Enprotec | Hibbs & Todd

January 5, 2026

CITY OF MONAHANS
MAXWELL RESERVOIR ROOF REPLACEMENT

Addendum No. 1

Attention is called to the following modifications to the referenced Plans, Specification and Contract Documents for the referenced project. The City of Monahans will receive sealed Bids for the Maxwell Reservoir Roof Replacement project at Monahans City Hall, located at 112 W. 2nd Street, Monahans, Texas 79756, until 10:00 a.m., local time on **Friday, January 9, 2026**, at which time the sealed Bids received will be publicly opened and read. We hereby modify as follows:

BID DOCUMENTS

1. **REPLACE** all references to the proposed bid opening dates in the Contract Documents from Wednesday, January 7, 2026 with **Friday, January 9, 2026,** at 10:00 a.m.

BID FORM:

1. **ADD Item (B1) Smart Pig Inspection** estimated quantity of 1 LS. This item is being **ADDED** as an additive alternate item. This item is being listed as an individual line item (B1) and shown on Drawing Sheet 7.

CONTRACT:

1. **REPLACE** Specification Section 13205 in its entirety with the attached Specification Section 13205.

Clarifications:

No Lead based paints or hazardous coatings are anticipated on the tank. There is AC Pipe onsite which requires tie ins, any and all compensation for working with AC pipe shall be included in the most practical item.

High tide Contact information is as follows:

- mike.neill@jchinc.com
- jim.bodkin@jchinc.com

Rip Rap shall be TXDOT item 432 Type R approximately 4' wide by 10' long

Chlorine building repairs shall be replacement in kind with the exception of the door. Door shall be replaced with metal hallow core door complete with frame.

Groundwater is not anticipated to be a problem and no major dewatering is anticipated. No calculations have been made for uplift and any groundwater shall be brought to the attention of the Engineer immediately. All lines are anticipated have water and dewatering of lines shall be included in the most applicable line item. As to not create a problem with Tank uplift or subsidence.

Crystalline concrete waterproofing is not intended to be applied to interior of roof or tank.

No exterior ladders are shown or anticipated on the tank as the tank lid is currently flat and buried.

No handrails are anticipated along the new tank roof; however, if new roof design creates a fall hazard, the hazard must be mitigated.

This addendum consists of Twenty-Two (22) pages and becomes a part of the referenced plans, specifications and contract documents and shall be acknowledged by the proposer and attached to the sealed proposal submitted.

By: Eric Lopez, P.E. #155754
Project Manager

1-5-2026

SECTION 13205

GROUND STORAGE TANK ROOFS

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Design, fabrication, and erection of Aluminum Geodesic Dome and Concrete Roofs.

B. Section includes design requirements for Aluminum Geodesic Self – Supporting Roof Structures as well as Column supported Concrete Roofs as described in the Contract Drawings and Documents

C. This section specifies the design qualifications for the Tank Contractor and requirements for the demolition and construction of an AWWA and TCEQ compliant concrete sloped, column supported concrete roof; including all site work, excavation, foundation improvements, reinforcing, concrete work, appurtenances, disinfection, testing, and backfill directly related to the tank roof unless otherwise specified.

D. Singular Responsibility: It is the intent of this specification to require a single party responsibility for the design and construction of the proposed tank roof, associated foundations, and tank rehabilitation. The tank roof design, construction, and rehabilitation work shall be performed by an established Tank Contractor having at least (10) years of experience in the design and construction of AWWA D 110 Type III wire or strand wound prestressed concrete tanks with domes / roofs that meet AWWA, ACI, and TCEQ requirements and those specified herein.

