loss rates. This results in the potential of pipe damage and an unanticipated tank draining. Additionally, overflow pipes without visible air breaks allow for a potential cross-connection. Therefore, Tank Industry Consultants and the AWWA Standard D100 recommend relocating the pipe to the tank exterior. The overflow pipe should exit the top shell ring and extend to approximately 24 in. above grade attached to the shell by welded steel brackets. The overflow pipe discharge should be equipped with a screened, counter-weighted flap gate or elastomeric check valve to prevent the ingress of birds, small animals and insects into the tank. The air break should be adequately sized to allow the proper functioning of the new flap gate. The overflow effluent should be directed away from the foundation using a concrete splash block, or if the Owner wants to continue to use the current underground piping, the vertical portion of the underground piping should be equipped with an air break and a large funnel to direct the overflow effluent into the pipe.

10. **Interior Ladder:** Interior ladders may be susceptible to accelerated rates of corrosion. If the Owner decides to keep the interior ladder, the ladder should be replaced by a ladder which complies with current industry standards and should be equipped with a corrosion-resistant safe-climbing device. A deflector plate should be installed at the roof manhole to eliminate the head hazard due to the limited head clearance.

11. **Roof Support Structure:** After abrasive blast cleaning, the roof support structure should be carefully evaluated as metal loss repairs may be necessary at areas where the metal loss was not previously visible. Due to the distortion and metal loss present, the roof rafters should be replaced as soon as possible. Additional purlins may be required to prevent future bowing and twisting.

**ECONOMIC FACTORS:**

<u>Item</u>	<u>Cost</u>	<u>Life in Years</u>
Replacement of tank with a new one	\$ 1,250,000 <sup>1</sup>	75+

The following is a complete list of repairs and estimated costs for their respective recommendations found in the RECOMMENDATION section of this report.

<u>Item</u>	<u>Sanitary &amp; Safety</u>	<u>Scheduled Maintenance Repairs</u>
Clean and Paint Exterior:		
Spot Repair and Topcoat		\$ 100,000
Containment		80,000
SP 6, Complete Clean, Epoxy/Polyurethane System		150,000
Containment		100,000
Clean and Paint Interior:		
SP 10, 3-Coat Epoxy System		260,000
Miscellaneous Chipping and Grinding		10,000
Seam Sealing		5,000
Pit Repair		6,000
Install Exterior Ladder Safe-Climbing Device	\$ 1,000	
Install New Vandal Deterrent	2,000	
Install Additional Shell Manhole	8,000	
Replace Interior Ladder	4,000	
Replace Interior Ladder Safe-Climbing Device	1,000	
Overflow Relocation and Install Elastomeric Check Valve	8,000	
Install Additional Roof Manhole	6,000	
Install Clog-Resistant Vent	8,000	
Roof Rafter Replacement and Repair Contingency	150,000	
Contingency Items	10,000	12,000

Estimates are believed to be a high average of bids that would be received in 2015.

<sup>1</sup> The replacement estimate includes costs associated with new tank fabrication and erection, foundation, painting, and engineering. The budget estimate given does not include costs associated with tank demolition, site acquisition, and distribution interruptions.

The following economic factors include only those work items that the Engineer believes to be the minimum to properly maintain this tank from an operational standpoint. Other items related to safety and risk management should be evaluated by the Owner.

Item	Cost
Clean and Paint Exterior:	
Spot Repair and Topcoat	\$ 100,000
Containment	80,000
Clean and Paint Interior:	
SP 10, 3-Coat Epoxy System	260,000
Miscellaneous Chipping and Grinding	10,000
Seam Sealing	5,000
Pit Repair	6,000
Install Exterior Ladder Safe-Climbing Device	1,000
Install New Vandal Deterrent	2,000
Install Additional Shell Manhole	8,000
Replace Interior Ladder	4,000
Replace Interior Ladder Safe-Climbing Device	1,000
Overflow Relocation and Install Elastomeric Check Valve	8,000
Install Additional Roof Manhole	6,000
Install Clog-Resistant Vent	8,000
Roof Rafter Replacement and Repair Contingency	150,000
Contingency Items	15,000
<b>Total of Engineer's Recommendations</b>	<b>\$ 664,000</b>

Tank Industry Consultants has no control over the cost of labor, materials, or equipment, or over the contractors' methods of determining prices, or over competitive bidding, or the market conditions. Opinions of probable cost, as provided for herein, are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the design, maintenance, and construction of concrete and steel plate structures. However, Tank Industry Consultants cannot and does not guarantee that proposals, bids, or the construction cost will not vary from opinions of probable cost prepared for the Owner.

