Subpart 54.23—Fabrication by Brazing

§ 54.23–1 Scope (modifies UB–1).

(a) Fabrication by brazing shall be in accordance with the provisions of this part and with part 57 of this subchapter.

[CGFR 69–127, 35 FR 9977, June 17, 1970]

Subpart 54.25—Construction With Carbon, Alloy, and Heat Treated Steels

§ 54.25–1 Scope.

The carbon, alloy, and heat treated steels used in construction of pressure vessels and parts shall be as indicated in section VIII of the ASME Boiler and Pressure Vessel Code (incorporated by reference; see 46 CFR 54.01–1) except as noted otherwise in this subpart.


§ 54.25–3 Steel plates (modifies UCS–6).

The steels listed in UCS–6(b) of section VIII of the ASME Boiler and Pressure Vessel Code (incorporated by reference; see 46 CFR 54.01–1) will be allowed only in Class III pressure vessels (see table 54.01–5(b)).


§ 54.25–5 Corrosion allowance.

The corrosion allowance must be as required in 46 CFR 54.01–35.


Subpart 54.25–10 Low temperature operation—ferritic steels (replaces UCS–65 through UCS–67).

(a) Scope. (1) This section contains requirements for pressure vessels and nonpressure vessel type tanks and associated secondary barrier, as defined in §38.05–4 and §154.7 of this chapter, and their parts constructed of carbon and alloy steels which are stressed at operating or hydrostatic test temperatures below 0 °F.

(2) The service temperature is the minimum temperature of a product at which it may be contained, loaded and/
or transported. However, the service temperature shall in no case be taken higher than given by the following formula:

\[ t_s = t_w - 0.25(t_w - t_B) \]

where:

- \( t_s \) = Service temperature.
- \( t_w \) = Bolling temperature of gas at normal working pressure of container but not higher than +32 °F.
- \( t_B \) = Bolling temperature of gas at atmospheric pressure.

Only temperatures due to refrigerated service usually need to be considered in determining the service temperature, except pressure vessel type cargo tanks operating at ambient temperatures must meet paragraph (d) of this section. "Refrigerated service", as used in this paragraph, means a service in which the temperature is controlled by the process and not by atmospheric conditions.

(b) Specifications. Materials used in the construction of vessels to operate below 0 °F. (but not below the designated minimum service temperature) shall conform to a specification given in table 54.25–10(b)(1) for each steel. The service temperature shall not be colder than the minimum specified in table 54.25–10(b)(1), and shall conform to the requirements of ASTM A 20 pressure vessel applications shall conform to the requirements of that listed), provided all other chemical and mechanical properties specified for steels in this temperature range are satisfied.

<table>
<thead>
<tr>
<th>Steel Minimum service temperature °F</th>
<th>Max. C* percent</th>
<th>Manganese range* percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>−30</td>
<td>0.20</td>
<td>0.70–1.35</td>
</tr>
<tr>
<td>−50</td>
<td>0.16</td>
<td>1.15–1.50</td>
</tr>
<tr>
<td>−67</td>
<td>0.12</td>
<td>1.30–1.60</td>
</tr>
</tbody>
</table>

* At service temperatures intermediate between those specified, intermediate amounts of carbon and manganese will be allowed (in proportion to the actual service temperature variation from that listed), provided all other chemical and mechanical properties specified for steels in this temperature range are satisfied.

(2) For minimum service temperature below −67 °F., but not below the designated minimum service temperature, ferritic steels shall be normalized, low carbon, fully killed, fine grain, nickel alloy type, conforming to any one of the specifications in table 54.25–10(b)(2). Consideration will be given to other heat treatments. Refer to §57.03–1(d) of this subchapter for quenched and tempered steels. The ultimate and yield strengths shall be as shown in the applicable specification and shall be suitable to the design stress levels adopted. The service temperature shall not be colder than the minimum specified in table 54.25–10(b)(2) for each steel.

(3) The materials permitted under paragraphs (b) (1) and (2) of this section shall be tested for toughness in accordance with and shall satisfy the applicable requirements of subpart 54.05.

TABLE 54.25–10(b)(1)

<table>
<thead>
<tr>
<th>Steel Minimum service temperature °F</th>
<th>Max. C* percent</th>
<th>Manganese range* percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>0.25</td>
<td>1.00–1.75</td>
</tr>
<tr>
<td>60</td>
<td>0.30</td>
<td>1.35–2.00</td>
</tr>
<tr>
<td>67</td>
<td>0.35</td>
<td>2.00–2.50</td>
</tr>
</tbody>
</table>

Note: For high alloy steels refer to §54.25–15. For heat treated steels refer to §54.25–20.

(1)(i) For minimum service temperatures not lower than −67 °F., ferritic steels shall be made with fine grain practice and shall have an austenitic grain size of 5 or finer, and shall be normalized. Consideration will be given to other heat treatments. Refer to §7.03–1(d) of this subchapter for pressure vessel applications shall conform to the requirements of ASTM A 20 (incorporated by reference, see §54.01–1). It may be produced by the open hearth, basic oxygen or electric furnace process and shall conform to the requirements of table 54.25–10(b)(1). (Other alloying elements may only be present in trace amounts.)

(ii) Mechanical properties shall be within the following limits:

- **Ultimate strength**: −50,000–58,000 ps.i.
- **Yield strength**: −35,000 ps.i.
- **Elongation minimum**: −20 percent in 8 inches, or

TABLE 54.25–10(b)(2)

<table>
<thead>
<tr>
<th>Steel</th>
<th>Minimum service temperature °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-203, 2½ percent, Ni, normalized.</td>
<td>−80 °F. for Grade A.</td>
</tr>
<tr>
<td>A-203, 3½ percent, Ni, normalized.</td>
<td>−75 °F. for Grade B.</td>
</tr>
<tr>
<td>5 percent Ni, normalized.</td>
<td>−130 °F. for Grade D.</td>
</tr>
<tr>
<td></td>
<td>−110 °F. for Grade E.</td>
</tr>
<tr>
<td></td>
<td>Dependent on chemical and physical properties.</td>
</tr>
</tbody>
</table>

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§54.25–15 Low temperature operation—high alloy steels (modifies UHA–23(b) and UHA–51).

(a) Toughness tests for the materials listed in UHA–51(a) in section VIII of the ASME Boiler and Pressure Vessel Code (incorporated by reference; see 46 CFR 54.01–1) for service temperatures below $-425 \, ^\circ F$, UHA–51(b)(1) through (5) for service temperatures below 0 \, ^\circ F., and UHA–51(c) for all service temperatures, shall be performed in accordance with the requirements of subpart 54.05. These requirements are also applicable to nonpressure vessel type, low temperature tanks and associated secondary barriers, as defined in §38.05–4 in subchapter D (Tank Vessels) of this chapter. Such tests are required regardless of the vessel’s design stress. Service temperature is defined in §54.25–10(a)(2).

(b) Materials for pressure vessels with service temperatures below $-320 \, ^\circ F.$ shall be of the stabilized or low carbon (less than 0.10 percent) austenitic stainless steel type, produced according to the applicable specifications of table UHA–23 of section VIII of the ASME Boiler and Pressure Vessel Code. These materials and their weldments shall be tested for toughness according