

Changes shown by

SCOPE

- I 1.1 This practice covers the piping associated with field instrument installations and instrument air systems. Piping for Sample Transport and Conditioning Systems of process analyzers are covered by [IP 15-8-2](#).
- I 1.2 **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 practices, code and standards which shall be used with this practice.
- I 2.2 **ISO 5167-1**, *Measurement of Fluid Flow by Means of Pressure Differential Devices*, shall be used with this practice, as specified by the Purchaser.

TABLE 1

PRACTICES			
IP 3-6-2	Piping at Control and Protective System Valve Stations	IP 15-1-3	Instruments for Storage Tanks and Vessels
IP 3-9-1	Winterization and Protection Against Ambient Temperatures	IP 15-2-1	Temperature Instruments
IP 3-18-1	Piping Fabrication Shop or Field	IP 15-3-1	Pressure Instruments
IP 4-2-1	Auxiliary Structures for Operation and Maintenance	IP 15-4-1	Flow Instruments
		IP 15-5-1	Level Instruments
CODE AND STANDARDS			
API Standards		ASME Code	
RP551	Process Measurement Instrumentation	Sect. VIII	Pressure Vessels, Division 1
Manual of Petroleum Measurement Standards (MPMS)		ASTM Standards	
Chapter 5.2	Measurement of Liquid Hydrocarbons by Positive Displacement Meter	A269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
Chapter 5.3	Measurement of Liquid Hydrocarbons by Turbine Meter	B16	Free Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
Chapter 5.4	Accessory Equipment for Liquid Meters	B68	Seamless Copper Tube, Bright Annealed
Chapter 14.3	Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids	B111	Copper and Copper Alloy Seamless Condenser Tubes and Ferrule Stock
ASME Standards		D1047	Poly (Vinyl Chloride) Jacket for Wire and Cable
B1.20.1	Pipe Threads (Except Dryseal)		
B16.36	Steel Orifice Flanges		

- S 2.3 **No fluids**, except instrument air, potable water, and fresh air from a safe location, **shall be piped into the control house**. Instrument air that is backed up by nitrogen shall not be piped into control houses or other walk-in enclosed spaces.
- S 2.4 Downstream of the first isolation block valve, **all piping, tubing, instruments, and instrument accessories** in contact with the process or any purge medium, shall have a suitable pressure/temperature rating and material for the service conditions.

MOUNTING OF INSTRUMENTS AND ACCESS REQUIREMENTS

- C,O 3.1 The preferred instrument installation is close coupled (line mounted).
- M,S * 3.2 **All instruments, including thermocouples, shall be accessible for maintenance**. Instrument process connections which require maintenance shall also be accessible, including accessories such as rod-out connections, condensate pots, and seal connections. Permanent platforms for instrument maintenance are preferred. In cases where personnel safety is not compromised, alternative methods of access may be approved by Owner's Engineer.
- R 3.3 When **piping or platforms** are subject to process or equipment induced vibrations (e.g., fluid solids units, reciprocating compressors, lines in two-phase flow, hydraulic shock from rapid valve action) a more stable location for the instrument mounting shall be selected. In addition, piping/tubing bends shall be used to mitigate vibration.

- S 3.4 **Insertion type instruments** shall be equipped with a blowout prevention device, such as a mechanical stop or safety chain. This device must prevent the unintentional removal of the instrument while under process pressure. Insertion type instruments that are installed in a toxic or flammable service and rely on a non fire resistant elastomer seal (PTFE, for example) for process pressure containment, shall be equipped with a secondary seal that will prevent the process fluid from being released in the event that the instrument is subjected to a fire.
- M,O 3.5 In addition to any vendor-supplied nameplate, each installed instrument shall be provided with an **identification nameplate** containing the tag number and the process service description. These nameplates shall be fabricated from a corrosion resistant material and shall be permanently and securely fastened. The identification nameplate shall be visible from grade or the associated maintenance platform. If any process connection is not viewable from its associated instrument, then a separate tag name plate is required at each such process connection.

TAKE-OFF CONNECTIONS

- M 4.1 **A gate valve shall be installed in each instrument take-off connection**, and shall be located as close to the vessel or line as possible, consistent with manual opening and closing of the valve. In no case shall the valve outlet be a distance greater than 9 in. (225 mm) from the branch connection. The use of elbows between the take-off point and the valve is prohibited. Take-off connections, including the first valve, shall be in accordance with the line service classification.
- M,O * 4.2 **Separate process take-off connections** shall be furnished for **each instrument** except as follows, in which case separate block valves shall be provided.
- a. Dual range installations requiring two instruments.
 - b. Pressure measurement associated with flow metering or suppressed range pressure instruments.
- All other proposals to use the same set of process take off connections for more than one instrument shall require the approval of the Owner's Engineer.
- R 4.3 For **process lines**, the **minimum size of take-off connections** shall be NPS 1/2 (15 mm). Where the line service classification (including corrosion allowance) will result in an ID of less than 0.466 inches or 12 mm (equivalent of Schedule 160), the connection size shall be increased to NPS 3/4 (20 mm). Alternatively, a suitable alloy material with a smaller required corrosion allowance may be used.
- R 4.4 For **pressure vessels**, a minimum NPS 2 (50 mm) nozzle-sized flanged valve with the same pressure/temperature rating and metallurgy as the vessel shall be used. The outboard side of the valve shall be suitable for connection to the instrument. Thermowells are excluded from this valve requirement.
- R,O * 4.5 **Connections to vessel bottom** shall be avoided whenever possible. When this is not possible, bottom connection shall extend into the vessel at least 3 in. (75 mm) beyond the inside of the shell or vessel lining. All bottom connections shall be approved by the Owner's Engineer.
- R,O * 4.6 **Connections to vessel top** shall be avoided whenever possible where the upper fluid is a liquid. When this is not possible, a valved vent connection shall be furnished at the highest point in the instrument piping. All top connections shall be approved by the Owner's Engineer.
- O 4.7 **Take-off connections for pressure instruments** shall be horizontal except for gauges which can be vertical.
- O 4.8 Horizontal process **takeoff connections** for all **differential pressure type flow meters** are preferred. Gas takeoffs may be installed from horizontal to 90 degrees above horizontal and liquid connections from horizontal to 45 degrees below horizontal.
- O 4.9 The **mounting location for differential pressure type flow instruments and pressure instruments** with relation to take-off connections shall be as follows:

FLUID	INSTRUMENT LOCATION	
	Line-Mounted	Pedestal Mounted
Liquids	Level with or below take-off	Below take-off
Non-Condensing Gases	Level with take-off	Above take-off (1)
Steam/Condensing Vapors	At least 2 in. (50 mm) below take-off	Below take-off
Cryogenic Liquids	Level with take-off with the connection to the instrument being beyond the 100% vapor point (usually 12 in. (300 mm) from the line or vessel)	Above take-off

Note:

- (1) If necessary to mount below take-off connection, make take-off horizontal and (a) for **liquid filled vertical legs**, provide fill connections and (for displacement type) seal pots, or (b) for **gas filled vertical legs**, provide heat tracing, knock-out pots, or drain pots with drain valves as dictated by the amount of condensate expected.