Due to the numerous potential scopes of work which exist, the Owner should obtain an updated budget estimate once the final scope of work has been determined. This would enable the Owner to accurately budget monies for additional mobilization costs and damaged coating rehabilitation costs.

Engineering and resident observation costs are not included in the Total of the Engineer's Recommendations because these fees are dependent upon the scope of work to be performed. Tank Industry Consultants performs all facets of the engineering services which would be required for this project. Estimated fees for engineering and resident observation will be furnished upon request.

## **CLOSURE:**

**Brief Summation:** Lake Havasu City owns and operates a 1,000,000 gallon ground storage tank in Lake Havasu City, Arizona. The exterior of the tank was in good overall condition with only minor

corrosion and spot failures noted. The interior surfaces were in very poor condition with significant corrosion and metal loss noted on the roof rafters. Many of the roof rafters were twisted, bowed, and sagged from the metal loss. The rafters should be replaced as soon as possible. Tank Industry Consultants recommends that the interior of the tank be recoated in the next 6 months. It would be more economical to spot clean and topcoat the exterior of the tank at the time of the interior recoating. **Tank Industry Consultants recommends that personnel not enter the tank until the rafters have been replaced.** Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 to 5 years in accordance with AWWA recommendations, and the installation and proper maintenance of a new ice-resistant cathodic protection system with long-life anodes.

**Contractor Selection:** The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

**Standards for Repairs and Coatings:** All work done and coatings applied should be applied in accordance with NACE, ANSI/NSF Standard 61, the manufacturer's recommendation, AWWA D100 and AWWA D102 (latest revisions), and the SSPC: The Society for Protective Coatings.

**Observation of Work:** Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, Owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

**Anniversary and Maintenance Evaluations:** An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every three years.

**Time Frame:** If the work is not performed within the next 6 months, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

**Specifications and Bidding Documents:** The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the Owner, Contractor, and Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

**Limitations of Evaluation:** It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the Owner and the Engineer.

**Seismic Loadings:** This tank is located in or near a region of moderate to high seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards which have since been replaced by more restrictive standards.

**Hazardous Materials in Coatings:** It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of lead-based and other heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of lead or other particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