1.2 REFERENCES:

A. ACI 301 Specifications for Structural Concrete.

B. ACI 305 Hot Weather Concreting.

C. ACI 306 Cold Weather Concreting.

D. ACI 309R Guide for Consolidation of Concrete.

E. ACI 318 Building Code Requirements for Reinforced Concrete and Commentary.

F. ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary.

G. ACI 350.3 Seismic Design of Liquid Containing Concrete Structures and Commentary.

H. ACI 372R Design and Construction of Circular Wire- and Strand Wrapped Prestressed Concrete Structures.

I. ACI 506R Guide to Shotcrete.

J. AISC S326--Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

K. ANSI B16.5--Steel Pipe Flanges and Flanged Fittings.

L. ANSI Z49.1--Safety in Welding and Cutting.

M. ASCE 7 Minimum Design Loads for Buildings and Other Structures.

N. ASCE 8-02 Specification for the Design of Cold-Formed Stainless Steel Structural Members.

O. ASTM A6--Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.

P. ASTM A36--Specification for Structural Steel.

Q. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

R. ASTM A136--Specification for Electric-fusion (ARC) - Welded Steel Pipes (Size 4 inch and over).

S. ASTM A416 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.

T. ASTM A475 Standard Specification for Zinc-Coated Steel Wire Strand.

U. ASTM A568--Specification for General Requirements for Steel, Carbon and High-Strength Low-Alloy Hot-Rolled Sheet, Hot-Rolled Strip, and Cold-Rolled Sheet.

V. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

W. ASTM A706/A706M Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

X. ASTM A722/A722M Standard Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete.

Y. ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

Z. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.

AA. ASTM C33 Standard Specification for Concrete Aggregates.

BB. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

CC. ASTM C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

DD. ASTM C509 Standard Specifications for Elastomeric Cellular Preformed Gasket and Sealing Material.

EE. ASTM C618, Type F Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

FF. ASTM C 920 Standard Specification for Elastomeric Joint Sealants.

GG. ASTM C1115-00 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets.

HH. ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete and Shotcrete.

II. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 Ft. – lbf/ft3) 600 KN-M/M3).

JJ. ASTM D1056 Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.

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

LL. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 Ft. – lbf/ft3) 2700 KN-M/M3).

MM. ASTM D2000 Classification System for Rubber Products in Automotive Applications.

NN. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

OO. Aluminum Association Specifications for Aluminum Structures.

PP. Aluminum Association Aluminum Design Manual 2010; Specifications and Guidelines for Aluminum Structures.

QQ. AWS A2.4--Symbols for Welding and Nondestructive Testing Including Brazing.

RR. AWS A3.0--Welding Terms and Definitions Including Terms for Brazing, Soldering, Thermal Spraying, and Thermal Cutting.

SS. AWS A5.1--Specification for Covered Carbon Steel Arc Welding Electrodes.

TT. AWS D1.1--Structural Welding Code-Steel.

UU. ASTM C33--Standard Specification for Concrete Aggregates.

VV. AWWA C652 Standard for Disinfection of Water-Storage Facilities.

WW. AWWA D100-84--AWWA Standard for Welded Steel Tanks for Water Storage.

XX. AWWA D110 Wire and Strand Wound, Circular, Prestressed Concrete Water Tanks.

YY. AWWA D115-06 Tendon Prestressed Concrete Water Tanks.

ZZ. Federal Specifications TT-S-00230C and A-A-59588.

AAA. TID-7024, Dynamic Pressure on Fluid Containers of Nuclear Reactors and Earthquakes.

BBB. Texas Commission on Environmental Quality (TCEQ)--Permanent Rule Adoption of 30 TAC Chapter 290, Rules & Regulations.

CCC. US Army Corps of Engineers Specification CRD-C-572, Specification for PVC Waterstop.

1.3 DESIGN REQUIREMENTS:

A. Wind Load - As required per ASCE 7-16 Chapter 26 but not less than AWWA requirements and as required by local building codes and/or amendments.

1. Importance Factor (Iw) = 1.0 or greater per ASCE 7-16

2. Basic Wind Speeds for Occupancy Category III and IV per ASCE 7-16 Or greater wind speed if specified or as required for local conditions.

3. Exposure Factor = C minimum or D where required.

4. Internal wind pressure coefficient per ASCE 7-16

B. Snow Load: As required per ASCE 7-16 but not less than required by local building codes and/or local amendments.

1. Importance Factor (Is) = 1.1 or greater per ASCE 7-16 for Risk Category III.

2. Exposure Factor (Ce) = 1.0 or greater per ASCE 7-16

3. Thermal Factor (Ct) = 1.2 or greater per ASCE 7-

4. Slope factor (Cs) = ASCE 7-16 or greater.

C. Unbalanced Snow Load – As required per ASCE 7-05 Section 7.6.4 and Figure 7-3 but not less than AWWA D108 Sec. 5.3 and as required by local building codes and/or amendments.

