

Internal Floating Roofs for Atmospheric Storage Tanks

(This practice is appropriate for attachment to Inquiry or Purchase Document)

IP 9-7-4

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Rev. 1

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THE FOLLOWING PARAGRAPH NUMBERS REFER TO API STANDARD 650, 9TH EDITION, JULY, 1993, TITLED "WELDED STEEL TANKS FOR OIL STORAGE, APPENDIX H, INTERNAL FLOATING ROOFS," WHICH IS A PART OF THIS PRACTICE.

H. 1 SCOPE

- I H.1.1 This practice covers the design, fabrication, erection, inspection and testing of internal roofs for fixed roof atmospheric storage tanks. Unless otherwise specified, such roofs shall be per **API-650 Appendix H, 9th Edition, Addendums 1 & 2 December, 1995**, as modified by this practice.
(New) For User Convenience, the beginning of each paragraph in this practice is noted as follows:
 - a. (Addition) The paragraph specifies additions to the corresponding API paragraph.
 - b. (Exception) The paragraph completely replaces the corresponding API paragraph.
 - c. (Modification) The paragraph revises the corresponding API paragraph.
 - d. (New) The paragraph does not appear in API Standard 650 and denotes new requirements.
- I H.1.2 (New) **An asterisk (*)** indicates that a decision by the Purchaser is required or that additional information is furnished by the Purchaser.
- I H.1.4 (Addition) ASTM E84, Surface Burning Characteristics for Building Materials, and ASTM E162, Surface Flammability of Materials Using a Radiant Heat Energy Source, shall be used with this practice.

H.2 TYPES OF INTERNAL FLOATING ROOFS

- I H.2 (Addition) The types of internal floating roofs shall be per **API-650, Appendix H.2**, with the following additions, modifications and exceptions.
- R H.2 H.2.a. (Exception) Metallic pan roofs are not permitted.
- H.2.b. (Exception) Metallic bulkhead roofs are not permitted.
- * H.2.g. (Exception) Plastic sandwich-panel roof designs shall be approved by the Owner's Engineer. Such designs, however, are not acceptable for tank diameters greater than 60 ft (18 m).

H.3 MATERIALS

- R H.3 (Addition) Materials shall be per **API-650, Appendix H.3**, with the following additions, modifications and exceptions.
Cover materials, joint sealing compounds (if used) **and all seal materials**, shall be suitable for exposure to ambient and design temperature and any corrosive material in the product stored.
- R H.3.3 (Addition) **Stainless steel hardware** (nuts, bolts, washers, etc.) shall be used for all **plastic and aluminum** internal floating roofs.
- S **H.3.4.1** (Exception) **Plastic used for the encapsulation of floats** shall have a **flame spread classification** of not more than 25 per **ASTM E84**.
- E **H.3.5.1** (Modification) The space between the outer periphery of the roof and the tank shell shall be sealed by flexible device which provides a **close fit** to the shell surfaces **and meets all regulatory requirements for the location**. Columns, ladders, gauge pipes, and the like that penetrate the internal floating roof shall be provided with seals **that meet all regulatory requirements for the location**.
- S **Flexible seal material** shall have a **flame spread index** of not more than 35 per **ASTM E162**.
- H.3.5.4 (Exception) Liquid filled seals are not permitted.

H.4 DESIGN REQUIREMENTS FOR ALL TYPES

- I H.4 (Addition) Design shall be per **API-650, Appendix H.4**, with the following additions, modifications and exceptions:
- R H.4.1 (Exception) **The roof and accessories** shall be so designed and constructed as to allow the tank to overflow and then return to a liquid level which floats the roof well below the top of the tank shell without damage to any part of the roof, tank or appurtenances. During such an occurrence, no manual attention shall be required to protect the cover, tank, or appurtenances.


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- R * Roofs shall be designed with **flexible connections** between the primary structural members to permit their relative movement when a mixer is installed in the tank. Other tank installations where flexible connections are required such as in tanks with frequent filling and emptying cycles, will be specified.
- R * The **design of internal floating roofs** for use in fixed roof tanks **greater than 150 ft (46 m) in diameter and having roof support columns**, shall be submitted to the Purchaser for review by the Owner's Engineer.
- S **H.4.2.4** (Addition) If **flexible cables** are used as **electrical drains**, they shall be constructed of **stainless steel** and be installed to prevent entanglement with floating roof appurtenances.
Non-metallic roofs made entirely of non-conducting material do not require bonding. Plastic containing additives which render them conductive will require bonding.
Combination metallic/non metallic roofs with isolated metal components shall be provided with means of bonding the metal parts to the tank shell or roof. Bonding may be accomplished either by direct metallic path, or by rendering the bulk non-metallic material conductive by suitable additives (surface treatment is not acceptable). In the latter case, the resistance between the metal component and the ground shall not exceed one megohm.
- E ♦ **H.4.5.4** (New) **Wiper seals** shall be above the product level and shall not dip into the product during upward travel of the roof. **Seals shall be in contact with the shell above the liquid level for at least 90% of the tank circumference.** The maximum permissible gap between the seal and the tank shell is 1/4 in. (6 mm).
- S,E **H.4.6** (Modification) Columns, ladders and other rigid vertical appurtenances, **except around support legs**, that penetrate the deck shall be provided with a seal that will permit a local deviation of ± 5 in. (125 mm). **No metal-to-metal seals will be acceptable, and all slide plates shall be held to the floating cover by retaining springs and shall be electrically connected to the roof by a stainless steel cable.** Appurtenances shall be plumb within a tolerance of 3 in. (75 mm).
- M **H.4.7.1** (Modification) The floating roof shall be provided with **adjustable supports**.
- M **H.4.7.3** (Addition) The **height of support legs** shall be adjustable to two positions from the top of the floating roof.
 - The low position shall be the lowest permitted by tank internals.
 - The high position shall be such that a minimum of 6 ft (2 m) clearance is provided underneath the cover.
- R **H.4.7.4** (Addition) **Pads** shall be attached to the bottom of aluminum pipe or structural supports.
For steel roofs, bearing plates shall be centered under each support, attached to the tank bottom by a 3/16 in. (5 mm) continuous fillet weld. Plates shall be 3/8 in. (10 mm) thick and at least 24 in. (600 mm) round or square.
- * Where freezing prevention between support legs of any roof type and the tank bottom is required, 3 in. (75 mm) high raised bearing plates shall be provided.

H.5 DESIGN REQUIREMENTS FOR SPECIFIC TYPES

- I H.5 (Addition) Design shall be per **API-650, Appendix H.5**, with the following additions, modifications and exceptions:
- S,R **H.5.1 METALLIC INTERNAL FLOATING ROOFS IN CONTACT WITH THE LIQUID**
H.5.1.1 (Modification)
 - Metallic pan (no pontoons or bulkheads) are not permitted.
 - Bulkhead (pan style with bulkheads forming open-top compartments) are not permitted.

H.6 OPENINGS AND APPURTENANCES

- I H.6 (Addition) Design shall be per **API-650, Appendix H.6**, with the following additions, modifications and exceptions:
- H.6.1 **LADDERS**
- S * **H.6.1.1** (Addition) **If a permanent ladder is not specified, a pad** shall be provided **on the cover** and equipped with cleats that will accommodate and prevent slippage of a ladder (temporary) placed on it. The pad shall be located in direct vertical alignment with the roof access manway.