

SCOPE

- I 1.1 This practice covers the design, size, quantity, and location of accessories for atmospheric fixed roof and floating roof storage tanks and open top storage tanks.
- I 1.2 The requirements for **refrigerated storage tanks and vessels** are **not covered** by this practice.
- I 1.3 **An asterisk (*)** indicates that either a decision by the Owner's Engineer is required, that additional information is to be furnished by the Owner's Engineer, or that information for Owner's Engineer approval is to be supplied by the vendor or contractor.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the practice and standards which shall be used with this practice.
- I * 2.2 **Table 2** lists the practices and standard which shall be used with this practice **as specified** by the Purchaser.

TABLE 1

PRACTICE	
IP 15-1-3	Instruments for Storage Tanks and Vessels
STANDARDS	
API Standard	
650	Welded Steel Tanks for Oil Storage
RP-2003	Recommended Practice for Protection Against Ignitions Arising Out of Static, Lightning and Stray Currents
ANSI Standard	
A 1264.1	Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems

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TABLE 2

PRACTICES	
IP 3-2-2	Foam Systems for Storage Tanks
IP 3-2-7	Manual Sampling Systems
IP 3-16-1	Flanged Joints, Gaskets and Bolting
IP 9-7-3	Vents for Fixed Roof Atmospheric Storage Tanks
IP 14-1-1	External Insulation
STANDARD	
ANSI Standard	
A 14.3	Safety Requirements for Fixed Ladders

TANK CONNECTIONS

LOCATION OF ATTACHMENTS

- O,R * 3.1 Unless otherwise specified, **the location of principal connections and attachments for fixed roof tanks** shall be per **Figure 1**. The location of **shell nozzles and manholes for floating roof tanks** shall be per **Figure 2**. The requirements for and the location of other tank connections and appurtenances will be specified.

ROOF AND SHELL MANHOLES

- M 3.2 The minimum number and size of shell and roof manholes shall be per the following:

NOMINAL TANK DIAMETER		NUMBER AND SIZE OF MANHOLES								
		SHELL			ROOF					
		All Tank Types			Fixed Roof Tanks			Floating Roof Tanks (1)(2)		
ft	m	Number	in.	mm	Number	in.	mm	Number	in.	mm
10 - 20	3 - 6	1	30	750	1	24	600	1	30	750
> 20 - 60	> 6 - 18	1 1	24 30	600 750	2	24	600	1	30	750
> 60 - 90	> 18 - 27	1 1	24 30	600 750	2	24	600	2	30	750
> 90	> 27	2 1	24 30	600 750	2	24	600	2	30	750

Notes:

- (1) In addition, floating roofs shall be provided with at least one 20 in. (500 mm) manhole for each pontoon compartment.
- (2) Where two deck manholes are required, they shall be located at diametrically opposite positions.

Manhole requirements for internal floating roofs are specified in [IP 9-7-4](#).

MANUAL GAUGING - SAMPLING FOR FIXED ROOF TANKS

- S,O * 3.3 **Fixed roof tanks (with or without internal floating covers).** A manual gauging-sampling well per [Figure 4](#) shall be used where the stored product, including intermediate storage, is specified as a "static accumulator." Gauge well shall be burr-free.
- A gauging-sampling well is not required where the stored product will not be a "static accumulator." In such cases, a gauge hatch shall be installed on a roof manhole cover.
- R * 3.4 **If a manhole or a separate roof connection is used for gauging-sampling purposes** it shall be located near a roof support.
- O 3.5 **Gauging hatches** shall be per the following:
- a. The gauging hatch shall have a seal with corrosion resistant seats suitable for a pressure of 2 oz/sq in. (0.86 kPa) or design pressure of tank whichever is greater, and a heavy stay-back cover.
 - b. The gauging hatch shall be of 8 in. (200 mm) minimum diameter.
 - c. The cover shall weigh at least 6-1/2 lb. (3 kg).
 - d. Larger hatches shall have the same minimum weight (mass) per unit area.