1. Importance Factor (Is) = 1.1 or greater per ASCE 7-16 for Risk Category III.

2. Exposure Factor (Ce) = 1.0 or greater per ASCE 7-.

3. Thermal Factor (Ct) = 1.2 or greater per ASCE 7-16.

4. Slope factor (Cs) = ASCE 7-16 or greater.

D. Load Combinations – As required per ASCE 7-for allowable stress design and Section 2.3.2 factored loads strength design and as required by AWWA D108 Sec. 5.3.

E. Dead Load –The dead load shall be defined as the weight of the structure and all permanently attached to and supported by the structure.

F. Live Load – As required per ASCE 7-16

G. Temperature - The load combinations listed above shall be considered for a temperature change of 50 degrees F below the installation temperature and 50 degrees F above the installation temperature and for a material temperature range of 40 degrees F below 0 to 160 degrees F above zero.

1.4 ALUMINUM ROOFS:

A. The entire roof structure shall be designed to sustain the loads specified herein, with the stress limitations of the Aluminum Association SPECIFICATIONS FOR ALUMINUM STRUCTURES. For members subjected to axial forces and bending moments due to load eccentricity or lateral loads, the combined member stresses shall be determined by adding the stress component due to axial load to the stress components due to bending in both the major and minor axis. In no case shall the dome be designed for any loads less than those specified by the local building code and/or local amendments.

B. The load cases to be considered shall be those described below

1. Panel Design Load - In addition to the above mentioned loads and load combinations, the aluminum panels shall be designed for a 250-pound load distributed over one square foot at any location and a plus or minus 60 psf load distributed over the entire area of any given panel. These loads are to be taken as acting separately from one another and not simultaneously with other design loads.

2. The design of the roof shall be in accordance with the 2010 Aluminum Design Manual (ADM 2010).

C. The roof struts shall be a minimum of 6 inches deep and have a double web. The dome struts shall have sufficient torsional stiffness so as to prevent torsional buckling of the shape when the dome panels are attached. The use of I-beams with only a single web is expressly prohibited.

D. The required strengths of members and connections shall be determined by a non – linear elastic analysis. The analysis shall comply with all provisions of ADM 2010 Section C.2. Use of empirical formulas, linear analysis, or a single step second order analysis shall not be allowed for design of members, connections, or as a check for shell buckling.

1. Flexural, shear, and axial deformations, including all member and connection deformations that contribute to displacements of the structure shall be accounted for in the analysis.

2. The structural model shall include a minimum of three intermediate nodes along each member to account for P-δ effects (the effect of loads acting on the deflected shape of a member between joints or nodes).

3. The structural model shall be modified to account for geometric imperfections. The effect of geometric imperfections on the stability of the structure shall be accounted for by analyzing the structure with the members' points of intersection displaced from their nominal locations. The geometric imperfections used shall cause the greatest destabilizing effect on the structure.

4. Member stiffness reduction due to inelasticity. The effect of member stiffness reduction due to inelasticity on the stability of the structure shall be accounted for by using a reduced stiffness as follows.

   a. A factor τb shall be applied to the flexural stiffness of all members whose flexural stiffness contribute to the stability of the structure, where.

      i. τb, = 1.0 for $\varepsilon * Pr/Py \leq 0.5$
      ii. τb, = 4(Pr/Py) (I- ε*Pr/Py) for a ε*Pr/Py > 0.5 P
      iii. τb, = 4(Pr/Py) (I- ε*Pr/Py) for a ε*Pr/Py > 0.5 P

5. Uncertainty in stiffness and strength shall be addressed by applying a factor of 0.8 to all axial, shear and flexural stiffness in the structure.

6. The effective length factor k of all members shall be taken as 1 to calculate available strength of the members.

E. Snap-Through Buckling (General Shell Buckling) shall be determined in accordance with the following formula.

$$W = \frac{2258 \times 10^6 \sqrt{I_x A}}{(SF) R^2 L}$$

Where:
w = Allowable load [pressure psf].
Ix = Moment of inertia of strut about the strong axis [in4].
A = Cross sectional area of strut [in2].
R = Spherical radius of dome [in].
L = Average member length [in].
SF = Safety factor (1.65)

The allowable buckling pressure shall be compared to the maximum intensities of symmetrical and non symmetrical load conditions.

Alternatively, w shall be determined by a non-linear finite element analysis with a safety factor of 1.95.

In addition to this section requirements, all modeling and design requirements of ADM 2010 must be satisfied.

