

Changes shown by ↗

## SCOPE

- I 1.1 This practice covers the materials, fabrication, and testing of statically cast steel and alloy pressure containing parts and tube supports for fired heaters for use in high temperature or corrosive service, or both.
- I 1.2 **An asterisk (\*)** indicates that a decision by the Purchaser is required, or that additional information shall be furnished by the Purchaser.

## SUMMARY OF ADDITIONAL REQUIREMENTS

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

**TABLE 1**

| PRACTICES                                                                                         |                                                                     |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| IP 18-7-1                                                                                         | Welding Procedures                                                  |
| IP 18-10-1                                                                                        | Additional Requirements for Materials                               |
| IP 18-12-1                                                                                        | Positive Materials Identification                                   |
| IP 20-1-1                                                                                         | Inspection of Equipment and Materials                               |
| CODES, STANDARD AND SPECIFICATIONS                                                                |                                                                     |
| <b>ASME Codes</b>                                                                                 |                                                                     |
| Section VIII                                                                                      | Pressure Vessels, Division 1                                        |
| Section IX                                                                                        | Welding and Brazing Qualifications                                  |
| B31.3                                                                                             | Process Piping                                                      |
| <b>ASTM Standard</b>                                                                              |                                                                     |
| A 488 / A 488M                                                                                    | Steel Castings, Welding, Qualifications of Procedures and Personnel |
| <b>MSS Specification</b>                                                                          |                                                                     |
| Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components: |                                                                     |
| SP-54                                                                                             | Radiographic Method                                                 |
| SP-55                                                                                             | Visual Method                                                       |

- I \* 2.2 **Table 2** lists the practice and standards which shall be used with this practice **as specified** by the Purchaser.

**TABLE 2**

| PRACTICE       |                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------|
| IP 18-3-3      | Centrifugally Cast High Alloy Tubes for Fired Heaters Other than Steam Cracking Reactors                              |
| STANDARDS      |                                                                                                                       |
| <b>ASME</b>    |                                                                                                                       |
| B16.5          | Pipe Flanges and Flanged Fittings                                                                                     |
| <b>API</b>     |                                                                                                                       |
| 560            | Fired Heaters for General Refinery Services                                                                           |
| <b>ASTM</b>    |                                                                                                                       |
| A 216 / A 216M | Steel Castings, Carbon, Suitable for Fusion Welding, For High-Temperature Service                                     |
| A 217 / A 217M | Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service |
| A 351 / A 351M | Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts                                     |
| A 560 / A 560M | Castings, Chromium-Nickel Alloy                                                                                       |

|                  |           |                                                                                                                                                                                               |                                                                                    |
|------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>IP 18-3-2</b> |           | <b>Statically Cast Steel and Alloy Pressure Containing<br/>Parts and Tube Supports for Fired Heaters</b><br><br>(This practice is appropriate for attachment to Inquiry or Purchase Document) |  |
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| Rev. 2           | June 1999 |                                                                                                                                                                                               |                                                                                    |

## DEFINITIONS

- I 3.1 **The term Inspector**, as used in this practice, refers to the Owner's Representative.
- I 3.2 **Critical areas of load bearing castings** refer to areas subject to tensile stresses equal to or greater than 70% of the allowable stress, areas within 5 section thicknesses of weld bevels, chaplets, chills, and any areas defined by the Owner's Engineer.
- I 3.3 **Critical areas of pressure containing castings** refer to areas subject to stresses equal to or greater than 40% of the allowable stress during service, areas within 5 section thicknesses of weld bevels, chaplets, chills, and any areas defined by the Owner's Engineer.
- I 3.4 **Critical areas of castability of both load bearing and pressure containing castings** refer to areas of the casting configuration where potential casting defects may occur (e.g., at sharp changes in casting cross-section).
- I 3.5 **The term pilot casting** refers to a single casting inspected, tested and accepted in accordance with the requirements of this standard before additional castings are made.

## MATERIALS

- R \*4.1 **Foundries shall be approved by the Owner's Engineer.**
- I ♦ \*4.2 **Material composition and mechanical properties** shall conform to the specified standard or specification except that the lead content shall not exceed 0.01%.
- R ♦ \*4.3 **If patented or proprietary alloys are specified**, the composition and high temperature mechanical properties of such alloys shall be approved by the Owner's Engineer.
- I 4.4 **Chaplets, chills and internal chills** shall be of the same nominal chemical composition as the castings.
- R \*4.5 The use of chaplets or internal chills shall be minimized for heat resistant steel castings and their use requires approval by the Owner's Engineer.
- I 4.6 Inspection and testing shall be performed on castings in the final heat treated condition.

## DOCUMENTATION

- I 5.1 A report of the analysis of each heat shall be furnished to the Inspector. In addition to the elements required by the materials specification, the report shall include the lead content, if not otherwise required, and the content of residual or tramp elements not specified but normally included in the foundry's quality control procedures.
- I 5.2 The casting designer shall identify the critical areas of the casting based on stress and castability as defined by **Pars. 3.2, 3.3 and 3.4** and shall report them to the foundry and the Owner's Engineer.
- I \*5.3 All castings requiring repair shall be reported to the Owner's Engineer. Major repairs require approval before welding. A drawing shall be submitted showing the number, location and extent of weld repairs on each casting.

## FABRICATION

- I \*6.1 Fabrication welding and welding repair procedures for each cast alloy, and welding performance qualifications, shall be in accordance with **ASME Code Section IX** or **ASTM A 488 / A 488M for non-pressure containing parts**, and **ASME IX for pressure containing parts**.
- R 6.2 Base metal weldability tests are required for materials not listed in ASME Section IX, Table QW-422, or their equivalents. Weldability tests shall be approved by the Owner's Engineer.
- R \*6.3 **Weld bevels on ends of fittings** shall be **machined** to remove unacceptable surface discontinuities on the bevel face and along the surface adjacent to the weld for a distance of 1 in. (25 mm). Other machining shall meet the specified dimensions and tolerances.
- R 6.4 All **tube hole edges** shall have 1/8 in. (3 mm) minimum radii to facilitate insertion and removal of tubes.