Tank Industry Consultants



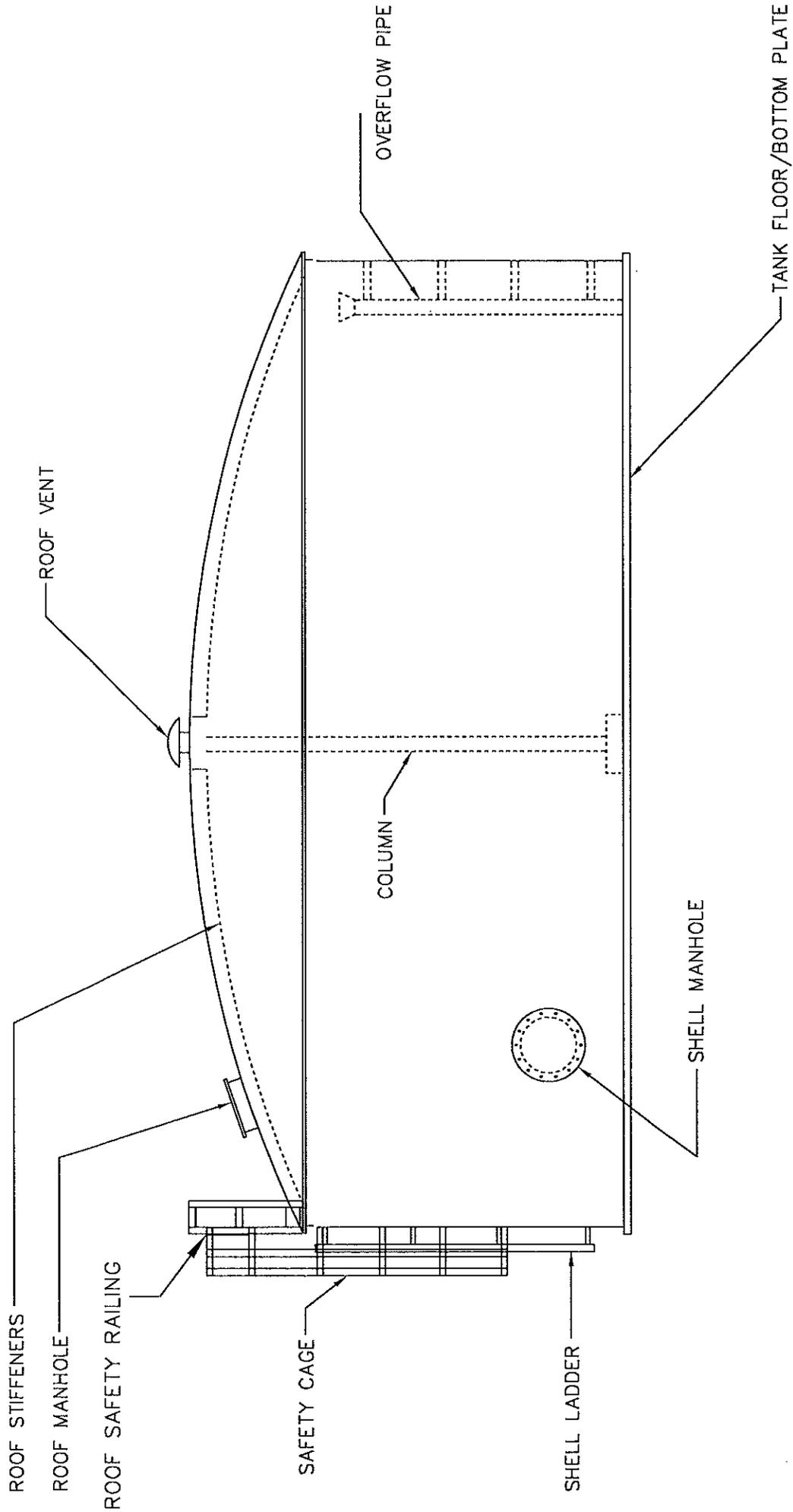
Joshua A. Selig, E.I.  
Project Engineer



Gregory R. "Chip" Stein, P.E.  
Managing Principal



# GROUND STORAGE TANK



## NOMENCLATURE

# Classification of Adhesion Test Results

Method A – X Cut Tape Test Approx. 1.5 in. long cuts at 30 deg. to 45 deg. apart.	Surface	Classification
No peeling or removal.		5
Trace peeling or removal along incisions.		4
Jagged removal along incisions up to 1/16 in. (1.6mm) on either side.		3
Jagged removal along most of incisions up to 1/8 in. (3.2mm) on either side.		2
Removal from most of the area of the X under the tape.		1
Removal beyond the area of the X.		0

Method B – Lattice Cut Tape Test Six parallel cuts at 2mm apart.	Surface	Classification
The edges of the cuts are completely smooth; none of the squares of the lattice are detached.	No Failure	5
Small flakes of the coating are detached at intersections; less than 5% of the lattice is affected.		4
Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.		3
The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.		2
The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.		1
Flaking and detachment worse than grade 1.		0

ASTM 3359 Standard Test Methods for Measuring Adhesion by Tape Test

## Tank Industry Consultants

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Attn:

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**Tank Industry Consultants**  
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**Indianapolis, IN 46214**

4/9/2015

Phone: (317) 271-3100  
Fax: (317) 271-3300

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 4/7/2015. The results are tabulated on the attached data pages for the following client designated project:

**S1580.001**

The reference number for these samples is EMSL Order #161505212. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (317) 803-2997.

