The proposed additional text for this Addendum is highlighted. Deleted text is indicated by ~~strike through~~.

5.3.2.2 Heat Treating

5.3.2.2.1 General

~~All~~ Heat-treatment operations intended to establish mechanical properties of base material shall be performed using equipment qualified in accordance with the requirements specified by the manufacturer and the requirements as specified in Annex B.

~~Heat-treatment processes shall be in accordance with the manufacturer's approved written specification. For batch heat treatment, the number and location of contact thermocouples (attached to a part, or heat sink as defined by the manufacturer) shall be recorded. A minimum of two contact thermocouples are required per heat-treat batch. The soak time shall begin once all contact thermocouples are within +/- 14 °C (+/- 25 °F) of the qualified temperature set point. Temperature ramp rates and temperature tolerances shall be defined for the heat-treat cycle.~~

~~NOTE For continuous heat treatment, contact thermocouples are not required.~~

~~Furnace loading shall be performed to ensure that the presence of one part does not adversely affect the heat-treating response of any other part. The use of supporting or separating equipment may be required to ensure uniform and adequate heating in the qualified heating zone of the furnace, or to support the running of part thermocouples.~~

~~Quenching shall be performed in accordance with the manufacturer's written specifications.~~

~~a) Water quenching~~

~~The temperature of the water or water-based quenching medium shall not exceed 38 °C (100 °F) at the start of the quench, nor exceed 49 °C (120 °F) at the completion of the quench.~~

~~b) Oil quenching/polymer~~

~~The temperature of any oil/polymer-quenching medium shall be greater than 38 °C (100 °F) at the start of the quench.~~

~~The heat-treat facility shall have a procedure to control and maintain the quality of the quenching media. The procedure shall identify controls of chemistry and purity. Process conditions for the use of the quenching media shall be defined.~~

Note: Examples of heat treat operations referenced in the above paragraph include normalize, austenitize, temper, solutionizing, annealing, and ageing. Heat treat operations exempt from 5.3.2.2 include, but are not limited to, PWHT, stress relief, and DHT.

5.3.2.2.2 Carbon, Low Alloy, and Martensitic Stainless Steels

Heat treatment of Carbon, Low-Alloy, and Martensitic Stainless Steels shall follow these requirements:

1. Heat treat operations shall be performed per manufacturer's written specification.
2. For batch heat treatment, the number and location of contact thermocouples (attached to a part, or heat sink as defined by the manufacturer) shall be recorded.
3. For pressure containing parts, the following shall apply:
    a. Either use a minimum of two contact thermocouples per heat-treat batch, or, follow section 5.3.2.3.
    b. The soak time shall begin once all contact thermocouples are within +/- 14 °C (+/- 25 °F) of the qualified temperature set point.
4. Temperature ramp rates and temperature tolerances shall be defined for the heat-treat cycle.
5. Furnace loading shall be performed to ensure that the presence of one part does not adversely affect the heat-treating response of any other part. The use of supporting or separating equipment may be required to ensure uniform and adequate heating in the qualified heating zone of the furnace, or to support the running of part thermocouples.
6. Quenching shall be performed in accordance with the manufacturer's written specifications.
    a) Water quenching
    The temperature of the water or water-based quenching medium shall not exceed 38 °C (100 °F) at the start of the quench, nor exceed 49 °C (120 °F) at the completion of the quench.
    b) Oil quenching
    The temperature of any oil quenching medium shall be greater than 38 °C (100 °F) at the start of the quench.
    c) Polymer quenching
    The temperature and concentration shall be specified by the polymer manufacturers' specification.

The heat-treat facility shall have a procedure to control and maintain the quality of the quenching media. The procedure shall identify controls of chemistry and purity. Process conditions for the use of the quenching media shall be defined.

5.3.2.2.3 Other Materials

Heat-treatment processes for material other than carbon, low alloy, and martensitic stainless steels shall be heat treated per manufacturer's written specifications.

5.3.2.3 Alternative Validation of Material Mechanical Properties.

If an alternative method for qualifying heat treatment per 5.3.2.2.2 is performed, one of the following methods shall be used to validate the mechanical properties:

1. Prolongation or trepanned core: the mechanical test specimens from a prolongation or trepanned core shall be removed in accordance with section 5.3.5 from an area with thickness greater than or equal to the critical section thickness determined by FEA.

2. Sacrificial Part: the sacrificial part shall be as described in section 5.3.5. The mechanical test specimens shall be removed from the sacrificial part in an area with thickness greater than or equal to the critical section thickness determined by FEA.

5.3.5 Qualification Test Coupon (QTC)

5.3.5.1 General

The properties exhibited by the QTC shall represent the properties of the material ~~comprising the equipment~~ it qualifies.

~~NOTE 1~~ The QTC ~~may~~ shall be a sacrificial part, prolongation, trepanned core, or separately forged test piece.

A single QTC may be used to represent the impact and/or tensile properties of components produced from the same heat, provided it satisfies the requirements of this specification.

~~Note 2~~ A QTC shall ~~may~~ only qualify material and parts produced from the same heat. (Remelt heat may be qualified on a master heat basis.)

When the QTC is a trepanned core or a prolongation removed from a production part, the QTC shall only qualify parts having the same or smaller equivalent round (ER).

5.3.5.2 QTC dimensions

5.3.5.2.1 General

The dimensions of a QTC for a part shall be determined using the following ER method.

5.3.5.2.2 ER Methods

Figure 9 illustrates the basic models for determining the ER of simple solid and hollowed parts and more complicated equipment. The ER of a part shall be determined using the actual dimensions of the part in the “as-heat-treated” condition.

5.3.5.2.3 Required Dimensions

The ER of the QTC shall be equal to, or greater than, the heat-treated maximum critical wall thickness of the part it qualifies as defined by the manufacturer, except the QTC is not required to exceed 254 mm (10 in) ER. If the ER of the QTC used is less than the maximum critical wall thickness of the part it is qualifying and below 254 mm (10 in), 5.3.2.3 shall be followed.

5.4 Pressure-controlling Parts

5.4.1 Property Requirements

Pressure-controlling parts shall be manufactured from materials as specified by the manufacturer.

5.4.2 Processing

5.4.2.1 Melting, Casting, and Hot Working

The melting, casting, and hot-working practices of pressure-controlling parts shall meet 5.3.2.1.

5.4.2.2 Heat Treating

All heat-treatment operations for pressure-controlling parts shall conform to 5.3.2.2, except contact thermocouples are not required.