

Changes shown by ↕

SCOPE

- I 1.1 This practice covers requirements for valve selection excluding control valves and pressure relief valves.
- I 1.2 **An asterisk (*)** indicates that additional information is required. If a job is contracted, this information is furnished in the Job Specification.

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 practice, code, standards and specification which shall be used with this practice as specified by the Purchaser.

TABLE 1

PRACTICE	
IP 3-12-9	General Requirements for Valves
STANDARDS	
ASME Standard	
B16.34	Valves - Flanged, Threaded, and Welding End
API Standards	
594	Wafer and Wafer-Lug Check Valves
600	Steel Gate Valves, Flanged and Buttwelding Ends
602	Compact Steel Gate Valves-Flanged, Threaded, Welding, and Extended-Body Ends
603	Class 150, Cast, Corrosion-Resistant, Flanged-End Gate Valves
608	Metal Ball Valves, Flanged, Threaded, and Welding End
609	Butterfly Valves, Lug-Type and Wafer-Type
ASTM Standard	
A 494 / A 494M	Castings, Nickel and Nickel Alloy
AWWA	
C504	Rubber-Seated Butterfly Valves

TABLE 2

PRACTICE	
IP 19-1-1	Paint and Protective Coatings
CODE, STANDARDS AND SPECIFICATION	
ASME Code	
B31.3	Process Piping
ASME Standard	
B1.20.1	Pipe Threads, General Purpose (Inch)
API Standard	
607	Fire Test for Soft-Seated Quarter-Turn Valves
AWS Specification	
A5.13	Solid Surfacing Welding Rods and Electrodes
MSS Specification	
SP-25	Standard Marking System for Valves, Fittings, Flanges, and Unions

DEFINITIONS

- I 3.1 **Onstream equipment isolation** as used herein indicates the removal from service of equipment or a unit for the purpose of repairs, cleaning, or inspection while the remainder of the plant continues in operation. Equipment includes pumps, compressors, steam turbines, dryers, vessels, and fired heaters either provided with a spare or able to be bypassed.

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- I 3.2 **Product segregation to prevent contamination.** The prevention of fluid mixing which would result in unacceptable contamination of either fluid.
- I 3.3 **Segregation for safety.** The segregation for safety of fluids which could result in an explosive mixture such as at cyclic POWERFORMING unit reactor and regeneration block valves.
- I 3.4 **Line service classification** defines the design pressure, design temperature, material, and corrosion allowance of a piping system.
- I 3.5 **Dangerous materials**, for purposes of this practice, include the following:
 - a. Toxic materials such as phenol, hydrogen sulfide, chlorine.
 - b. **Highly corrosive** materials such as acids, caustic and other similar materials.
 - c. **Flammable materials** (including light hydrocarbons lighter than 68 degrees API).
 - d. **Boiler feedwater and steam**, in systems requiring ASME Class 300 and higher flange ratings.
 - e. **Oxygen** in concentrations greater than 35%.
- I 3.6 **Non-dangerous materials**, as used herein, include all materials not listed as dangerous per **Par. 3.5**.
- I 3.7 **Combustible liquids.** High flash liquids [flash points 100°F (38°C) or higher] when handled at temperatures 15°F (8°C) below their flash point and lower.
- I 3.8 **Flammable liquids.** Low flash liquids [flash point below 100°F (38°C)]; and high flash liquids [flash point 100°F or higher] when handled at temperatures above or within 15°F (8°C) of their flash points.
- I 3.9 **Flammable materials.** Flammable liquids; hydrocarbon vapors; and other vapors, such as hydrogen and carbon disulfide, that are readily ignitable when released to atmosphere.
- I 3.10 **Block Valve** refers to any valve used to stop flow, typically, an on/off valve.
- I 3.11 **Valve Type:**
 - a. **Wafer type valve** describes a valve type which is installed between mating pipe flanges and held in place by the compressive force produced by the mating flange bolt forces. The flange bolts are exposed.
 - b. **Lug style valves** are single flange valves where **ALL** the flange bolts are covered by the valve body material. The valve is held in place either by the compressive force produced by the mating flange bolt forces (preferred method) or by the use of machine bolts threaded into the valve body.
 - c. **Flanged valves** are the conventional double flanged valves.
 - d. **Welding End Valves** (Buttweld end) are conventional valves with buttwelding ends.
- I 3.12 **Emergency block valves (EBV).** Type A is a manually operated valve located at the equipment nozzle. Type B is a manually operated valve located in the piping system at least 25 ft (7.5 m) from the equipment protected. Type C is a power operated valve located in the piping system located at least 25 ft from the equipment protected with the actuator button mounted on the actuator. Type D is a power operated valve located anywhere in the piping system with a remotely located actuator button at least 40 ft (12 m) from the equipment protected.
- I 3.13 **Soft seals** are defined as resilient sealing elements located in the body seating and/or closure components.
- I 3.14 **Wet H₂S** is defined as greater than 50 wppm of H₂S in a water phase (determined by using the total amount of sulfide in the water phase) or ≥ 0.05 psia (0.34 kPa abs) H₂S partial pressure in the gas phase with liquid water present.
- I 3.15 **Corrosion inhibitor.** An additive to inhibit corrosion between two materials. There are active and passive corrosion inhibitors.
- I 3.16 **Slurry Service.** Streams having a solids content greater than 0.1 lb/gal (11.98 kg/m³).
- I 3.17 **Fire-Tested.** For the purpose of this practice means compliance with API Standard 607, fourth edition or later.