Reviewed and Approved By:

---

Doug Wiegand, Laboratory Manager

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

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EMSL Order: 161505212  
 CustomerID: TICO62  
 CustomerPO: 08995  
 ProjectID:

Attn: **Julie Perkins**  
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Phone: (317) 271-3100  
 Fax: (317) 271-3300  
 Received: 04/07/15 3:00 PM  
 Collected: 4/1/2015

Project: S1580.001

**Analytical Results**

**Client Sample Description** 1 **Collected:** 4/1/2015 **Lab ID:** 0001  
 East Shell Exterior

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
3050B/6010C	Cadmium	ND	0.39	mg/Kg	4/8/2015	TD	4/8/2015	TD
3050B/6010C	Chromium	ND	0.97	mg/Kg	4/8/2015	TD	4/8/2015	TD
3050B/6010C	Lead	5.8	0.97	mg/Kg	4/8/2015	TD	4/8/2015	TD

**Client Sample Description** 2 **Collected:** 4/1/2015 **Lab ID:** 0002  
 Interior West Shell

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
3050B/6010C	Cadmium	ND	0.40	mg/Kg	4/8/2015	TD	4/8/2015	TD
3050B/6010C	Chromium	ND	1.0	mg/Kg	4/8/2015	TD	4/8/2015	TD
3050B/6010C	Lead	2.6	1.0	mg/Kg	4/8/2015	TD	4/8/2015	TD

**Definitions:**

ND - indicates that the analyte was not detected at the reporting limit  
 RL - Reporting Limit



1. Overall view of tank.



2. Overall view of tank.



3. View of surrounding area.



4. View of surrounding area.



5. View of surrounding area.



6. View of surrounding area.



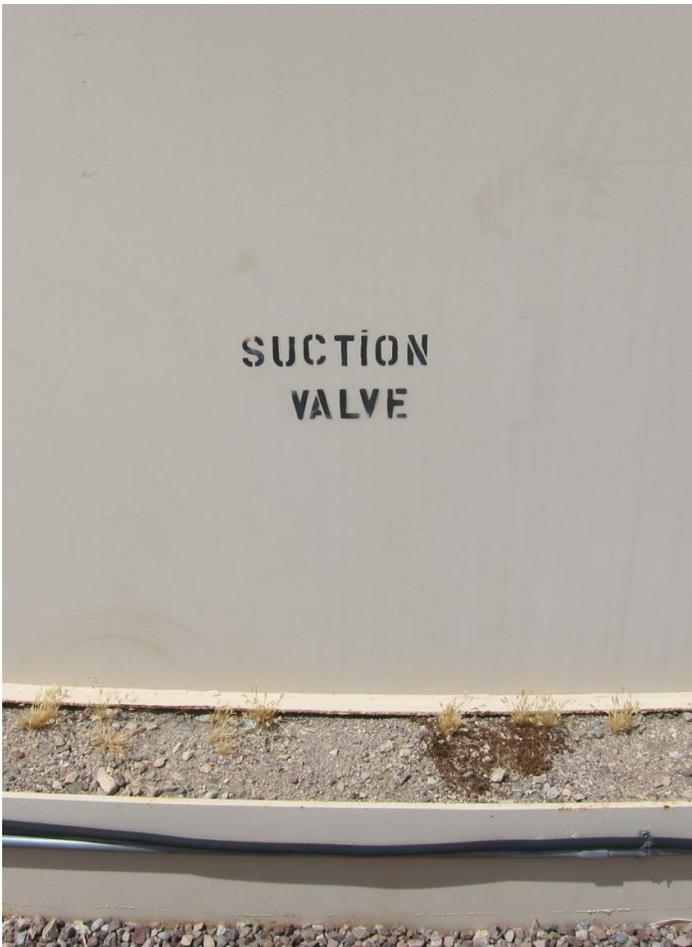
7. Entrance to site.



