Annex W
(normative)

Commercial and Documentation Recommendations

This annex provides a number of design options requiring decisions by the Purchaser; standard requirements; recommendations; and information that supplements the basic standard. This annex becomes a requirement only when the Purchaser specifies an option covered by this annex or specifies the entire annex.

- The following commercial and documentation recommendations apply to all tanks when specified by the Purchaser on the Data Sheet.

• W.1 Document Submittals and Review

• W.1.1 General

1) Technical documents listed below shall be submitted by the Manufacturer for review by the Purchaser at specified times during a project. Additional documents may be required and shall be a matter of agreement between the Purchaser and the Manufacturer. Submittals and reviews shall be in accordance with contractual schedule agreements. All documents shall be in reproducible form agreeable to the Purchaser.

2) Unless specified otherwise by the Purchaser, the minimum required content of the technical documentation packages shall be as described in this Annex.

• W.1.2 Quotation or Bid Document Package

1) All quotations shall be submitted in accordance with this standard and Purchaser's requirements listed in the Data Sheet. In addition, a second quotation containing alternates to Purchaser's requirements may be quoted for Purchaser's consideration provided the alternates are clearly marked as such and are completely described in that bid.

2) The Manufacturer shall mark and return the Purchaser's previously prepared Data Sheet. Some entries will not be determined until completion of negotiations and/or completion of the detailed design. Such entries may remain blank for this submittal. The bid shall include the design wind speed and design snow loads (ground, balanced and unbalanced) that will be used in the design by the Manufacturer.

3) The Manufacturer shall provide a list of all engineered accessories being purchased from suppliers, indicating the Manufacturer, and model or part number. Alternatively, when a specific Manufacturer is not known at the time of bidding, a list of Manufacturer-approved suppliers may be submitted. Excluded from the list requirement are commodities such as plate, pipe, flanges, and bolts. Included in the list are items such as floating roofs, dome roofs, roof seals, pressure vents, gauges, and instrumentation. Also, see C.1.1.

• W.1.3 Design Review Document Packages

Unless specified otherwise, a Purchaser's review of Manufacturer's design calculations and general arrangement drawings is required before the order of materials. Unless specified otherwise, the Purchaser's review of the documents listed in Items 3 through 7 below is required prior to the start of fabrication. Work may begin following conclusion of any negotiations generated by the review process. A copy of the review packages with any annotations including nozzle size, orientations, projections, placement and elevations of ladders, platforms, stairs, and attachments, etc., shall be returned to the Manufacturer. The Manufacturer shall promptly revise/update the drawings, calculations, and information on the **Data Sheet** showing all review-generated changes and shall submit copies to the Purchaser. The Design Review Document shall consist of at least the following.

1) Manufacturer's design calculations as described in W.2 and structural loads for foundation design.

2) General arrangement drawings with complete material specification.

3) Detailed fabrication drawings.

4) Welding procedure specifications (WPSs) and procedure qualification records (PQRs). This shall include weld hardness criteria when required by the Purchaser. Review of duplicate weld procedures for multiple tanks is not required when written permission is received from the Purchaser.

5) Heat treatment procedures (if required).

6) Nondestructive examination procedures and testing procedures.

7) Description of proposed test gaskets (see 4.9), including material properties, dimensions, and design characteristics.

W.1.4 Interim Documents During Construction

The Manufacturer shall promptly submit revised documents describing any design or construction changes to the Purchaser. Copies of Material Test Reports applicable to components listed in 4.2.10.1 shall be forwarded to the Purchaser upon receipt of the reports.

• W.1.5 Post-Construction Document Package

Upon completion of construction and testing, copies of a Manufacturer's data book shall be supplied in the quantities specified in the contract. Each copy shall contain at least the documents listed below.

1) Final general arrangement and detail fabrication drawings, marked "as-built" by the Manufacturer, complete with dimensions and data, with complete materials specification and parts list.

2) Design calculations described in W.2.

