



417-776-2500

## SPECIFICATION

### FACTORY-WELDED STEEL USA TANK FOR DRY BULK SOLIDS STORAGE

#### GENERAL

The Engineer's selection of factory-welded (factory-coated carbon steel) (stainless steel) (aluminum) tank construction for this facility has been predicated upon the design criteria and construction methods specified. Deviations from the specified design and construction details will not be permitted.

#### DRAWINGS AND SPECIFICATIONS

After receipt of order, the Bidder is required to furnish, for the approval of the Engineer, complete specifications and construction drawings for all work shown on the bidding drawings. When approved, one set of such prints will be returned to the Bidder marked *Approved*, and these drawings will then govern the work detailed thereon. The approval by the Engineer of the Contractor's drawings shall be an approval relating only to their general conformity with the bidding drawings and specifications and shall not guarantee detail dimensions and quantities. Construction shall be governed by the Owner's drawings and specifications showing general dimensions and construction details. After approval by the Engineer of detailed drawings prepared by the Bidder, there shall be no deviation from the drawings and specifications except upon written order or approval from the Engineer.

#### QUALIFICATIONS OF BIDDER

The Bidder shall be a specialist in the design and fabrication of factory-welded carbon steel, stainless steel, and aluminum tanks. Bidder shall also submit a list of five comparable tanks now in service in the United States for references.

#### I. General

Owner's name \_\_\_\_\_

Jobsite location \_\_\_\_\_

Product to be stored in tank \_\_\_\_\_

Loose density of product \_\_\_\_\_ lbs./cu. ft.

Maximum compacted density of product \_\_\_\_\_ lbs./cu. ft.

Angle of repose \_\_\_\_\_ degrees

Required working capacity each tank \_\_\_\_\_ cu. ft.

Suggest tank diameter and straight sidewall height \_\_\_\_\_

Quality system conforms to requirements of ISO 9002, Certificate No. QSC- \_\_\_\_\_

Hopper slope (45°) (60°) (Other \_\_\_\_\_ )

Clearance from foundation to hopper discharge \_\_\_\_\_ feet

(Mass flow) (Funnel flow) design loads \_\_\_\_\_

Operating pressure and vacuum \_\_\_\_\_ oz./sq. in.

Dust collector and/or equipment load \_\_\_\_\_ lbs.

Roof live load: \_\_\_\_\_ PSF

Earthquake: Seismic Zone \_\_\_\_\_ per UBC

Wind: mph per ASCE 7-98

## II. Scope

- A. Furnish all material necessary for the tanks and appurtenances as specified hereinafter.
- B. Tanks will be self-supporting for placement on foundation or structures furnished by Owner.
- C. When possible, delivery will be accomplished on specially designed, self-unloading trailers. If tank geometry allows, silos will typically be unloaded by Vendor and left in a horizontal position. Actual transportation equipment will be dictated by tank geometry.
- D. Vertical placement of tanks at jobsite will be by Owner.

## III. Design Criteria

- A. Vendor to quote on the nearest standard size welded tanks of manufacturer.
- B. Standard wind design is 90 MPH wind velocity using *ASCE 7-98* as a reference.
- C. Seismic design (if applicable) is to be based on the 1997 edition of the *Uniform Building Code*. When designing a tank in a seismic zone, the load producing the higher stresses comparing wind and seismic will control the dynamic portion of design.
- D. Combined live and dead roof load shall be uniformly distributed with all nozzle, manhole, and filter locations designed for a minimum of 200 lbs. each. Live and dead loads to be a combined minimum of 25 psf. Roof to have 10° (2.116 to 12) slope for water drainage. Roof is not designed as a working platform.
- E. Tank wall design is to be based on the critical buckling formula from the book *Structural Analysis of Shells* by Baker, Kovalevsky & Rish, page 230. The walls above the hopper are to be designed using Janssen's formula for cylindrical bins.
- F. Tank shall be designed for (center fill) (off-center fill) (center discharge) (off-center discharge) of product.
- G. Tank shall be designed for (mass) (funnel) flow loads.
- H. (Tank operating pressure shall be 0.5 oz. per square inch negative and 2.0 oz. per square inch positive.) (Design tank for atmospheric pressure.)
- I. Tank design to be based on a level full capacity using the maximum compacted density of product.
- J. Owner solicits recommendations that may improve the price, delivery, or performance of tanks. As an alternate, Vendor is invited to quote changes in physical dimensions, modifications to the design, fabrication, or stock of Vendor's standard equipment that would reduce the initial cost of the equipment as specified without changing the design premise. Alternate quotations shall be listed as such in the proposal specifying the alternate and the price and delivery for the alternate.

## IV. Material Specifications

### A. Shell Structure

The materials, design, and fabrication of the welded shell shall conform to the manufacturer's standard specifications including the following:

#### 1. Materials

##### a. Carbon Steel

- 1) Hot Rolled Sheet and Plate - ASTM A1011 Grade 40 or equal with a minimum yield strength of 40,000 psi.
- 2) Structural Shapes - Carbon steel structural shapes shall conform to ASTM A36 or ASTM A992.
- 3) Pipe - Carbon steel structural pipes shall conform to ASTM A53 Grade B.