8. Sign on fence.



9. Electrical cabinet.



10. Sign on shell.



11. Retaining ring and bottom plate.



12. Retaining ring. Note missing sand.



13. Erosion adjacent to bottom plate.



14. Flush cleanout manhole.



15. Hinged manhole cover.



16. Shell manhole.



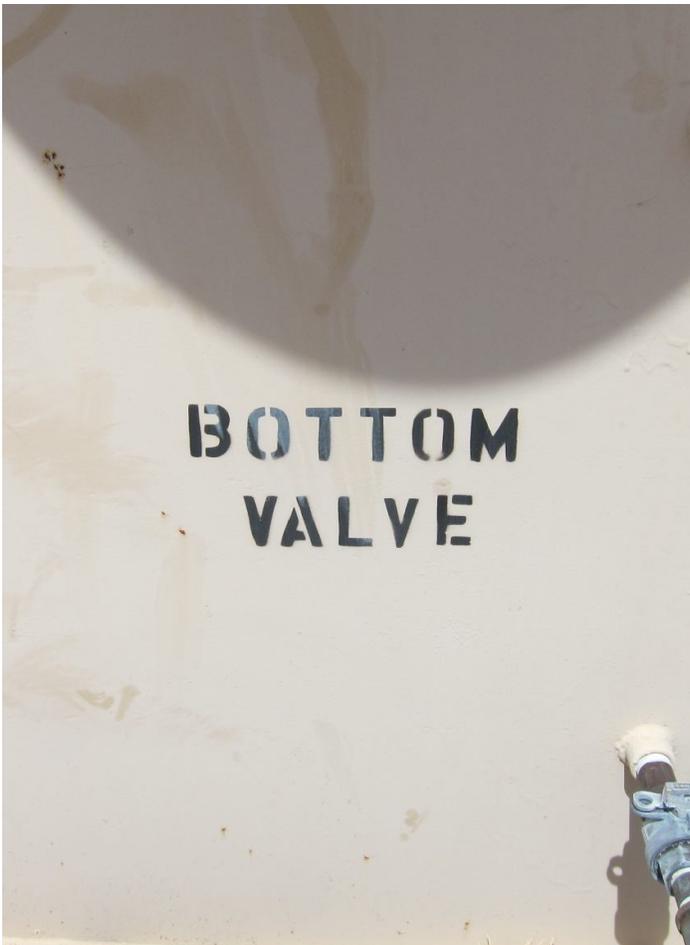
17. Nameplate.



18. Target gage.



19. Target gate back board.



20. Sign on shell.



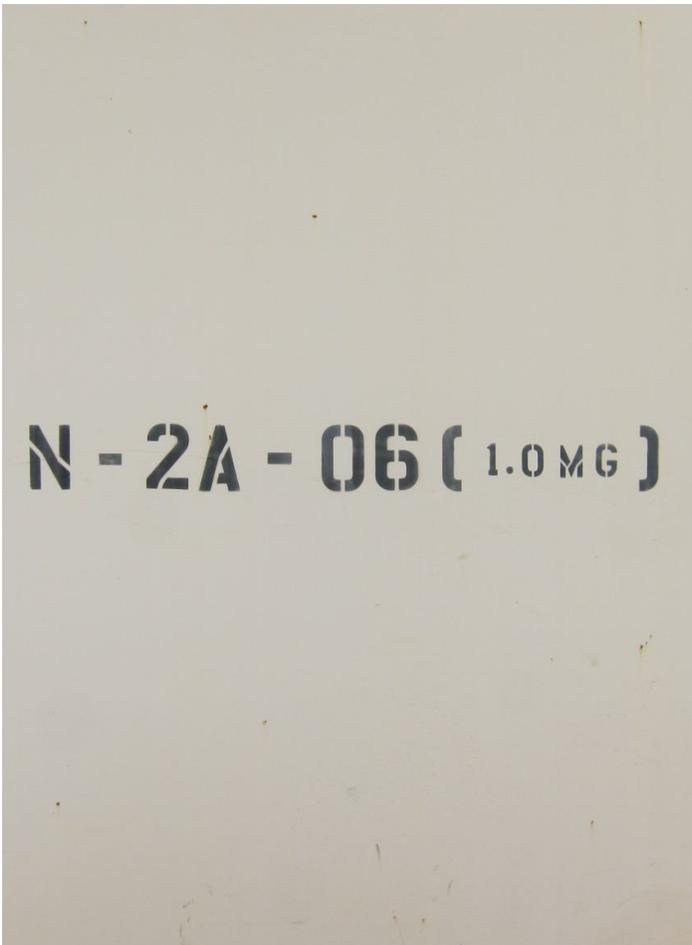
21. Cathodic protection cabinet.



