

Pressure Testing of Unfired Pressure Vessels

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

IP 5-3-1

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Rev. 1

March 1998

Changes shown by ↗

SCOPE

- I 1.1 This practice covers the pressure testing of pressure vessels, including TEMA type, double pipe, and air-cooled heat exchangers.
- 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 practice and code which shall be used with this practice.

TABLE 1

PRACTICE	
IP 18-10-1	Additional Requirements for Materials
CODE	
ASME Code Section VIII	Pressure Vessels, Division 1 and Division 2

- I 2.2 All applicable local rules and regulations shall be complied with.

TEST PROCEDURES

- R * 3.1 **Pneumatic testing.** Testing with vessels partly or completely filled with air is not permitted unless approved by the Owner. When such testing is approved, the test pressure shall meet the minimum requirements specified in the **ASME Code Section VIII**.
- R 3.2 Vessels with **internal non-metallic linings or protective coatings** shall be **pressure tested before the application** of such linings or coatings.
- R 3.3 Vessels shall be **pressure tested before external painting** of pressure containing welds.
- R 3.4 **The hydrostatic test pressure** at the top of each section of a vessel shall be no lower than the pressure determined below. A section of a vessel is defined as an area within the vessel where the design pressure or ratio $t/(t-c)$ varies from that of another area.

$$C \times \text{Design Pressure} \times \frac{S_{rt}}{S_{dt}} \times \frac{t}{t-c}$$

The ratio S_{rt} / S_{dt} shall be the lowest ratio for the vessel.

The ratio $t / (t-c)$ shall not be greater than 1.20, and applies to new vessels only.

- C = 1.5 for vessels designed to **ASME Code Section VIII**, Div. 1 allowable stresses;
1.25 for vessels designed to higher than **ASME Code Section VIII** Div. 1 allowable stresses
- S_{rt} = Allowable design stress at room temperature
- S_{dt} = Allowable design stress at design temperature
- t = Vessel section nominal wall thickness, including corrosion allowance
- c = Corrosion allowance

- R 3.5 **The test pressure** shall be held for at least one hour per in. (25 mm) of vessel thickness, and in no case for less than one hour.



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- S **3.6** **Vessel Temperature (metal).** When the vessel thickness exceeds 1/2 in. (13 mm), the metal temperature of the vessel at time of hydrostatic test shall be as follows:
- a. For vessel thickness 2 in. (50 mm) or less, the temperature shall be at least 10°F (6°C) above the temperature at which the impact requirements given in **IP 18-10-1** are met by the material.
 - b. For vessel thickness greater than 2 in. (50 mm), the temperature shall be at least 30°F (17°C) above the temperature at which impact requirements given in **IP 18-10-1** are met by the material.
 - c. When the required vessel temperature during hydrostatic test is greater than 70°F (21°C), this temperature shall be marked on the vessel nameplate.
- S,R * **3.7** **Any vessel containing austenitic stainless steel** shall be tested with water containing **less than 250 ppm (250 mg/kg) chloride ion and a pH greater than 7. Potable water** will meet this requirement. Water shall not be boiled out of the vessel after hydrostatic testing. Proposals to use water deviating from these requirements shall be submitted to the Purchaser for approval by the Owner.
- R 3.8 All vessels with **austenitic stainless steel or high alloy materials exposed to test water** shall be drained immediately after hydrostatic testing and dried by blowing with air.

Revision Memo

9/68	Original Issue of Basic Practice
6/69	Revision 1
6/71	Revision 2
1/74	Revision 3
1/77	Revision 4
12/91	Revision 5
6/97	Revision 0 - Original Issue of International Practice
3/98	Revision 1 Substituted IP 18-10-1 for IP 18-6-1 (deleted).

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