F. The available strength of members and connections shall be determined in accordance with all provisions of ADM 2010.

1. Available tension strength of members shall comply with ADM 2010 section D. Available tension strength at connections shall be based on the effective area per ADM 2010 section D.3.2, or by testing in accordance with ADM 2010.

2. Available compression strength of members shall comply with ADM 2010 section E.

3. Available flexural strength of members shall comply with ADM 2010 section F.

4. Allowable strength of connections shall comply with ADM 2010 section J. Block shear strength of the connection must meet the requirements of Section J.6.3.

1.5 CONCRETE ROOFS:

A. The existing tanks roofs shall be designed in accordance with the provisions of ACI 350 and AWWA D110 Standard for Wire or Strand Wound Circular Prestressed-Concrete Water Tanks, ACI 350.3, TCEQ, ASCE 7 and IBC.

B. The Tank Contractor shall use the following loadings and requirements in the design calculation.

1. Tank No. 1: 1.5 million gallons (115’-0” Long x 115’-0” Wide x 20’-0” maximum water depth.

2. Dead Load: shall be the estimated weight of all permanent imposed loads. Unit weight of concrete 150 pounds per cubic foot; steel 490 pounds per cubic foot.

3. Roof Live Load 25 psf.

4. Wind Loads Per ASCE 7

5. Minimum Backfill Height Over Footing: 8 ft.

6. Maximum Backfill Height Over Footing: 4 ft.

C. A Geotechnical report has not been provided and foundation load limits needed for a specific design shall be the responsibility of the Engineer of Record (Tank Contractor).

D. The only available, original design drawings have been provided in the plan set This information is for bidding purposes only and Tank Contractor shall be responsible for obtaining all measurements and geotechnical information necessary for final design. Existing drawings shall not be utilized for any loading calculations.

E. For the basis of bid, the assumed allowable bearing capacity for the existing foundation shall be limited to 2,500 PSF and a limit of loading the existing perimeter wall shall be 2,500 pounds per linear foot. The perimeter wall is assumed to be 10" thick for basis of bid. Existing foundation dimensions are unknow but can be roughly scaled from drawing for bidding purposes.

F. Seismic design shall be based on the applicable sections of AWWA D110, ASCE 7 and the local jurisdictional building code. Impulsive and convective forces, as well as fluid spectral velocity shall be calculated utilizing each code and the maximum value of each component shall be utilized.

1. Risk Category: IV

2. Sloshing The sloshing height shall be calculated using AWWA D110 and ASCE 7. If sloshing wave interacts with the roof of the structure, the roof must be designed for the uplift pressures and the confined portion of the convective (sloshing) mass of water must be added to the impulsive force.

G. All exposed exterior surfaces (Walls & Roof) shall be given a protective two – coat finish consisting of one coat of cementitious based damp – proofing product such as "Tamoseal with AKKRO – 7T" or approved equal, and one coat of a non cementitious, high build, 100% acrylic resin polymer such as "Tammscoat H Smooth", textured protective coating TNEMEC TNEME-CRETE 180, or approved equal. All exterior exposed exterior wall surfaces shall be given a two – coat finish of non – cementitious 100% acrylic such as "Tamsmmscoat Smooth" or approved equal. Work shall be performed by personnel skilled in the application of these types of products. The Manufacturer's application instructions shall be submitted to the Engineer prior to beginning coating operations. The Contractor shall confer with the manufacturer's representatives regarding application techniques and shall follow the manufacturer's written instructions implicitly.

H. The concrete surface to be coated must be clean, free of all laitance, dirt, grease, or other foreign materials. All defective surfaces shall be filled and or repaired. Application shall be in full accordance with the manufacturer's

written instructions.

I. The color of the exterior shall be selected by the Owner.

1.6 SUBMITTALS:

A. Submit under provisions of Section 01300.

B. Approval by the Engineer of the drawings and calculations submitted by the Tank Contractor will not in any way relieve the Tank Contractor of full responsibility for the accuracy and completeness of the drawings and calculations.

C. Detailed drawing of the tank and fittings per AWWA D108 or D110ad-latest edition and ACI 350 as applicable and as supplemented by this specification.

1. Before executing any of the work in this section, prints or drawings shall be submitted to the engineer showing dimensions, sizes, thickness, gauges, materials, finishes, joint attachment and erection procedure.

2. A complete set of design calculations for the dome(s) shall also be submitted. These calculations shall be signed by a registered professional engineer. All work shall be fabricated and erected in accordance with the approved drawings.

