

SCOPE

- I 1.1 This practice covers the design and layout of piping, and the location of associated equipment, for storage tanks and storage vessels.
- I 1.2 Requirements for Foam Systems or Cooling Water Deluge and Spray Systems are not covered by this practice.
- I 1.3 **An asterisk (*) indicates that additional information is required. If a job is contracted, this additional information is furnished in the Job Specification.**

SUMMARY OF ADDITIONAL REQUIREMENTS

- R 2.1 **ASME B31.3, Process Piping**, shall be used with this practice.

PIPING AUXILIARIES AND CONNECTIONS

- M 3.1 **All tank nozzles, except** those on the roofs of fixed roof storage tanks, shall be **valved**, using block valves per **IP 3-12-1** located at the tank nozzles.
- S 3.2 **Protection against liquid thermal expansion** shall be per **IP 3-2-4**.
- S * 3.3 A **valved bypass** to an API Low Type or Regular Type nozzle shall be provided **around elevated inlet nozzles or jet mixing nozzles** to permit initial filling without splashing or spraying.

ADDITIONAL REQUIREMENTS FOR REFRIGERATED STORAGE VESSELS

- S 3.4 **The block valve adjacent to the vessel in the main process piping** (fill and discharge lines) shall be **motor actuated**. The valve actuator and leads shall be **fireproofed**. An emergency OPEN-CLOSE pushbutton control shall be located outside the dike.
- S,M 3.5 **All connections below the liquid level** shall be **provided with a block valve**, installed as follows:
 - a. **For single wall vessels**, the block valve shall be located adjacent to the shell insulation.
 - b. **For double wall vessels**, the block valve shall be located adjacent to the outer shell. There shall be no flanged joints between the connection to the inner wall and the flange at the block valve.
 Piping connections between the vessel and the block valve are prohibited.
- S 3.6 **Liquid drawoff piping leading to the atmosphere** or to an open container shall be **double valved**.

ADDITIONAL REQUIREMENTS FOR PRESSURIZED (EXCLUDING REFRIGERATED) STORAGE

- S 3.7 **Liquid drawoff piping leading to the atmosphere**, or to an open container, shall be **double valved** if the vessel contains stocks which can auto-refrigerate. The valve next to the shell shall be a quick action type, such as a metal-seated plug valve. The second valve, for flow control, shall be of a type suitable for partially open operation.
- S 3.8 **Water drawoff piping** shall **discharge** at a point not less than 15 ft (4.5 m) from the peripheral boundary of the storage vessel. The discharge shall be so located that any flammable liquid spillage will drain away from the vessel.
- S 3.9 **The block valve adjacent to the storage vessel in the main process piping** - fill lines if located below the liquid level, and discharge lines - shall be motor actuated and remotely controlled from outside the dike. The valve actuator and leads shall be fireproofed.

PIPING LAYOUT AND INSTALLATION

- R 4.1 **Tank piping** shall have a minimum of **one elbow** between the tank and dike wall:
Stress caused by various load combinations and their respective allowable stresses are given below:

LOAD COMBINATION	ALLOWABLE STRESS
T + R	S_R
P + W	S_A
T + R + S	$2S_R$

where: T = Thermal expansion or contraction of piping and tank
R = Radial movement and rotation of tank nozzle due to tank wall bulging caused by hydrostatic head and pressure
P = Design pressure of pipe
W = Weight of pipe and contained fluid plus any sustained external loadings
S = Tank settlement
 S_R = Allowable stress range per **ASME B31.3**
 S_A = Allowable stress at design temperature per **ASME B31.3**

- R * 4.2 **Moment exerted on the tank nozzles by the connected pipe** shall be limited to the maximum allowable moment calculated for the nozzle in accordance with **IP 9-4-1**.
- M 4.3 **Aboveground piping either extraneous or associated with tanks or vessels** shall not run through separately diked areas of other tanks or vessels. However, piping at atmospheric storage tanks within a group may cross intermediate toe walls within that group.
- S * 4.4 **Pumps and piping manifolds shall be located outside the diked area**, except pumps may be located within the diked area to limit the suction line pressure drop of heavy viscous stock. In such cases, remote shut-off facilities shall be provided outside the diked area.
- S 4.5 **Ancillary equipment for the operation of the storage tanks** such as air eliminators, filters, refrigeration equipment and air-cooled heat exchangers shall be **located outside the diked area**. The **location of shell and tube exchangers** shall be **governed by the following**:
- * a. Exchangers integral with the piping system may be located within the diked area for atmospheric storage operations if approved by the Owner's Engineer.
- b. Exchangers associated with refrigerated storage operations shall be located outside the diked area.
- O 4.6 **Process unit feed tanks** shall have **separate filling and discharge systems** to avoid sending slugs of water to the process units.
- R 4.7 **Permanent piping shall not be connected** to the tank shell until after completion of tank hydrostatic testing.
- R 4.8 **Protection of pipe passing through dikes**. A protective coating system in accordance with **IP 19-1-1**, as for Underground Steel Pipe, shall be applied to portions of piping passing through dikes or dike sleeves. A sleeve is required where pipes pass through concrete dikes.
- S **The annular space between pipe and pipe sleeve** shall be packed with a sealant material from outside the dike and a minimum of 6 in. (150 mm) of fire resistant material, such as ceramic fiber, from inside the dike. A sliding joint packed with fire retardant material or metallic bellows joint (between pipe sleeve and outside surface of process pipe) may be used. Sleeves shall be provided with **low point drain holes**. For horizontal installations, drain holes shall be located near each end of the sleeve.

ADDITIONAL REQUIREMENTS FOR ASPHALT AND "HOT" OIL [ABOVE 250°F (120°C)] STORAGE VESSELS

- S 5.1 **Fill and discharge systems** shall not have connections to other systems to reduce the risk of injection of water or light ends [Reid Vapor Pressure of 15 psia (103.4 kPa) or greater].
- O * 5.2 Only **external steam tracing, or self limiting electric tracing** when approved by the Owner's Engineer, shall be used on fill and discharge lines. Steam jacketing is not permitted.