

FIELD-WELD TANK SPECIFICATION DRY BULK STORAGE — CARBON STEEL TANKS

1. SCOPE

1.1. This specification covers the supply of field erected atmospheric and low pressure process and storage tanks. Tank supplier to be Tank Connection, ATEC Steel, or approved equal.

2. OPERATING CONDITIONS

The subject equipment shall be operated in accordance with the conditions outlined attached preliminary drawing(s) – if any are listed.

2.1. (List drawings here)

3. DETAILED REQUIREMENTS OF EQUIPMENT

3.1. Standards and Codes Applicable

3.1.1. All applicable codes in effect as of the date of purchase and any subsections thereof, as applicable, shall govern design, fabrication, inspection, testing, and selection of equipment and materials supplied. These include, but are not limited to, the following:

ASME	American Society of Mechanical Engineers
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
ANSI	American National Standards Institute
ASTM	American Institute for Testing and Materials
AISC	American Institute of Steel Construction
AWS	American Welding Society, D1.1-Rev. 1/76
API	American Petroleum Institute Standard 650 (as applicable)
API	American Petroleum Institute Standard 620 (as applicable)
OSHA	Occupational Safety and Health Standards

All pertinent regulations of OSHA (Occupational Safety and Health Administration) shall be complied with.

3.1.2. Local, state, and federal regulations in effect as of date of purchase shall be complied with.

3.1.3. Vendor shall warrant that all materials, equipment, and things furnished by Vendor in connection with this specification and that Purchaser's use in accordance with Vendor's operating instructions

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shall comply with all such applicable laws, rules, regulations, and codes.

3.2. General

- 3.2.1. The tank fabricator shall have full responsibility of tank's design and fabrication.
- 3.2.2. The Owner relies entirely on the builder of the tanks for their safe design and construction. Any approvals required by the Owner shall be limited to approvals of configuration, dimensions, and finish and shall not affect the builder's responsibility to construct a structurally safe tank.
- 3.2.3. All shell nozzles shall have reinforcing as required per API 620. Reinforcing pad materials, if required, shall be of the same material as the shell.
- 3.2.4. Slip-on flanges on tanks shall be installed so that the face of the flange projects over the end of the pipe a distance of equal to the pipe thickness plus 1/8-inch minimum. Minimum nozzle projection shall be 6 inches.
- 3.2.5. Nozzle size and location will be determined after the purchase order is issued. Any attached data sheet(s) and/or drawings shall give the approximate number and size of nozzles presently anticipated. The Vendor shall include, in his base price, all nozzles shown.
- 3.2.6. Nozzles supporting mechanical equipment shall be suitably reinforced.
- 3.2.7. Tank components and loose parts shall be tagged by the tank equipment number as specified on the sketches.
- 3.2.8. The fabricator shall submit shop drawings to the Owner's Engineer for approval before commencing work.
- 3.2.9. See attached tank sketches for dimension and other pertinent information.

3.3. Materials

- 3.3.1. For carbon steel tanks, plates shall be free of heavy rust and mill scale and white conforming to ASTM A36. Any deviation from this paragraph will be stated on attached tank sketches.
- 3.3.2. For carbon steel tanks bolts and nuts shall conform to ASTM A-307. Bolts shall be Grade B with regular hexagon heads; nuts shall be the hexagon heavy series.
- 3.3.3. Carbon steel piping shall conform to ASTM A-53 B, and couplings to ASTM A-105. All pipe nozzle flanges shall be 150 pound, forged steel, slip-on type, conforming to ASTM A181, Grade 1. Manway flanges and covers shall be drilled to 150-pound standard dimensions. Any manway covers on the top shall be hinged and capable of sealing. Any manway covers on the side shall have a davit installed with the tank.
- 3.3.4. Chemical analysis of the material as supplied by the steel manufacture

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shall be available upon request.

- 3.3.5. Ladders, cages, crosswalks and handrails shall be Galvanized or Epoxy painted CS construction. Fabrication shall be in accordance with and must meet OSHA Standards.

3.4. Design

3.4.1. Stress Values

- a. Design strength of carbon steel materials shall be in accordance with AISC 360-05.

- b. The outstanding leg of the shell top angle shall extend outside the tank and shall include a drip ring if the tank is insulated. Support rings should be included as required.

- 3.4.2. The Supplier shall design all tank anchorage requirements for the maximum calculated loading including wind and seismic loads per the applicable codes. Anchor bolts shall have a minimum size of 3/4inch in diameter. Anchor bolt design stress shall be within the limits permitted by the latest edition of the American Institute of Steel Construction (AISC 360-05).

- 3.4.3. Tanks which are subjected to a vacuum shall be noted by a negative psig or inches of water vacuum design pressure on the appropriate Tank Specification Sheet or Tank Sketch. These tanks shall have adequate wall thickness and or external ring reinforcements to resist tank wall collapse.

