

SCOPE

- 1.1 This practice covers the design, selection, and application of instrumentation for atmospheric storage tanks, pressure storage vessels, and refrigerated storage tanks. Not included are normal onsite surge vessels closely associated with process units and considered unit pressure vessels.
- Requirements for tank blanketing and water draw-off instrumentation, and manual tank gauging equipment are not covered in this practice.
- 1.2 **An asterisk (*)** indicates that a decision by the Owner's Engineer or purchaser 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

- 2.1 **Table 1** lists the practices and standards which shall be used with this practice.

TABLE 1

PRACTICES	
IP 3-6-1	Piping for Instruments
IP 9-7-1	Accessories for Atmospheric Storage Tanks
IP 15-2-1	Temperature Instruments
IP 15-3-1	Pressure Instruments
IP 15-5-1	Level Instruments
STANDARDS	
API Standard	
RP 551	Instrumentation and Control Manuals for Refinery Service - RP 551 Process Measurement Instrumentation (All Sections)
2545	Method of Gauging Petroleum and Petroleum Products (ANSI/ASTM D1085)
Section 1B	Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Tanks by Automatic Tank Gauging
Section 3	Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Pressurized Storage Tanks by Automatic Tank Gauging
Chapter 7.4	Static Temperature Determination using Fixed Automatic Tank Thermometers
API MPMS	Manual of Petroleum Measurement Standards (Chapter 3 Tank Gauging)

DEFINITIONS

- 3.1 **Pressure Storage Vessels** are above-ground pressurized spheres, bullets, and horizontal and vertical drums, used for the storage of toxic and/or flammable liquids (such as LPG and ammonia), designed for pressures greater than 2.5 psig (17 kPa gage). Not included are normal onsite surge vessels closely associated with process units and considered unit pressure vessels.
- 3.2 **Refrigerated Storage Tanks** are above-ground storage tanks and spheres operating at metal temperatures between +40°F and -270°F (+5°C and -168°C) and at pressures not exceeding 15 psig (103 kPa gage).
- 3.3 **Flammable Liquids** are low flash point liquids [flash point below 100°F (38°C)] (such as gasoline, some jet fuels, etc.) and high flash point liquids [flash point 100°F (38°C) or higher] when handled at temperatures above or within 15°F (8°C) of their flash point (such as some heated asphalts). Crude oils are not included.
- 3.4 **Combustible Liquids** are high flash point liquids [flash point of 100°F (38°C) or higher] (such as kerosene, some jet fuels, heating oils, heavy fuel oils, lubricating oils, transformer oils, and some asphalts) when handled at temperatures more than 15°F (8°C) below their flash points.
- 3.5 **Crude Oils** are hydrocarbon mixtures which have not been processed in an oil refinery. This category also includes other wide boiling range stocks which may boil-over during a tankage fire.
- 3.6 Refer to applicable national codes and standards for definitions of **Hazardous and Toxic Materials**.

IP 15-1-3		Instruments for Storage Tanks and Vessels	EXXON INTERNATIONAL PRACTICE
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DESIGN AND INSTALLATION

- I,C 4.1 **All level gauging and temperature sensing devices** to be installed on any new or existing atmospheric storage tanks, pressure storage vessels and refrigerated storage tanks in existing facilities shall be designed to match existing equipment to the maximum extent possible. Exceptions must be approved by the Owner's Engineer.
- R 4.2 All Automatic Tank Gauging (ATG) Systems and associated components, data transmission system, etc., shall **incorporate lightning protection** surge arrestors or shall otherwise be inherently designed to resist damage due to lightning strikes.

LEVEL INSTRUMENTS

- I * 4.3 **Automatic level gauging instruments** shall be float, servo-operated, radar, displacer, or differential-pressure type, and shall be designed for continuous operation. The Owner's Engineer shall approve all installations.
- * Proposals to use other types of automatic level gauging instruments, such as capacitive, ultrasonic, or magnetostrictive, shall be submitted to the Owner's Engineer for prior approval.
- S,E 4.4 The use of **level gauge glasses** on atmospheric storage tanks, pressure storage vessels, and refrigerated storage tanks is **prohibited**.
- I * 4.5 Servo-operated or radar type gauges are the **preferred measurement method** for product sales, custody-transfer, and internal inventory accounting **applications**. Automatic level gauge selection shall be reviewed/approved by the Owner's Engineer.
- I 4.6 **Automatic level gauges** (Servo, Radar, Floats) shall be capable of **measuring level** to $\pm 1/8$ in. (± 3 mm).
- Differential pressure type instruments**, which provide inferential rather than direct level gauging, shall be capable of measuring level to ± 1 in. (± 25 mm).
- * For **custody transfer applications**, the gauging system (i.e., level gauge, signal transmission and data-acquisition system) shall be designed to meet the accuracy specified by the applicable Exxon regional **"Hydrocarbon Measurement"** manual.
- O 4.7 Level gauging instruments shall be equipped with a **level indicator readable from grade** for each atmospheric storage tank, pressure storage vessel, and refrigerated storage tank. Exceptions must be approved by the Owner's Engineer.
- M 4.8 **Level gauges and alarm devices** shall be located such that all external components of the gauge and alarm device are **accessible for maintenance** from grade or a permanent platform. The tank roof or wind girder is not considered a permanent platform.
- O * 4.9 **A stilling well** is required for all internal level gauging devices, unless specified otherwise by the Owner's Engineer. Stilling wells for float, servo-operated, and radar gauges shall be designed in accordance with [IP 9-7-1](#).

TEMPERATURE MEASUREMENT

- O 4.10 **Temperature indication** shall be provided for each atmospheric storage tank, pressure storage vessel and refrigerated storage tank.
- * Where an **accurate volume measurement** is required (e.g., sales or custody transfer applications) a resistance temperature detector (RTD) shall be specified and provided with remote indication at a location specified by the Owner's Engineer.
- Overall accuracy** of the measurement system, including the sensor, signal transmission, and readout devices, shall be $\pm 1.25^{\circ}\text{F}$ (0.7°C). This accuracy does not include errors due to the placement of the thermowell or temperature stratification in the tank.
- I * 4.11 **Single point temperature measurement** shall be used for unheated, low-viscosity (below 36 centistokes) products and continuously heated fuel oils. For tanks containing other products, as well as where density stratification exists, the measurement technique to be used (e.g., multi-element temperature measurement system) shall be specified by the Owner's Engineer.