3. Details of all accessories.

4. Indicate welded joints with A2.0 welding symbols. Indicate size, length and type of each weld.

5. Certification that the specified material alloys, sizes and quantities that have been furnished shall be submitted upon completion of the project.

6. Design proportions for all concrete and shotcrete. Concrete strengths of trial mixes.

7. Admixtures to be used in the concrete or shotcrete and their purpose.

8. Reinforcing steel shop drawings showing fabrication and placement.

9. Catalog cuts or shop drawings of all appurtenances, i.e. hatch, vent, ladders, waterstops.

1.7 QUALITY ASSURANCE:

A. Shop inspection may be conducted by Engineer.

B. Written welding report under AWWA D100 Section 11.2.1 is not required.

C. Inspection of welded joints shall be by the radiographic method.

1. Cost of radiographic testing shall be roof erector's responsibility.
2. Radiographic film shall be the property of the Owner through the Engineer.

1.8 ALUMINUM ROOFS:

A. The dome roof shall be clear-span and self-supporting from the peripheral structure with primary horizontal forces contained by an integral aluminum tension ring (unless otherwise specified). The frame shall consist of aluminum structural members with the joints arrayed on the surface of a sphere. The arrangement of members shall result in a pattern of triangular spaces. These spaces shall be closed with light gauge aluminum panels. The members shall be joined by means of bolting their flanges to aluminum gusset plates.

B. The entire structure shall be designed as a watertight system under all design load and temperature conditions. The design shall include all sealant joints to be tooled slightly concave after sealant is applied to the gusset covers' outside connection. Care shall be taken to keep sealant confined to the joint area, and any outside of the joint shall be removed so that the panels will be free from misplaced sealant. All sealants shall be placed only in a manner as recommended by the sealant manufacturer.

C. The aluminum closure panels shall be attached continuously along their edges to the structural members by means of batten bars, which engage the panels in an interlocking joint. These batten bars shall also secure an elastomeric weatherseal gasket that shall form a continuous watertight seal along the panel edges. The top surface of the batten bars must be flush with the panel surfaces and shall not cause water to pond at the cover joints. Designs that incorporate raised battens, overlapping panels and/or designs that incorporate fasteners which penetrate panels and attach to structural members are expressly prohibited.

D. Connection forces shall be transferred through gusset plates connected to the top and bottom flanges of the beam struts. The connections shall be designed as moment connections; a minimum of four bolts shall be used to connect the gusset plate to each strut flange.

E. The structural analysis shall be performed using non-linear, second order, stiffness analysis models. The structural computer models shall include the effect of geometry irregularities such as dormer openings and perimeter support members. Thermal affects shall be fully accounted for in structural analysis.

F. Fasteners shall be designed with a factor of safety of 2.34 on ultimate strength and 1.65 on yield strength.

G. The design of welded components shall be done in accordance with the Aluminum Structural Welding Code ANSI/AWS D1.2-90.

1.9 CONCRETE ROOFS:

A. The roof shall be a cast-in-place, reinforced concrete, two way sloped slab, supported by columns with drop panels with a minimum thickness of 9 inches.

B. Construction joints shall incorporate a continuous 6 inch horizontal PVC ribbed flatstrip waterstop.

C. The roof shall be supported at the wall by rubber bearing pads allowing free radial movement of the wall and roof including in a seismic event.

D. The design shall provide a weather-tight roof to minimize cracking and to prevent leakage and contamination of the contents. Consideration shall be given for the exposure conditions. Reinforcement of concrete slabs shall also be provided to resist temperature stresses.

E. The roof slope shall be a minimum of ¾" per Foot.

1.10 QUALIFICATIONS:

A. No company is considered qualified unless it has designed and built / installed, in its own name, at least twenty (20) TCEQ compliant tank roofs in the state of Texas in the last 10 Years.

B. The Tank Contractor shall have in its employ a design professional engineer with a minimum of ten (10) years experience and registered in the State of Texas. The design engineer shall have been the engineer of record for a minimum of twenty tanks / roofs meeting TCEQ requirements.

C. Fabricator: Company specializing in and regularly engaged in performing the work of this Section with minimum 10 years experience.

D. Erector: Company specializing in and regularly engaged in performing the work of this Section with minimum 10 years experience.