3.5. Tolerance

- 3.5.1. The tolerances apply for empty tanks in normal position.

- 3.5.2. All appurtenances shall be located in elevation from a common base or datum line.

- 3.5.3. The difference between the maximum and minimum inside diameter or a tank shall not exceed 1/2percent of the nominal diameter or 1 1/2inches (whichever is less).

- 3.5.4. The difference in height or length of a tank shall not exceed $\pm \frac{1}{4}$ percent of the specified dimension or $\pm 1 \frac{1}{2}$ inches (whichever is less).

- 3.5.5. Anchor bolt hole locations shall not exceed $\pm \frac{1}{4}$.

- 3.5.6. Tank nozzle and accessories location shall not exceed $\pm \frac{1}{4}$ inch.

3.6. Tank Appurtenances Assembly

- 3.6.1. Plates, gaskets, and fasteners shall be included. Manhole cover davits or hinges shall be included.

- 3.6.2. Carbon steel pipe nozzle wall thickness shall no be less than standard weight pipe. All nozzles 2-inch IPS and smaller shall be Schedule 80 pipe.

- 3.6.3. Tank ladders and caged ladders shall be supplied loose and shall be

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installed in the field. Grounding lugs where applicable shall be indicated as required.

- 3.7. Surface Preparation
 - 3.7.1. Heavy weld splatter shall be removed by grinding and any deep scars, pits, or points shall be filled in or ground out as required to remove sharp edges.
 - 3.7.2. Tanks shall be clean and reasonably free of oil, grease, loose scale, and rust.

- 3.8. Paint and Insulation
 - 3.8.1. Field erected tanks shall not be painted or insulated under this specification.
 - 3.8.2. Ladders, cages, and stairways shall be Epoxy Painted or Galvanized after fabrication.

- 3.9. Additional Design Standards
 - 3.9.1. Shell and hopper product pressures are calculated using the technical paper "Effect of Solid Flow Properties and Hopper Configuration of Silo Loads," by Jenike, A.W., Jenike and Johanson, Inc. The analysis uses the Janssen formula for defining pressures and loads imposed by funnel or mass flow. Radial tension in the shell, from the above mentioned product loads, are from the "Design of Steel Bins for Storage of Bulk Solids," Gaylord and Gaylord, Section 8.2. Loadings in the hopper, from the above mentioned product loads, are from the "Design of Steel Bins and Storage of Bulk Solids," Gaylord and Gaylord, Sections 5-12, 8-6.
 - 3.9.2. Shell compressive strength design is based on the critical buckling formula for a long cylinder from the book Structural Analysis of Shells by Baker, Kovalesvsky & Rish, pg. 230. The shell material's critical buckling stress is not allowed to exceed its yield strength.
 - 3.9.3. Shell unit forces from day product pressure is based on the principles of API 620.
 - 3.9.4. The hopper to sidewall connection design is based on the principles of API 620.
 - 3.9.5. Deck sheet design unit forces under internal pressure are based on the principles of API 620. The deck to sidewall connection under internal pressure is based on API 620.
 - 3.9.6. Shell design under vacuum is based on the critical buckling formula from the book "Structural Analysis of Shells" by Baker, Kovalevsky & Rish.

- 4. ALTERNATES
 - 4.1. Vendor shall provide optional pricing to paint all exterior Steel surfaces with vendor's standard Epoxy.

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5. EQUIPMENT, MATERIALS, AND SERVICES BY VENDOR

- 5.1. The Vendor shall supply, unload, and field erect, the tank or tanks as described in the attached drawing(s).
- 5.2. Covers, blind flanges, and gaskets for nozzles as designated on the datasheet.
- 5.3. Tank Vendor shall provide gasoline (or diesel) powered welding machines and air compressors. Owner shall provide 110 volt source for erector's use. The use of 110 volt power by Tank Vendor shall be limited to lighting, small electric hand tools, and ventilation equipment.

6. EQUIPMENT, MATERIALS, AND SERVICES BY OTHERS

- 6.1. Foundation and anchor bolts.
- 6.2. Insulation required shall be supplied by others except as noted.

7. INFORMATION BY BIDDER

- 7.1. Bidder shall list by item the tank name, weights, and cost.
- 7.2. Vendor shall list metal thickness quoted for walls, bottom, and top of each tank.

8. PERFORMANCE GUARANTEE

A warranty as to workmanship, material, and satisfactory mechanical functioning for a period of 12 months after the equipment is placed in service is to be furnished in writing with quotation.

9. SPECIAL COMPLIANCES

Not Applicable.

10. QUESTIONS BY BIDDERS

Questions of an engineering or technical nature should be directed to:

Questions of a commercial nature should be directed to:

11. ATTACHMENTS

- 11.1. The following Data Sheet(s) and/or Drawing(s) are included:

END OF SPECIFICATION