##### b. Other Materials

- 1) Aluminum - 5052-H32, 6061-T6 typical grades
- 2) Stainless steel - 304, 316, 316L, 317 typical grades
- 3) Other grades of carbon steel, stainless steel and aluminum are available.

#### 2. Bolts

- a. Bolts shall be 1/2 inch diameter and shall or exceed *API Specification 12B*. USA Tank standard bolt coating is mechanically galvanized per ASTM B695, Class 50.
- b. Anchor bolts conform to ASTM A36 or A307.
- c. Other bolts shall meet or exceed ASTM A307 or ASTM325.

**3. Gaskets**

Bolted connections shall incorporate white EPDM gasket material.

**4. Manufacturing**

- a. Welding - All structural welding shall be to the latest edition of AWS using ASME or AWS certified welders - *AWS D1.2* for aluminum, *AWS D1.1* for carbon and stainless steel. Welding procedures are qualified to *ASME Section IX*.
- b. Shell seams shall be full penetration using the SAW (sub-arc welding) process with copper backup.
- c. Other seams may be made with GMAW (gas metal arc welding), SMAW (shielded metal arc welding), FCAW (flux-cored arc welding) or SAW (submerged arc welding) process.

**5. Coatings - Carbon steel only**

All carbon steel plates, members, and miscellaneous parts (except bolts) shall be factory coated in accordance with the provisions of Section B of these specifications.

**B. Coating Systems - Carbon steel**

- 1. Interior coating (product zone) shall be \_\_\_\_\_  
Interior coating (skirt area) shall be \_\_\_\_\_
- 2. Exterior coating shall be \_\_\_\_\_

**C. Appurtenances**

**STANDARD ACCESSORIES FURNISHED WITH TANK**

- 3'0" x 6'8" walk-in door with a 12" x 24" louver (skirted tank only)
- Foundation anchor bolts and clips

**OPTIONAL ACCESSORIES**

- Hillside flange in deck for mounting filter (size and weight required)
- 20" diameter access in hopper or sidewall
- 12" diameter aluminum slidegate with control handle
- Stub and flanged nozzles in deck and sidewall
- Openings for level indicator
- 20" diameter manhole/ventilator in deck
- 20" or 24" diameter dust-tight manhole in deck
- 20" or 24" diameter combination manhole, pressure vacuum valve, (2 oz. pressure and 0.5 oz. vacuum).
- Recommended for use with filter.
- 20" diameter hillside dome with cover for deck
- Special hopper outlet opening
- Deck perimeter guardrails with toeboard (OSHA), aluminum construction (alternate - hot-dip galvanized)
- Outside ladders with safety enclosures and rest platforms (OSHA), hot-dip galvanized (alternate - aluminum construction)
- Crossovers for use between tanks (OSHA), aluminum construction (alternate - hot-dip galvanized)

**D. Shipping**

- 1. All tanks, structures, and miscellaneous parts shall be packaged for shipment in such a fashion as to minimize abrasion or scratching of finished coating system.
- 2. Shipment by either rail or truck is available.
- 3. Shipping covers shall be provided for all openings.

## **FACTORY-WELDED TANK SPECIFICATIONS**

### **I. General**

All labor and equipment furnished in this proposal to be guaranteed against defects in workmanship for a period of one year after delivery. This warranty excludes maintenance and repairs caused by normal usage and wear or abuse.

### **II. Owner to Furnish**

- A. Any applicable state or local taxes on the equipment.
- B. Foundations.

### **III. Owner Agrees to the Following Conditions:**

Provide adequate space adjacent to foundation for unloading.

**COATING SPECIFICATIONS AVAILABLE  
FOR FACTORY-WELDED USA TANKS  
INTERIOR COATINGS**

**SURFACE PREPARATION**

- A. Tanks with the following interior coatings are steel grit blasted to a commercial finish (SSPC-SP6) with a nominal 2 mil surface profile.
- B. Blasting shall be done in a separate, enclosed facility designed to protect from water, weather, and other contamination.
- C. Blasted tanks shall not be exposed to rain, dew, dust, or other contaminants while being transported from blast facility to coating facility.
- D. Coatings shall be applied in a separate, temperature-controlled, enclosed facility designed for painting, protected from weather and other contamination.

**POLYAMIDE EPOXY PRIMER**

- A. One coat corrosion-inhibitive polyamide epoxy primer, Technical Coatings #920-A-500 (or equal), spray-applied. B. Primer to have 2.0 +/- 0.5 mils DFT.

**FDA and USDA DRY FOOD CONTACT ACCEPTED EPOXY**

- A. Cross-coat spray application of FDA and USDA dry food contact accepted white amine adduct epoxy, Technical Coatings #920-W-263 (or equal).
- B. Coating to have 5.0 +/- 0.5 mils DFT.

**AR-LON 6100®**

- A. One cross-coat spray application of FDA and USDA dry food contact accepted white amine adduct epoxy primer, Technical Coatings #920-W-263 (or equal), to 3.5 mils DFT.
- B. One spray-applied finish coat of FDA and USDA dry food contact accepted manila urethane, Ameron #3414 (or equal) to 1.5 mils DFT.
- C. Coating system to have 5.0 +/- 0.5 mils DFT.