E. The roof manufacturer must own and operate its own US-based manufacturing facility, and the use of a fabrication facility that is not US-based and/or owned and operated by the cover manufacturer is expressly prohibited. Manufacturers that do not meet these qualifications will not be considered.

F. The roof manufacturer must be ISO 9001 certified for Aluminum Roofs.

G. All concrete roof work shall be performed by a company that specializes in the design and construction of AWWA D110, Type III, and ACI 350 concrete tanks with proven capability of meeting all the requirements of these specifications.

H. Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1. Provide certification that welders employed in work have satisfactorily passed AWS qualification tests.

2. If recertification of welders is required, retesting will be Contractor's responsibility and cost.

I. Design: Shop drawings prepared under the direct supervision of a Structural Engineer.

1. Minimum 10 years experience in design of this work.
2. Licensed in the State of Texas.
3. Affix seal to all submittal sheets.

1.11 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, sleepers, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Do not store materials on structures in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S

A. CST

B. Ultraflote

C. DN Tanks

D. Preload

E. Temcor

F. Conservatek

2.2 MATERIALS:

A. All materials shall be new and alloys shall be as defined by the Aluminum Association and published in the ALUMINUM STANDARDS AND DATA.

B. All metal components of the aluminum roof structure shall be aluminum or 300 series stainless steel. No galvanized, aluminized, painted, or plated steel shall be used anywhere in the dome above the mounting bracket base plates. Dissimilar materials in the supporting structure shall be isolated from the

aluminum dome by means of a compatible elastomeric gasket.

C. Sheets - Sheet material shall be aluminum alloy 3003-H16, 3105-H154, 5052-H32 or 5052-H36; mill finish AA - M10 as fabricated. Minimum thickness shall be 0.05".

D. Plates - Plate material shall be aluminum alloy 6005A-T61 or 6061-T6; mill finish AA - M10 as fabricated. Minimum thickness for gussets shall be 5/16". Free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness.

E. Structural Shapes: Aluminum structural shapes shall be alloy 6005A-T61 or 6061-T6.

F. Miscellaneous Shapes - Miscellaneous aluminum shapes shall be alloy 6005A-T61, 6061-T6 or 6063-T5.

G. Gaskets - All gaskets shall be ozone resistant Silicone or Neoprene only. If Neoprene gaskets are utilized they must be shielded from exposure to ultraviolet light. The gaskets must have a 1/8" minimum thickness.

H. Sealant - All sealants shall be silicone and resistant to ozone and ultraviolet light and conform to Federal Specification TT-S-00230C.

I. Miscellaneous Penetration Seals- All other penetration seals shall be weatherproof rubber seals.

J. Bolts and Fasteners – Threaded fasteners shall be 300 series stainless steel per ASTM F593, Alloy Group 1. Lockbolts shall be 7075-T73 aluminum, 304 or 305 stainless steel. Screws shall be aluminum or 300 series stainless steel.

K. Concrete and shotcrete shall conform to and be proportioned in accordance with ACI 301 and 506 respectively, except as modified herein.

L. Cement shall be Portland cement Type I, Type II or Type I/II.

M. Admixtures, other than air-entraining, superplasticizers, hydration stabilizers, shrinkage reducing and water reducing admixtures will not be permitted unless approved by the Engineer.

N. If air entrainment is utilized, the total volumetric air content of the concrete or shotcrete before placement shall not exceed 8% (±1.5%) as determined by ASTM C173 or ASTM C231.

O. Curing compound to be membrane forming and in accordance with ASTM C309.

P. Concrete shall be cured using water methods, sealing materials, or curing compounds. Curing compounds shall not be used on surfaces to which decorative coatings, mortar, or shotcrete is to be applied. Curing compounds used within the tank shall be suitable for use with potable water.

Q. Concrete for tank wall and roof construction shall have a minimum compressive strength of 4,000 psi at twenty-eight days and a maximum water to cementitious ratio of 0.42.

R. Proportioning for concrete shall be in accordance with ACI 301.

S. All concrete shall have a maximum water soluble chloride ion concentration of 0.06% by weight of cement.

T. Shotcrete shall conform to ACI Standard 506, except as modified herein.

U. All concrete and shotcrete for the tank wall and dome ring shall have a maximum water soluble chloride ion concentration of 0.06% by weight of cementitious. All other concrete which has encased uncoated steel shall have a maximum water soluble chloride ion concentration of 0.1% by weight of cementitious.