3) Copies of Material Test Reports applicable to shell plates and annular plates.

4) Reports of the results of all tests including weld hardness (when weld hardness criteria are specified), and reports of all nondestructive examinations. Radiographic films shall also be included. For tank pressure test data, include results and duration of pressure test(s), test water level, fill rate, imposed pneumatic pressure, hold times, drain rate, etc.

5) Shell and bottom elevation measurements for hydro-test.

6) Nameplate facsimile.

7) Manufacturer's certification per Figure 10.2.

8) The **Data Sheet** reflecting as-built conditions.

9) A drawing that lists the following for each shell course:

a) the required shell thicknesses for both the design condition (including corrosion allowance) and the hydrostatic test condition;

b) the nominal thickness used;

c) the material specification;

d) the allowable stresses.

10) Nominal thicknesses used for materials other than shell plates.

11) Handling criteria and rigging instructions (for shop-built tanks only).

W.2 Manufacturer's Calculations

All manual calculations shall include relevant formulas and source paragraphs in this standard or in other specifications or engineering practices, values used in the formulas, calculated results, and acceptance criteria used. Where a computer program performs design calculations, a program description shall be given, including name and version of the program, program limitations and assumptions used, and a brief description of what the program does. These calculations and/or computer programs shall address at least the following.

1) Determination of design thicknesses for all pressure boundary elements to satisfy all specified loading conditions, which may include contents, pressure, partial vacuum, dead loads, live loads, snow loads, rain loads, roof flotation, dike or flood plain partial submergence, wind, and seismic activity.

2) Overturning check and anchorage due to wind forces, seismic forces, and internal pressure, if applicable.

3) Seismic design requirements (e.g. base shear, longitudinal compression, sliding friction resistance checks, overturning moment checks, and anchorage), if applicable.

4) Shell stability checks to determine whether shell stiffeners or increased shell course thicknesses will be required.

• 5) Unless specified otherwise by the Purchaser, whenever the tank diameter exceeds 36 m (120 ft), shell stiffness coefficients, maximum unrestrained radial deflection, angle of rotation of bottom course shell nozzles, and the nomographs for moments and forces that these nozzles can safely sustain from connected piping shall be provided in accordance with provisions of Annex P. Alternate analysis techniques, such as the finite element method, may also be used to satisfy this requirement.

• 6) Any additional calculations specified by the Purchaser to show compliance with this standard and any Annexes invoked.

W.3 Manufacturer's Drawing Contents

All Manufacturer's drawings shall be thoroughly checked for accuracy and completeness before sending for Purchaser review. Manufacturer's drawing(s) shall show, as a minimum, the following information.

1) An updated list of drawings for each tank shall be resubmitted each time drawings are revised and reissued.

• 2) Identification of the storage tank as designated by the Purchaser.

3) Reference to applicable practices, standards, specifications, details, and associated drawings and sketches.

4) Materials of construction, designated corrosion allowance(s), and gasket specifications.

5) Extent of postweld heat treatments.

6) Extent of radiography to be applied to bottom, shell, and roof butt-welds.

7) Shell design joint efficiencies, for Annex A, Annex J, and Annex S.

8) Complete details and dimensions of the tank, including external and internal attachments and appurtenances supplied by Manufacturer and sub-contractors.

9) Bottom slope.

10) Nominal plate thicknesses for shell, roof, reinforcement, and bottom.

11) Location of all welded seams. All welds shall be either pictorially detailed or identified by use of the standard welding symbols of ANSI/AWS A2.4. Welding procedures shall be listed for each weld. A “weld map” may be used if it clearly indicates the weld procedure specification used for every joint.

12) For flanges other than those conforming to ASME B16.5 or ASME B16.47, and marked accordingly, show all dimensions and finish of flange face.

13) Facsimile of nameplate with data to be stamped thereon with location and details of fabrication of nameplate bracket.

14) Empty, operating, and test weight of tank.

