

Casting Quality for Valves and Other Equipment in Critical Service

(This practice is appropriate for attachment to Inquiry or Purchase Document)

IP 18-3-4

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Rev. 1

June 2000

Changes shown by

SCOPE

- I * 1.1 This practice covers supplementary soundness requirements for pressure containing valves and other castings in critical service, when specified by the Owner's Engineer, for the following materials, service or operating conditions:
 - a. **Low alloy steel (P-Numbers 3, 4, 5A, 5B and 5C) valves in Hydrogen service** with design temperatures greater than the CS curve shown in API RP 941.
 - b. **All valves with ASME Class 900, 1500 and 2500 ratings.**
 - c. **Other valves and castings** designated by the Owner's Engineer.
- I 1.2 An asterisk (*) indicates that a decision by the Purchaser is required or that additional information is furnished by the Purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

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

TABLE 1

PRACTICES			
IP 18-10-1	Additional Requirements for Materials	IP 20-1-1	Inspection of Equipment and Materials
IP 18-12-1	Positive Materials Identification		
CODES, SPECIFICATIONS AND STANDARDS			
ASME		MSS Specification	
Section VIII	Pressure Vessels, Division 1	SP-55	Visual Examination Method
B31.3	Process Piping	API Recommended Practice	
B16.34	Valves - Flanged, Threaded, and Welding End	RP 941	Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants

DEFINITIONS

- I 3.1 The term **Inspector**, as used in this practice, refers to the Owner's Representative.
- I * 3.2 **Critical areas** are those defined by the Owner's Engineer and/or based on the results of examination of initial casting(s), including:

a. Valves	- End flange to body transition area. - Body transition area to the bonnet. - Small integral nozzle/bleed connections. - Both ends of butt welding end valves.
b. Other Equipment	- Abrupt changes in casting section thickness or shape. - Locations where risers, gates and feeders are attached to the casting. - Locations that may be subject to high-stress service loadings. - Ends of butt welding connections. - Other areas so designated by the Owner's Engineer.

EXAMINATIONS AND ACCEPTANCE CRITERIA

- I 4.1 The Inspector shall be furnished mill test reports of chemical composition and mechanical properties of castings.
- R * 4.2 **Table 2** specifies the nondestructive examinations and acceptance criteria required for:
 - a. Low Alloy Steel Valve Castings (P-numbers 3, 4, 5A, 5B and 5C) in hydrogen service with design conditions exceeding the limitations stated in **Par. 1.1a**.
 - b. All valves with ASME Class 900, 1500 and 2500 ratings.
- R * 4.3 The nondestructive examinations and acceptance criteria for other valves and castings will be specified by the Owner's Engineer.



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TABLE 2
REQUIRED EXAMINATIONS AND ACCEPTANCE CRITERIA

MATERIAL	EXAM TYPE(1)	EXAM FREQUENCY (NO. OF CASTINGS)	EXTENT OF EXAM	ACCEPTANCE STANDARDS
Carbon and Low, and Medium Alloy Steel: P1, P3, P4, P5A, P5B, P5C, P6, P7 and other magnetic materials	VT	All	100%	VT-1
	MT	All	100%(2)	MT-1
	RT	Initial: F1 Balance: F2 (see below)(4)	Critical areas (see Par. 3.2, this practice)(4)	RT-1(3)
Austenitic Stainless steels, Nickel steels and all Other Non-magnetic Materials	VT	All	100%	VT-1
	PT	All	100%(2)	PT-1
	RT	Initial: F1 Balance: F2 (see below)(4)	Critical areas (see Par. 3.2, this practice)(4)	RT-1(3)

Frequency of Examination:

F1: Min. of 2% of the order from each foundry for each material, with at least one casting of the highest ANSI Class rating and for the largest size for each material.

F2: Min. of 10% of the order as selected by the Inspector. Shall include one casting of each size and maximum ANSI Class rating as a minimum.

Acceptance Standards:

VT-1: MSS SP-55.

MT-1: ASME B16.34, Section 8

PT-1: ASME B16.34, Section 8

RT-1: ASME B16.34, Section 8

Notes:

- (1) VT - Visual examination per MSS SP-55.
MT, PT, RT per ASME B16.34, Section 8.
- (2) Including machined gasket surfaces and weld bevels.
- (3) If a defective casting is found by radiography, two additional castings of the same material and type shall be examined. If either of these is defective, all remaining castings of the same material and type shall be examined.
- * (4) When specified by the Owner's Engineer for severe cyclic service, all castings shall be 100% RT examined.

REPAIRS

- R 5.1 Repair and reexamination of castings shall be per ASME Code Section VIII-1, Appendix 7, Par. 7.4, except:
- a. Repair welds in carbon and low alloy steel materials shall be postweld heat treated in accordance with the requirements of either ASME Section VIII-1 or ASME B31.3. Welds shall meet the hardness requirements in [IP 18-10-1](#) covering Testing Equipment, Testing Procedure, and Acceptable Hardness Values.
 - * b. Repair welds in austenitic stainless steel shall be solution annealed when specified by the Owner's Engineer.
 - * c. Repairs in other materials shall be as agreed upon by the Owner's Engineer.

Revision Memo

1/77	Original Issue of Basic Practice	12/92	Revision 3
6/80	Revision 1	12/93	Revision 4
6/82	Revision 2		
3/98	Revision 0 - Original Issue of International Practice		
6/00	Revision 1		

Changed title to include castings other than valves.

Par. 1.1a and **4.2** changed the basis for inclusion of low alloy steel valves to design temperature from operating temperature. **Par. 1.1b** deleted the reference to austenitic SS and added Class 900 rating. **Par. 1.1c** added other valves and equipment to scope. **Table 1** added reference to [IP 18-12-1](#) and ASME B16.34. Deleted reference to MSS SP-54. **Par. 3.2.1** and **3.2.2** added to distinguish critical areas of valves from other equipment. **Par. 3.2.1a** clarified critical flange/body areas. **Par. 3.2.1b** clarified critical bonnet/body areas. **Par. 3.2.2** added critical areas for equipment other than valves. **Par. 4.2a** deleted reference to carbon steel. **Par. 4.2b** deleted reference to austenitic SS and added 900 Class rating. **Par. 4.3** added to allow Owner's Engineer to specify inspection criteria for valves and castings in other services. **Table 2** added references grouping all materials into the two categories in the table. Deleted the reference to Frequency of Examination F3. Added reference to note 4 in exam frequency and extent of exam for all material categories. Added sentence to frequency F2 to inspect castings of each size and Class rating. Changed acceptance code for MT-1, PT-1 and RT-1. Changed the exam type code for MT, PT and RT. **Par. 5.1** added carbon steel materials. **Par. 5.1c** added repair requirement for other materials not previously covered.

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