V. Polysulfide or polyurethane sealant will be a two or three component elastomeric compound meeting the requirements of ASTM C920. Sealants shall have permanent characteristics of bond to metal surfaces, flexibility, and resistance to extrusion due to hydrostatic pressure. Air cured sealants shall not be used.

W. Bearing pads shall be neoprene or rubber.

1. Neoprene pads shall have a hardness of 40 durometer and shall meet the requirements of ASTM D2000 Line Call-Out M 2 BC 410 A1 4 B14 or M 2 BC 414 A14 C12 F17 for 40 durometer material.

2. Natural rubber bearing pads shall contain only virgin natural polyisoprene as the raw polymer and the physical properties shall comply with ASTM D2000 Line Call-Out M 4 AA 414 A1 3.

3. Neoprene Sponge filler shall be closed-cell neoprene rubber conforming to ASTM D1056, Type 2, Class A, and Grade 1 or 3.

2.3 EQUIPMENT:

A. Flap Valves: Contractor to add to overflow if missing or verify functionality of existing

1. Type: Gravity, hinged and weighted.

2. Fit: No gap over 1/16 inch.

3. Manufacturers: Tank manufacturer's approved standard design, Clow F3012, Troy A2540, or approved equivalent.

B. Level Indicator: Contractor shall reinstall existing level indication equipment that was removed during demolition.

C. Climbing System:

1. OSHA approved for application. System shall consist of a rigid rail system attached to fixed ladder as required by manufacturer. Provide belt, and fall restraint system. Aluminum Roofs to access roof hatches as applicable.

2. Manufacturer: Saf-T-Climb Safety Fall Prevention System, or approved equivalent. Provide two (2) climbing system belts with trolleys.

3. Ladder Cages will not be allowed.

D. Access Ladder:

1. Provide Two (2) aluminum ladder section for access to exterior Hatches (Aluminum Roof to access hatches Only as applicable).

2. Access sections to have hooks for securing to exterior ladder system.

3. Ladder shall allow access from roof edge to hatch.

2.4 FABRICATION:

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

E. Assemble and weld built-up sections by members which will produce true alignment of axes without warp.

F. Seal joined members by continuous welds. Grind exposed welds smooth.

2.5 FINISH:

A. Column footings shall receive a steel trowel finish on the top surface and a form finish on the sides.

B. Columns shall have a form finish.

C. The top surface of the roof shall receive a light broom finish and a form finish on the bottom and edge surfaces.

D. For all formed concrete surfaces, all irregularities that project greater than 1/4" from the surface shall be ground off. All holes greater than 3/4" wide or 1/2" deep should be patched.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

C. Where access to the site by unauthorized persons is outside the Tank Contractor's control, while work is in progress, Tank Contractor shall erect protective fencing.

D. Tank Contractor to conform and enforce all Local and Federal OSHA safety rules and regulations.

3.2 ERECTION:

A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

C. All work shall be executed by skilled mechanics with a supervisor experienced in the erection of domes. The dome shall be erected plumb and level and in proper alignment.

D. 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.

E. Field Assembly: Set structural members accurately to lines and elevations indicated. Align and adjust various members forming part of 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.

F. Level and plumb individual members of structure within specified tolerances.

G. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

H. All gasket materials shall be continuous; splices will not be allowed. All sealants shall be placed only in a manner as recommended by the sealant manufacturer.

I. The installation shall be supervised by a qualified Supervisor who shall stay at the installation site until the installation is complete.

J. The columns and column footings shall be constructed as shown on the approved shop drawings.

K. Concrete in circular tied columns, having no horizontal reinforcing crossing into the region bounded by the vertical reinforcement, may be deposited from the top of the column form such that no separation of the coarse aggregate from the mortar takes place.Roofs over 20,000 sq. ft. in surface area may, at the option of the Tank Contractor, have one or more construction joints. Such construction joints shall be approved by the Engineer prior to placement and include galvanized or epoxy coated reinforcement through joint.

L. The roof and drop panels shall be constructed to the dimensions and slope provided on the approved drawings. Provisions shall be made to ensure proper slope and reinforcing cover.

M. Roof formwork shall not vary from slope shown, more than ¼ inch in 10 feet or ½ inch maximum in 20 feet or more.

3.3 ACCESSORIES:

A. Roof Vents: Gooseneck or roof ventilator per AWWA D108 or D110 as supplemented by this specification, shown on the plans, and in accordance with TCEQ.