MATERIALS

- R *4.1 Unless otherwise specified by Owner or by the block valve requirements of [Table 6](#), **trim material selection** for carbon steel or low alloy (up to 9% chrome) gate, globe and check valves shall be in accordance with [Table 3](#).

**TABLE 3
TRIM REQUIREMENTS**

SERVICE	NOMINAL TRIM MATERIAL (PER API 600)
a) Caustic	Trim #1, or #8
b) Water, Air, or Inert Gas	Trim #1, or #8
c) Hydrocarbon service 68 deg API (0.709 relative density) and heavier and other lubricating type service	Trim #1, or #8
d) Hydrocarbon service lighter than 68 deg API including vapor (non-lubricating service) Up to 900°F (480°C) maximum fluid design temperature Over 900°F (480°C) maximum fluid design temperature	Trim #8 Trim #5
e) Steam, boiler feedwater and condensate Class 150 and 300 Class 600 and higher	Trim #8 Trim #5
f) Wet H ₂ S ⁽¹⁾	Trim #2, #3, #5, #8, #9, #10, #11, #12, #13 or #14

Note:

(1) For wet H₂S services, see hardness requirements stipulated in [IP 3-12-9](#).

- R * 4.2 **Austenitic stainless steel (types 304, 316, 321, and 347), Monel, and nickel alloy valves** shall have trim, gland bolts and nuts, and yoke bolting of the same nominal chemistry as the body. When Trim #5 is required by [Table 6](#), AWS Specification A5.13 E/R CoCr-A hardfacing shall be provided for body and gate seats. AWS Specification A5.13 E/R CoCr-A hardfacing is always an acceptable alternative for seating surfaces.
- R 4.3 **Material for valve stem packing and seals** shall comply with the following:
- a. **Materials shall be suitable for the fluid service** and for the **maximum and minimum fluid design temperatures** to which these components will be exposed. As a minimum, stem packing for valves in hydrocarbon or steam service shall be suitable for 1000°F (538°C) process temperature.
 - * b. For **all non-oxidizing environments** and for **oxidizing environments** **£ 1000°F (538°C) process temperature, pure graphite** (minimum 95% carbon content) packings and interlaced braided graphite end retainer rings shall be used unless otherwise specified. Density of graphite preformed rings shall be 70 to 90 lb/ft³ (1120 to 1440 kg/m³). All packing rings shall contain corrosion inhibitor.
 - * c. **Except for certain acid services and oxygen, fire-tested valve stem packing materials** shall be used in **flammable, combustible or dangerous material services**.
- R 4.4 **Cast Monel valve material** shall be specified per ASTM A 494 / A 494M Grade M-35-1 or Grade M-30C. The supplemental Weldability Test S-2 (per A 494 / 494M) shall be specified.
- R * 4.5 **Limitations on the use of copper, and copper based alloys**, shall be as given below for the following services:
- a. **Ammonia:** Alloys with a copper content greater than 50% shall not be used in ammonia service or in aqueous solutions containing ammonia where the pH exceeds 8.5.
 - b. **Caustic and alkaline:** Alloys with a copper content less than 85% shall not be used.
 - c. **Acetylene:** Alloys with a copper content greater than 50% shall not be used in services where acetylene in a wet environment is present.
- R 4.6 **17-4PH stainless steel valve stems, shafts, hinge pins and their integral components**, shall not be used for design temperatures greater than 750°F (400°C). 17-4PH stainless steel is an acceptable substitute for 13 Cr when the material and heat treatment comply with ASME SA-564, Type 630, condition double 1150.
- R * 4.7 **Monel** shall not be used in H₂S service above 400°F (205°C) or Catacarb service.