**CURING AND SHIPPING**

- A. Baking oven to be used after each coat.
- B. All coated parts shall be inspected prior to shipment.
- C. Touch-up paint with instructions shall be included for application by erection crew.

**SURFACE PREPARATION**

- A. Tanks with TECTHANE 700+ interior coating are steel grit blasted to a near-white finish (SSPC-SP10) with a nominal 2 mil surface profile.
- B. Blasting shall be done in a separate, enclosed facility designed to protect from water, weather, and other contamination.
- C. Blasted tanks shall not be exposed to rain, dew, dust, or other contaminants while being transported from blast facility to coating facility.
- D. Coatings shall be applied in a separate temperature-controlled, enclosed facility designed for painting, protected from weather and other contamination.

**TECTHANE 700+ Interior**

- A. One coat of NSF and FDA accepted amine epoxy, Ameron #90HS (or equal), to 4.0 mils DFT as a primer. (May be tinted blue as an application aid.)
- B. Second coat of NSF and FDA accepted white amine epoxy, Ameron #90HS (or equal), to 4.0 mils DFT as a topcoat.
- C. Coating system to have 8.0 +/- 0.5 mils DFT.

**CURING AND SHIPPING**

- A. Baking oven to be used after each coat.
- B. All coated parts shall be inspected prior to shipment.
- C. Touch-up paint with instructions shall be included for application by erection crew.

**EXTERIOR COATINGS  
SURFACE PREPARATION**

- A. Tanks with the following exterior coatings are steel grit blasted to a commercial finish (SSPC-SP6) with a nominal 2 mils surface profile.
- B. Blasting shall be done in a separate, enclosed facility designed to protect from water, weather, and other contamination.
- C. Blasted tanks shall not be exposed to rain, dew, dust, or other contaminants while being transported from blast facility to coating facility.
- D. Coatings shall be applied in a separate, temperature-controlled, enclosed facility designed for painting, protected from weather and other contamination.

**POLYAMIDE EPOXY PRIMER**

- A. One coat corrosion-inhibitive polyamide epoxy primer, Technical Coatings #920-A-500 (or equal), spray-applied.
- B. Primer to have 2.0 mils DFT.
- C. Finish coat of epoxy, vinyl, acrylic, etc., to be field-applied by Owner.

**POLYAMIDE EPOXY PRIMER with ACRYLIC BAKING ENAMEL FINISH**

- A. One coat corrosion-inhibitive polyamide epoxy primer, Technical Coatings #920-A-500 (or equal), spray-applied to 2.0 mils DFT.
- B. One coat acrylic baking enamel, Technical Coatings 868-W-142 (or equal) white, spray-applied to 1.0 mil DFT. (Light green, light blue, light gray or light brown also available.)
- C. Coating system to have 3.0 +/- 0.5 mils DFT.

**POLYAMIDE EPOXY PRIMER with ALIPHATIC ACRYLIC POLYURETHANE FINISH**

- A. One coat corrosion-inhibitive polyamide epoxy primer, Technical Coatings #920-A-500 (or equal), spray-applied to 2.0 mils DFT.
- B. One coat aliphatic acrylic polyurethane, Technical Coatings, #975-W-426 white (or equal), spray-applied to 1.5 mils DFT. (Light green, light blue, light gray or light brown also available.)
- C. Coating system to have 3.5 mils +/- 0.5 mils DFT.

**CURING AND SHIPPING**

- A. Baking oven to be used after each coat.
- B. All coated parts shall be inspected prior to shipment.
- C. Touch-up paint with instruction shall be included for application by erection crew.

**SURFACE PREPARATION**

- A. Tanks with the following exterior coatings are steel grit blasted to a near-white finish (SSPC-SP10) with a nominal 2 mil surface profile.
- B. Blasting shall be done in a separate, enclosed facility designed to protect from water, weather and other contamination.
- C. Blasted tanks shall not be exposed to rain, dew, dust, or other contaminants while being transported from blast facility to coating facility.
- D. Coatings shall be applied in a separate temperature-controlled, enclosed facility designed for painting, protected from weather and other contamination.

**INORGANIC ZINC PRIMER**

- A. One coat inorganic zinc primer, Devoe CathaCote 302 (or equal), spray-applied.
- B. Primer to have 2.5 mils DFT.
- C. Finish coat epoxy, hi-build vinyl, etc., to be field-applied by Owner.

**SYSTEM 4**

- A. Inorganic zinc primer: 1 coat @ 2.0 mils DFT
- B. Polyamide epoxy primer: 1 coat @ 4.0 mils DFT
- C. Aliphatic acrylic urethane: 1 coat @ 1.5 mils DFT

D. Coating system to have **7.5** +/- 0.5 mils DFT.

**CURING AND SHIPPING**

A. Baking oven to be used after each coat.

B. All coated parts shall be inspected prior to shipment.

C. Touch-up paint with instructions shall be included for application by erection crew.