22. Piping on shell.



23. Threaded coupling in shell.



24. Sign on shell.



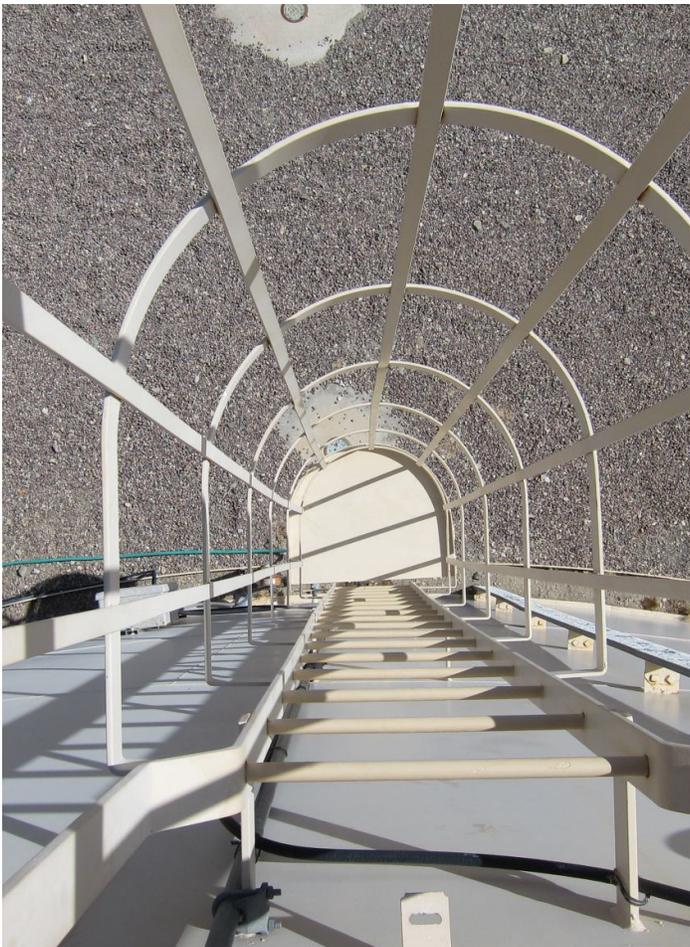
25. Shell.



26. Exterior ladder and safety cage.



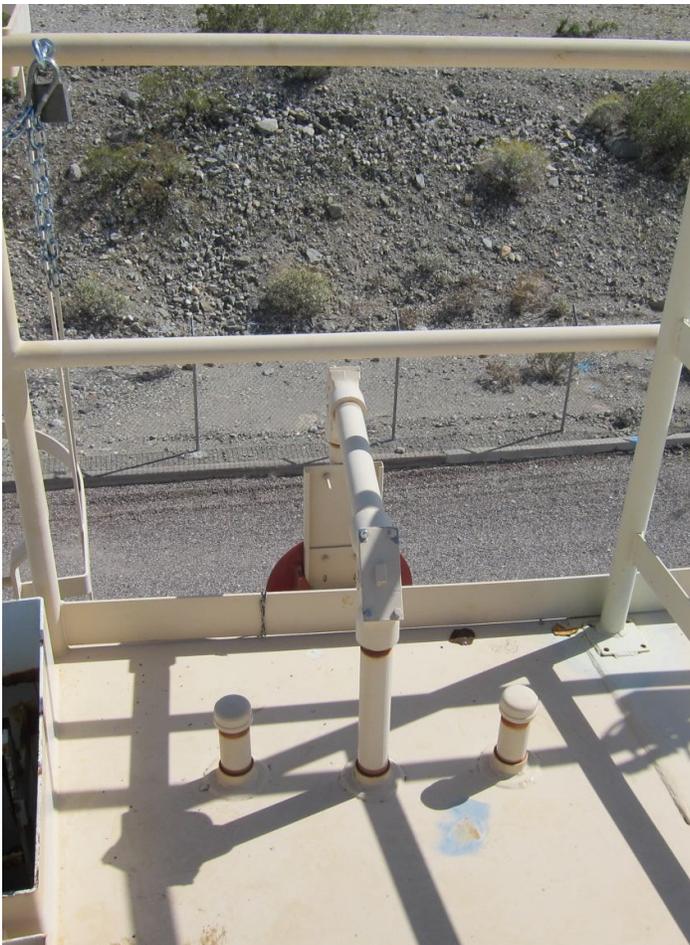
27. Vandal deterrent at base of safety cage.