1. Equip with corrosion-resistant screens, 16-mesh or finer.

2. Secure screens to withstand winds of not less than tank design criteria.

3. Maximum Fill Rate 4,000 GPM.

4. Maximum Drawdown Rate 4,000 GPM.

B. Roof Openings: In accordance with AWWA D108 or D110 as supplemented by this specification, shown on the plans, and in accordance with TCEQ.

1. Primary roof opening shall not be less than 30 inches in diameter.

2. Secondary roof openings shall not be less than 24 inches in diameter.

3. Provide 4-inch raised curbing with overlapping cover 2 inches, lockable.

4. Openings shall not be less than 30 inches.

C. Access Ladders: Inside tank ladders in accordance with AWWA D110. Comply with applicable OSHA Standards.

1. Install safety system specified in paragraph 2.2.D on exterior ladder.
2. Install roof handrail as shown.

3.4 QUALITY CONTROL:

A. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

B. Testing agency may inspect structural steel at plant before shipment; however, Engineer reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

C. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated are not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to confirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

D. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds.

3. Maintain lay-out sketch of welds and welder performing work.

E. Field Welding: Inspect and test during erection of structural steel as follows:

1. Certify welders and conduct inspection and test as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds.

3. Maintain lay-out sketch of welds and welder performing work.

F. Field inspection will be performed under provisions of Section 01400.

G. Engineer may request retest and recertification of any welder at any time. After retest has been requested, and before retest is successfully completed, welder may not perform welding operations.

3.5 FIELD TESTING:

A. Hydrostatic:

1. Prior to starting the tank rehabilitation and roof replacement work, an initial hydrostatic watertightness test of the existing concrete ground storage tank shall be performed by the Contractor with the City to establish a baseline of any water loss or leakage.

2. The tank shall be filled with potable water to the maximum level allowable and the liquid level measured for 24 hours to determine if any change has occurred.

3. Upon completion of the project, a final hydrostatic watertightness test shall be performed as described in section 3.5, A, 2 above. Water loss shall not exceed the initial baseline water loss originally determined during the baseline test. The intent of the initial test is to quantify any water loss from the tank structure, valves, fittings and pipe connections and validate existing structural integrity.

4. Water required for testing shall be furnished by the Owner at the end of the contract period, and at no charge to the tank erector. Disposal of test water shall be the responsibility of the Contractor.

    a. Cost of water for retesting shall be paid by the Contractor at $10 per 1,000 gallons.

5. Labor and equipment necessary for tank testing is to be included in the price of the tank.

6. For concrete placed in precast panels, a set of three cylinders shall be made for each truck load of concrete placed. For concrete placed in the foundation, dome ring, or dome slots, two sets of five cylinders for the first 50 cubic yards, and one set of five cylinders for every 100 cubic yards thereafter placed in the same day. Two cylinders shall be tested at seven days, two at twenty-eight days, and one held as a spare.

7. Slump, air content and temperature testing shall be performed on each truck where cylinders are taken.

8. All testing shall be in accordance with ASTM C31 and C39 at the expense of the Owner and shall be conducted by an independent testing agency approved by the Engineer Any re – testing shall be at the Contractor's Expense.

3.6 DISINFECTION:

A. The Contractor shall, at the completion of tank construction, thoroughly clean the interior of the tank.

B. The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA C652 Method 3.

C. Prior to placing the tank in service, bacteriological test(s) shall be taken, and successful results received. Testing shall be by an independent testing laboratory at the expense of the owner.

3.7 TANK MANUFACTURER'S WARRANTY:

A. The roof manufacturer shall include a warranty for the roof materials and coating. As a minimum, this warranty shall provide assurance against defects in material or workmanship and corrosion of interior and exterior surfaces for the minimum period specified.

1. Structure – The roof manufacturer shall warrant that the liquid storage roof shall be free from any defect in material or workmanship, under normal and proper use, maintenance and operation, during the period expiring one year after final acceptance by Owner.

2. Roof manufacturer shall replace or repair faulty workmanship or defective material furnished by manufacturer during the period expiring one year after final acceptance by Owner.

3.8 ERECTION TOLERANCES:

A. In accordance with applicable AWWA, ASTM, AWS, and related industry standards.

END OF SECTION