15) Loads on foundation as also shown on the **Data Sheet**, Line 13.

16) Foundation plans and construction details (if supplied by the Manufacturer or the sub-contractor).

W.4 Bids for Floating Roofs

• **W.4.1** Bids for tanks having floating roofs shall contain sufficient engineering data, including material specifications for both metallic and non-metallic components, nominal thicknesses, roof weight, and sufficient information (see C.3.4.1 and C.3.4.2 or H.2.1, as applicable) to enable the Purchaser to verify that the bidder has considered all specified design requirements.

W.4.2 Manufacturer shall list in the quotation all roof accessories furnished and included in the base price of the roof. If any accessories are purchased from other suppliers, the Manufacturer shall provide that supplier’s name and the model or part number.

W.4.3 Manufacturer shall state the lowest and highest operating level of roof in the quotation.

W.4.4 Manufacturer shall clearly describe the extent of electrical grounding and shunts included as a part of the floating roof design.

W.4.5 Manufacturer shall provide a cross-section of all seals showing materials and complete details of construction with the bid.

W.4.6 The Manufacturer shall submit with the bid the minimum and the maximum allowable annular space between the roof and shell, as well as the maximum and minimum annular space the proposed roof seal system can accommodate.

W.4.7 Manufacturer shall specify size, number, and type of drains with the quotation (external roof only).

W.4.8 The bid shall state if a wind skirt, a top-shell extension, or overflows will be required for proper functioning of the roof seal (external roof only).

W.4.9 The Manufacturer of the external floating roof shall prepare and submit to the Purchaser prior to order placement a written declaration that the roof design complies with all design requirements of Annex C.

DELETED

W.4.10 The Manufacturer of the internal floating roof shall prepare and submit to the Purchaser prior to order placement a written declaration that the roof design complies with all design requirements of Annex H.

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W.5 Required Floating Roof Contract Calculations

W.5.1 The Manufacturer of the external floating roof shall prepare and submit to the Purchaser the following calculations.

W.5.1.1 For single-deck pontoon and double-deck roofs, calculations showing that the roof design complies with the buoyancy requirements of C.3.4.1a, using the smaller of the specific gravity in C.3.4.1 (0.7), or the minimum specific gravity of the product specified on the Data Sheet, Line 5.

W.5.1.2 For single-deck pontoon roofs and double deck roofs, calculations showing that the roof design complies with the punctured compartment loading condition as specified in C.3.4.1b.

W.5.1.3 Calculations showing that the design of the roof and roof supports satisfies C.3.10.2.

W.5.2 The Manufacturer of the internal floating roof shall prepare and submit to the Purchaser the following calculations, considering internal floating roof deflections and stresses for each of the load conditions required by Annex H. All calculations for the floating condition shall be based upon the design specific gravity (per H.4.2.1.1).

W.5.2.1 Calculations showing that the roof design complies with the buoyancy requirements of H.4.2.1.

W.5.2.2 For single-deck pontoon and double-deck roofs, calculations showing that the roof design complies with the punctured compartment loading condition as specified in H.4.2.3.

W.5.2.3 Calculations showing that the design of the roof and roof supports in the landed condition satisfies H.4.2.2.2.

W.5.2.4 The internal floating roof Manufacturer shall specify the internal floating roof weight and total flotation displacement provided based on a flotation level for design specific gravity per H.4.2.1.

• W.6 Jobsite Responsibilities

Unless otherwise specified by the Purchaser, the Manufacturer shall furnish all labor, tools, equipment, supplies, materials, utilities (including power for welding), storage, and personnel services necessary for, and reasonably incidental to, the delivery of materials to the site, the construction of the tank(s), and the removal of surplus and scrap materials from the job site. See the **Data Sheet** (see Line 14) for the Manufacturer's additional post-hydro-test responsibilities. The Purchaser shall furnish and dispose of the water for hydro-testing the tank from the tie-in points as designated on the Data Sheet, Line 14.