28. Exterior ladder and safety cage.



29. Safety cage and access opening. Note closure chain.



30. Safety railing and target gage penetrations in roof.



31. Antenna attached to safety railing.



32. Roof safety railing and top of roof vent.



33. Spot failure on roof.



34. Spot failure on roof.



35. Roof.



36. Cathodic protection hand hole in roof.



37. Roof manhole.



38. Roof vent opening.



39. Removed top of roof vent.



40. Screening inside roof vent. Note tears.



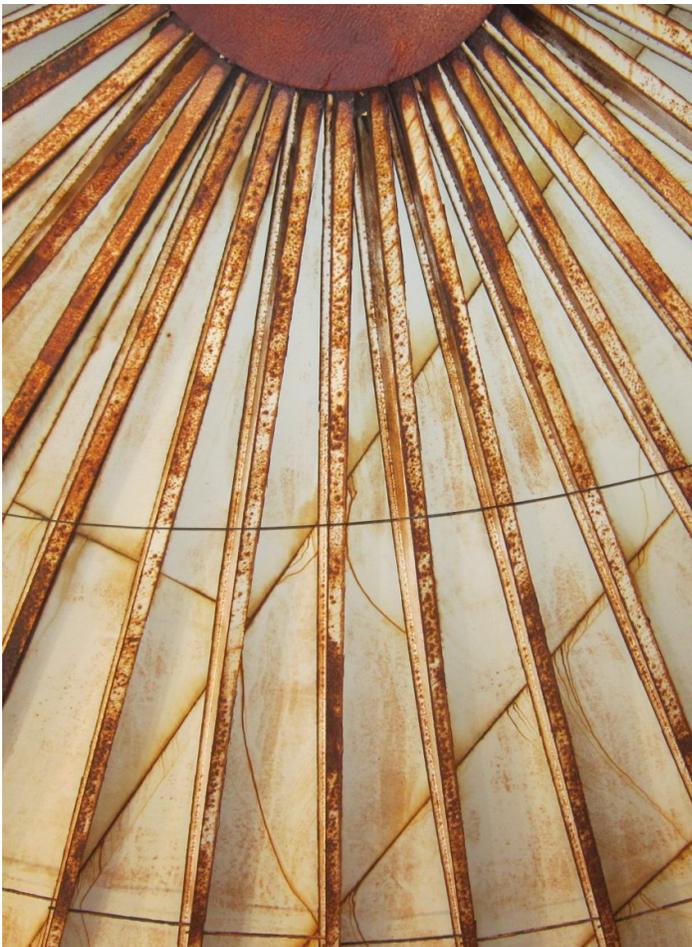
41. Roof support structure.