WATER DRAWOFF CONNECTIONS

- O * 3.6 **Water drawoff connection.** Tanks in hydrocarbon service shall be provided with a minimum of one water drawoff connection, using the API Low Type shell nozzle. Water drawoff's for tanks in other services (such as pitch, wax, hot oil) to be specified by the Owner's Engineer. **Water drawoff sumps shall be provided as follows:**
- a. For tanks over 20 ft (6 m) in diameter, a water sump is required. The sump may be any shape provided it has a volume at least equal to the volume of sump specified in [API-650](#). End of drawoff pipe shall be 4 in. (100 mm) above bottom of sump.
 - b. If "apex down" cone bottom is specified, a sump is not required. The drawoff line shall be piped to the center of the tank, turned down and terminated 4 in. above the bottom.
 - c. For tanks 20 ft or less in diameter, a sump is not required. The inlet end of the water drawoff pipe shall be 2 in. (50 mm) above the bottom, except in the case of "apex down" cone bottom tanks. In such cases, the end of the pipe shall be 4 in. above the bottom.
 - d. When flush type suction nozzles are used, the maximum size water drawoff connection shall be NPS 6 (150 mm).
- O * 3.7 Where **freeze protection** is required and product temperatures are less than 250°F (120°C), a NPS 1-1/2 **recirculation line** shall be provided from the water drawoff nozzle back to the tank.



FLUSH-TYPE SHELL CONNECTIONS

- O 3.8 Flush-type shell connections shall be provided with a **flow guide box** per [Figure 5](#).

FOAM SYSTEMS
FIXED ROOF TANKS

- S * [4.1](#) **If a foam system is specified**, the tank vendor shall furnish and install all components of the system per [IP 3-2-2](#). However, foam makers and terminal connections will be furnished by the Purchaser or vendor, as specified.
- S * [4.2](#) **For existing tanks with installed foam chambers, where an internal floating cover is to be added**, the foam system components shall be left in place or relocated as specified.

FLOATING ROOF TANKS

- S [4.3](#) **Foam systems and dams** shall be per [IP 3-2-2](#).
- S * [4.4](#) **For tanks with diameters 100 ft (30 m) or larger if a foam system is specified**, the tank vendor shall furnish and install all components of the system per [IP 3-2-2](#). However, terminal connections will be furnished by the Purchaser or vendor, as specified.

INSTRUMENTS

- O ♦ * [5.1](#) **Instruments** shall be provided per [IP 15-1-3](#).

LEVEL

- O * [5.2](#) **Gauge types and installation** shall be specified by the Owner's Engineer. A minimum of one level gauging instrument per tank, readable from grade, shall be provided.
- O,R * [5.3](#) **Hydrostatic tank gauging (HTG) systems**, when specified, shall be per the following:
- Tank connections for mounting HTG sensors shall be 2 in. (50 mm) flanged.
 - The bottom tank connection shall be located above the water drawoff connection or above the maximum operating level of sludge and water, whichever is greater.
 - The spacing between the bottom tank connection and the middle tank connection shall be 8 ft (2.5 m).
 - HTG sensors shall be mounted as close to the tank shell as possible.
 - Tank connections for HTG sensors shall not be located within 3 ft (1 m) of a girth or vertical tank weld and shall not be located near tank mixers/agitators or suction/production lines.
 - The thermowell connection for product temperature measurement shall be located near the HTG sensor connections.
 - A third HTG sensor connection may be required on cone roof tanks if the tank is not vented to atmosphere and the vapor pressure significantly impacts level measurement.
- Additional design and installation requirements for HTG systems shall be specified by the Owner. All detailed designs shall be reviewed and approved by the Owner's Engineer.
- S * [5.4](#) **Hot oil and asphalt service**. Provision shall be made to automatically shut off heaters when they become exposed above the liquid level if the heating medium is 350°F (176°C) or higher. The type of level control and installation requirements shall be specified by the Owner's Engineer.

