

with Appendix P of Section VIII of the ASME Code.

(d) Weldments and all materials used in pressure vessel type cargo tanks operating at ambient temperatures and constructed of materials listed in Table UCS-23 must pass Charpy impact tests in accordance with UG-84 at a temperature of -20°F or colder, except as provided by paragraphs (d)(1), (d)(2), and (d)(3) of this section.

(1) Charpy impact tests are not required for any of the following ASTM materials if the thickness for each is $\frac{5}{8}$ inch or less, unless otherwise indicated:

- (i) A-182, normalized and tempered.
- (ii) A-302, Grades C and D.
- (iii) A-336, Grades F21 and F22 that are normalized and tempered.
- (iv) A-387, Grades 21 and 22 that are normalized and tempered.
- (v) A-516, Grades 55 and 60.
- (vi) A-533, Grades B and C.
- (vii) All other plates, structural shapes and bars, and other product forms, except for bolting, if produced to a fine grain practice and normalized.

(2) Charpy impact tests are not required for any of the following ASTM materials if the thickness for each is $1\frac{1}{4}$ inch or less:

- (i) A-203.
- (ii) A-508, Class 1.
- (iii) A-516, normalized.
- (iv) A-524.
- (v) A-537.
- (vi) A-612, normalized.
- (vii) A-662, normalized.
- (viii) A-724, normalized.

(3) Charpy impact tests are not required for any of the following bolt materials:

- (i) A-193, Grades B5, B7, B7M, and B16.
- (ii) A-307, Grade B
- (iii) A-325, Type 1.
- (iv) A-449.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGFR 69-127, 35 FR 9977, June 17, 1970; CGD 73-133R, 39 FR 9178, Mar. 8, 1974; CGD 74-289, 44 FR 26007, May 3, 1979; CGD 77-069, 52 FR 31626, Aug. 21, 1987; CGD 85-061, 54 FR 50964, Dec. 11, 1989; USCG-1999-5151, 64 FR 67178, Dec. 1, 1999; USCG-2000-7790, 65 FR 58460, Sept. 29, 2000]

§ 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) of the ASME Code for service temperatures below -425°F ., UHA-51(b)(1) through (5) for service temperatures below 0°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 non-pressure 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°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 the ASME Code. These materials and their weldments shall be tested for toughness according to the requirements of subpart 54.05 except that the Charpy V-notch testing acceptance criteria will be in accordance with UHT-6(a)(4) and (5) of the ASME Code."

(c) Except as permitted by §54.05-30, the allowable stress values used in the design of low temperature pressure vessels may not exceed those given in Table UHA-23 of the ASME Code for temperatures of -20°F . to 100°F .

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGD 73-133R, 39 FR 9178, Mar. 8, 1974; CGD 73-254, 40 FR 40164, Sept. 2, 1975]

§ 54.25-20 Low temperature operation—ferritic steels with properties enhanced by heat treatment (modifies UHT-5(c), UHT-6, UHT-23, and UHT-82).

(a) For service temperatures below 0°F . but not below the designated minimum service temperature, steel conforming to the specifications of Table 54.25-20(a) may be used in the fabrication of pressure vessels and nonpressure vessel tanks and associated secondary barriers, as defined in §38.05-4 of subchapter D (Tank Vessels) of this chapter. The ultimate and yield

§ 54.25-20

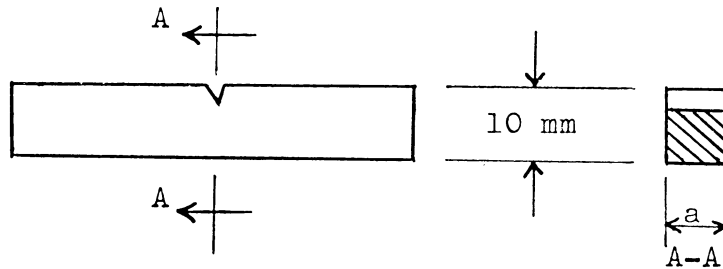
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strengths shall be as shown in the applicable specification and shall be suitable for the design stress levels adopted. The service temperature shall not be colder than -320 °F. Service temperature is defined in § 54.25-10(a) (2).