R 4.8 For butterfly valves for water service, valve materials shall be per **AWWA C504** except as modified below:

*SERVICE (1)		BODY LINING	SHAFT	DISC
Fresh Water	Not Throttled	Buna-N rubber seat (full lining not required)	Monel; or Austenitic Stainless Steel	Bronze; or Austenitic Stainless Steel
	Throttled	Buna-N rubber		
Brackish or Salt Water	Not Throttled	Buna-N rubber	Monel; or Type 316 Stainless Steel	Bronze per ASTM B584 Alloy C90500: or Type 316 Stainless Steel (2)
	Throttled			Monel; or Type 316 Stainless Steel (2)

Notes:

- (1) A valve is considered to be in throttling service when the disc is at an angle greater than 10 degrees from the full open position during normal operation.
- (2) Type 316 stainless steel shall not be used in services where the fluid (line) velocity, with the disc in its normal operating position, is less than 3 ft/sec (0.9 m/s) or where the disc is normally closed.

APPLICATION AND LIMITATIONS ON USE

S 5.1 GENERAL

- a. All valves shall be suitable for the **line service classification**.
- b. Single or double valves at a classification change shall be suitable for the more severe line classification on either side of the valve(s) location.
- c. Valves around control valves (upstream, downstream, and bypass) shall be of the same Class rating as the most severe line classification.

R,O 5.2 **Gate and globe valves** shall have **flanged ends, bolted bonnet**, and shall be **OS&Y** (outside screw and yoke). Deviations from these requirements, if any, shall be specified.

R 5.3 COMPACT AND EXTENDED BODY STEEL VALVES

- a. **Threaded and socket welding steel gate valves** per API 602 and **steel globe valves conforming to** the applicable requirements of API 602 may be used within the following limits:
 1. Valves shall be OS&Y (outside screw and yoke).
 2. The specified line **corrosion allowance** is 1/8 inch (3 mm) or less; or, if the specified valves have a thickness in excess of the minimum API 602 specified thickness, the additional thickness may be considered as additional corrosion allowance.
 - * 3. Valves shall be bolted bonnet unless welded bonnet is specified. Bonnet welds shall be maximum 225 Brinell hardness.
- b. Flanged valves per API 602 are not acceptable.

R 5.4 API 603 VALVES

API 603 valves shall not be used where the specified corrosion allowance of the connecting pipe of the same material as valve exceeds 0.03 in. (0.8 mm).

S,R 5.5 DUCTILE IRON, CAST IRON, LOW MELTING POINT ALLOY VALVES

- * a. **Ductile (nodular) iron valves**, either austenitic or ferritic, may be used within the limits of ASME B31.3 provided the installation is approved by the Owner's Engineer. Usage in hydrocarbon or dangerous material services require approval by the Owner's Engineer.
- b. **Cast iron valves may only be used in water service not subject to freezing.**
- c. **Low melting point alloy valves**, such as aluminum, brass or bronze, shall not be used for services in which **failure of the valve in a fire would increase the hazardous condition**. Examples are: Prevent steam flow to any process pump, steam header, or emergency steam line.
- d. **Low melting point alloy valves**, such as aluminum, brass and bronze, **shall not be used in hydrocarbon service.**