TEMPERATURE

- R * [5.5](#) **Connections for temperature indication** shall be provided as follows:
- Fixed roof tanks without internal floating covers**. A NPS 1 (25 mm) threaded connection shall be furnished for a thermowell installation (see [Figure 1](#)). A flanged thermowell, minimum flange size of NPS 1-1/2 (38 mm) is also acceptable, if specified by the Owner's Engineer.
 - Floating roof tanks and fixed roof tanks with internal floating covers**. The type and method of installation of the temperature measuring device shall be specified.

IP 9-7-1	Accessories for Atmospheric Storage Tanks	 EXXON INTERNATIONAL PRACTICE
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

STAIRWAYS, LADDERS, PLATFORMS, AND WALKWAYS

- R * 6.1 Stairways, walkways, platforms, ladders, and other structural parts attached to the roof top or shell shall be **hot-dip galvanized**, unless otherwise specified by the Owner.
- R 6.2 All **external attachments** to shell and roof tops shall be **continuously welded** to prevent rust streaking.

STAIRWAYS

- O 6.3 **Tanks requiring gauging or sampling from the roof** shall be provided with a **spiral stairway**, and a platform for access to gauge or sampling hatch.
- O 6.4 **A spiral stairway shall be provided for access to floating roof tanks.** In addition, a top platform with a guard railing shall be provided from the top of this stairway to the gauge well and the roof ladder.
- S 6.5 **Stairway design and construction** shall be per **API-650**, and the following:
 - a. Maximum angle with a horizontal line shall be 45 degrees.
 - b. Minimum effective tread width shall be 8 in.
 - c. Minimum effective width of stair shall be 2 ft 6 in. (750 mm), except where connecting to 2 ft (600 mm) wide walkways, in which case the effective width shall be 2 ft.
 - d. Stair landings shall not be less than 2 ft 6 in., in the direction of the stairway.
 - e. A vertical handrail post shall be provided for each tread, extending from tread to handrail.

LADDERS

- O * 6.6 **Tanks not equipped with spiral stairways** shall be provided with an external vertical ladder. Alternative staircases for closely spaced tanks may be specified by the Owner's Engineer.
- S 6.7 **Ladders and safety cages** shall be per **ANSI A14.3** except as modified below:
 - * a. Where ladders are the only means of access, they shall provide for side-step access to platforms unless through ladder type is specified.
 - b. Where ladders serve as a secondary access to platforms, they may be either the side-step or through ladder type installation.
 - c. Hinged drop bars or safety gates shall be provided across ladder openings at each platform landing.
 - d. Ladder safety devices shall not be used in lieu of cage protection.
 - e. Ladders shall be designed for a moving concentrated load of 500 lb. (227 kg).

PLATFORMS, GUARD RAILINGS, TOE PLATES

- S 6.8 **Platform floor plate** shall have a raised pattern and 1/4 in. (6 mm) nominal thickness. **Drainage** shall be provided by one hole, 1/2 in. (13 mm) diameter, for approximately every 15 sq ft (1.5 m²) of steel floor plate. Holes shall be located at low spots, and shall be drilled after erection.
- S 6.9 **Guard railings and toe plates** shall be per **ANSI A1264.1**. Guard railings shall be constructed of structural steel shapes or pipe. Any pipe railing shall be seal welded to prevent internal corrosion.
- S 6.10 **For fixed roof tanks, guard railings** shall be installed along the edge of the roof, extending at least 15 ft (4.5 m) beyond the platform in each direction.

ADDITIONAL REQUIREMENTS FOR FLOATING ROOF TANKS

GAUGE WELL AND GUIDE POLE

- O 7.1 **Gauge well and guide pole assemblies** shall be provided as follows:
 - * a. A combination gauge well and guide pole assembly per **Figure 3** shall be provided for each external floating roof tank whether or not the tank is to be equipped with an automatic gauge. Gauge well shall be burr-free. Unless otherwise specified, this design may also be used for internal floating roof tanks.
 - b. If an automatic gauge is installed in a combination gauge well and guide pole assembly per **Figure 3**, then a manual gauging-sampling well per **Figure 4** also shall be provided.