42. Roof rafters and suspended cathodic protection system. Note corrosion.



43. Roof rafters and suspended cathodic protection system. Note corrosion.



44. Roof rafters. Note corrosion.



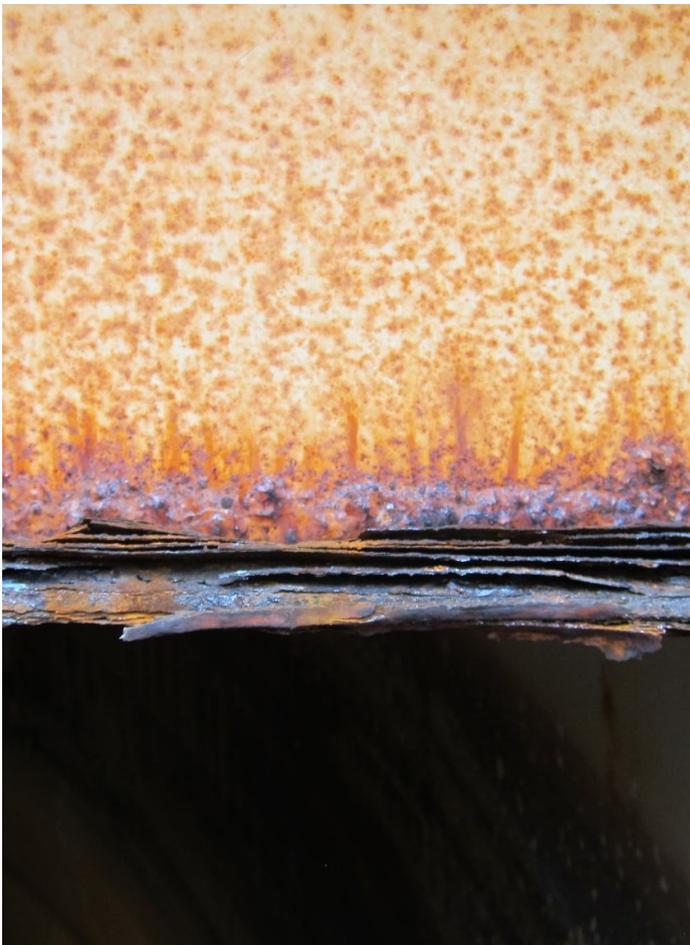
45. Roof rafters, center column, center hub, and shell.



46. Base of center column.



47. Rafter-to-shell connection. Note corrosion and metal loss.



48. Stratified corrosion on rafter flange.



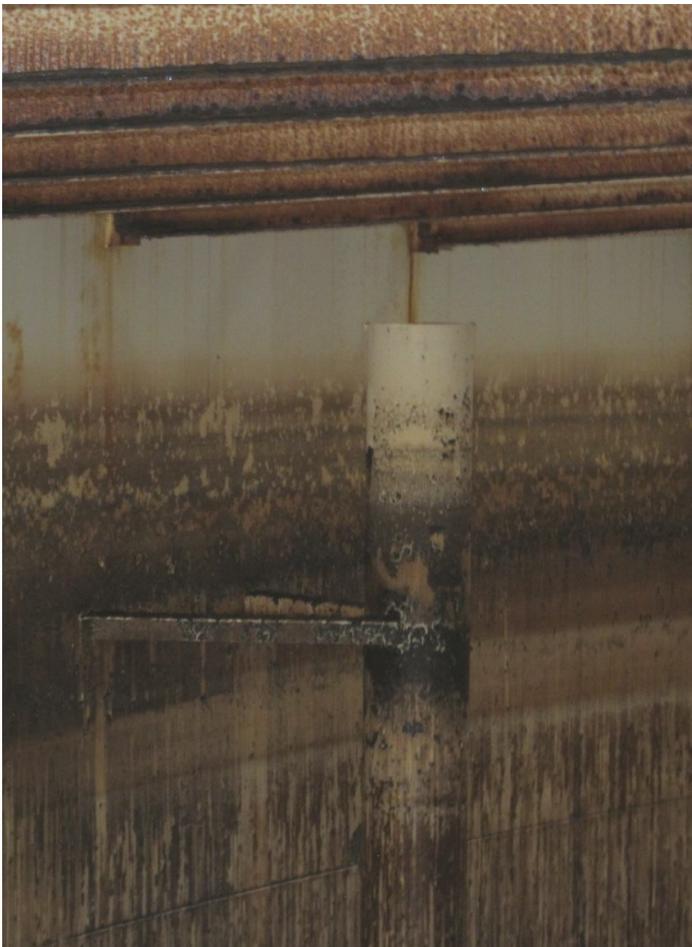
49. Roof rafter. Note corrosion.



50. Metal loss on rafter ends at center hub.



51. Metal loss on rafter ends at center hub.



52. Overflow inlet.



53. Overflow pipe.



54. Shell.



55. Overflow.



56. Interior ladder and safe-climbing device. Note corrosion and metal loss.



57. Interior ladder and safe-climbing device.



58. Floor.



59. Floor.



60. Blistered coating on floor.



61. Corrosion on floor.



62. Inlet pipe.



63. Interior piping.



64. Target gage float and guide wires.