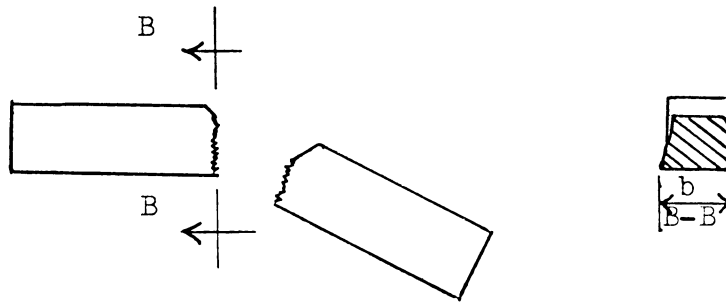
(b) The materials permitted under paragraph (a) of this section shall be tested for toughness in accordance with the requirements of UHT-6 of the ASME Code except that tests shall be conducted at the temperature specified in § 54.05-6 in lieu of that in UHT-5(c) of the ASME Code. Lateral expansion in a broken Charpy V-notch specimen is illustrated in Figure 54.25-20(b) and shall be measured in accordance with the procedure outlined in ASTM A 370 (incorporated by reference, see § 54.01-1).

TABLE 54.25-20(A)

Steel	Minimum service temperature, °F.
A-333, 9 percent Ni, grade 8	-320
A-334, 9 percent Ni, grade 8	-320
A-353, 9 percent Ni, double normalized and tempered	-320
A-522, 9 percent Ni, NNT, Q and T, forging	-320
A-553, 9 percent Ni, quenched and tempered	-320



CHARPY V-NOTCH SPECIMEN



BROKEN SPECIMEN

LATERAL EXPANSION = (b-a)

(c) The qualification of welding procedures and welders and weld production testing for the steels of Table 54.25-20(a) shall conform to the requirements of part 57 of this subchapter and subpart 54.05 except that the Charpy V-notch testing acceptance criteria shall be in accordance with UHT-6(a) (4) and (5) of the ASME Code.

(d) The values of absorbed energy in foot-pounds and of fracture appearance in percentage shear, which are recorded for information when complying with paragraphs (b) and (c) of this section shall also be reported to the marine inspector or the Commandant, as applicable.

(e) Except as permitted by § 54.05-30, the allowable stress values may not exceed those given in Table UHT-23 of the ASME Code for temperatures of 150 °F. and below.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGD 73-133R, 39 FR 9179, Mar. 8, 1974; USCG-2000-7790, 65 FR 58460, Sept. 29, 2000]

§ 54.25-25 Welding of quenched and tempered steels (modifies UHT-82).

(a) The welding requirements in UHT-82 of the ASME Code shall be modified to require that the qualification of welding procedures and welders and weld production testing shall conform to the requirements of part 57 of this subchapter. The requirements are § 57.03-1(d) of this subchapter are applicable to welded pressure vessels and nonpressure vessel type tanks of quenched and tempered steels other than 9 percent nickel.

(b) [Reserved]

Subpart 54.30—Mechanical Stress Relief

§ 54.30-1 Scope.

(a) Certain pressure vessels may be mechanically stress relieved in accordance with the requirements in this subpart.

(b) [Reserved]

§ 54.30-3 Introduction.

(a) Large conventional pressure vessels used to transport liquefied petroleum and natural gases, at “low temperatures” may often be difficult to thermally stress relieve. Where no

other problem, such as corrosion exists, mechanical stress relief will be permitted for Class II-L pressure vessels.

(b) Mechanical stress relief serves to cause small flaws, particularly in the weld zone, to yield plastically at the flaw tip resulting in a local relief of stress and a blunting of the crack tip. To achieve the maximum benefit from mechanical stress relief, it is necessary that the stresses so imposed be more severe than those expected in normal service life. At the same time, it is necessary that the stresses which are imposed are not so high as to result in appreciable deformation or general yielding.

(c) The weld joint efficiencies as listed in Table UW-12 of the ASME Code shall apply except that a minimum of spot radiography will be required. UW-12(c) of the ASME Code which permits omitting all radiography does not apply. Spot examination shall follow UW-52 of the ASME Code and in addition these vessels will be required to have radiographic examination of intersecting circumferential and longitudinal joints for a distance of at least 20 times the plate thickness from the junction. See § 54.25-8 on spot radiography.

(d) Severe cold forming will not be permitted unless thermal stress relief is used. For example, parts of the vessels which are individually cold formed, such as heads, must be thermally stress relieved, where the extreme fiber strain measured at the surface exceeds 5 percent as determined by:

$$\text{Percent strain} = (65t/R_f) [1 - (R_f/R_o)]$$

where:

t=Plate thickness.

R_f=Final radius.

R_o=Original radius (equals infinity for flat plate).

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by USCG-2000-7790, 65 FR 58460, Sept. 29, 2000]

§ 54.30-5 Limitations and requirements.

(a) Class II-L pressure vessels which require stress relief (see Table 54.01-5(b)) may be mechanically stress relieved provided: