

## § 54.01-40

### § 54.01-40 External pressure (modifies UG-28).

(a) The exemption from external pressure consideration provided by the note under UG-28(f) does not apply.

(b) Vessels which may at times be subjected to partial vacuum due to nature of the contents, temperature, unloading operations, or other facet of employment shall either have vacuum breaker protection or be designed for not less than one-half atmosphere of external pressure.

[CGFR 70-143, 35 FR 19906, Dec. 30, 1970]

## Subpart 54.03—Low Temperature Operation

### § 54.03-1 Scope.

(a) The pressure vessels for low temperature operation shall be as required by section VIII of the ASME Code as modified by this subpart.

### § 54.03-5 General.

(a) Requirements for ferritic steels, high alloy steels, and heat treated ferritic steels are contained in §§ 54.25-10, 54.25-15, and 54.25-20 respectively of this subchapter.

(b) Requirements for toughness testing of material product forms and weldments (including weld procedure qualification and production toughness tests) are contained in subpart 54.05.

(c) Materials suitable for a given minimum service temperature may be used in warmer service. Steels differing in chemical composition, mechanical properties, or heat treatments from those specified may be specially approved by the Commandant. Similarly, aluminum alloys and other nonferrous materials not intended to be covered by these sections may be specially considered by the Commandant for service at any low temperature.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGFR 69-127, 35 FR 9977, June 17, 1970]

## Subpart 54.05—Toughness Tests

### § 54.05-1 Scope (replaces UG-84).

(a) The toughness tests of materials used in pressure vessels shall be as required by this subpart in lieu of re-

## 46 CFR Ch. I (10-1-04 Edition)

quirements in UG-84 of the ASME Code.

### § 54.05-3 Tests required.

(a) Where material or welding toughness tests are required by §§ 54.25-10, 54.25-15, 54.25-20, and subpart 57.03 or 57.06 of this subchapter, the following requirements shall apply:

(1) Additional requirements for ferritic steels with properties enhanced by heat treatment are in § 54.25-20.

(2) Certified reports of toughness tests by the material manufacturer will be acceptable evidence provided the specimens taken are representative of the material delivered and that the material is not subject to treatment during or following fabrication that will reduce its impact properties. If such treatment is subsequently applied to the material, test specimens shall be so taken and treated as to be representative of the material in the finished vessel.

(b) The requirements of this subpart are also applicable to nonpressure vessel type low temperature tanks and associated secondary barriers, as defined in § 38.05-4 of subchapter D (Tank Vessels) of this chapter.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGFR 69-127, 35 FR 9977, June 17, 1970]

### § 54.05-5 Toughness test specimens.

(a) *Charpy V-notch impact tests.* Where required, Charpy V-notch tests shall be conducted in accordance with ASTM Specification E 23 (incorporated by reference, see § 54.01-1), "Notched Bar Impact Testing of Metallic Materials", using the Type A specimen shown in Figure 4 of the specification. Special attention is drawn to the fact that the Charpy Keyhole and U-notch specimens are not acceptable substitutes for the Charpy V-notch specimen and shall not be used to qualify materials within the scope of this subpart. Each set of Charpy impact tests shall consist of three specimens. For materials ½-inch thick or less, the largest possible Charpy specimens for that thickness shall be cut centered at the material's mid-thickness. For materials thicker than ½-inch, full size Charpy specimens shall be cut centered at a location as near as practicable to a point

midway between the material's surface and half-thickness. Except where otherwise specified, transversely oriented specimens must be used. When longitudinal specimens are used, the required energy values may not be less than 1.5 times the values required for transversely oriented specimens. In all cases the notch shall be cut normal to the material's surface. Test specimens shall be taken at least one "t" from any heat treated edge (where "t" is the material's nominal thickness).

(b) *Drop weight tests.* Where required, drop weight tests shall be conducted for no-break performance in accordance with ASTM Specification E 208 (incorporated by reference, see § 54.01-1), "Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels". For material thicknesses between 1/2-inch and 5/8-inch, the ASTM E-208 specimen P-3, machined to 1/2-inch thickness, shall be used with a stop distance of 0.090-inch. In preparing weld specimens for dropweight testing, weld reinforcement shall be ground flush, the hard facing bead centered on and transverse to the weld, and the notch centered on and parallel to the weld axis.

(c) *Retest procedures.* (1) When Charpy V-notch impact specimens are used and the average value of the three initial specimens fails to meet the stated requirements by an amount not exceeding 15 percent, or the value for more than one specimen is below the required average value of when the value for one specimen is below the minimum value permitted for a single specimen by an amount not exceeding 15 percent, three additional specimens from the same material may be tested and the results combined with those previously obtained to form a new average. This new average of six specimens must exceed the specified minimum average. In the event the Charpy retests fail, the material may still be qualified by exhibiting a no-break performance when tested in accordance with the drop weight procedure, if applicable. Two drop weight specimens shall be tested for each Charpy V-notch set of three initial specimens which failed to qualify. Failure of either or both of these drop weight specimens will constitute rejection of the mate-

rial or weldments represented, except as outlined in paragraph (c)(3) of this section.

(2) When drop weight specimens are used, retests shall be permitted only within the limits prescribed in ASTM Specification E 208 (incorporated by reference, see § 54.01-1), except as outlined in paragraph (c)(3) of this section.

(3) If, for heat treated base material, the required toughness results are not obtained in the initial test or in the retest, the material may be reheated one time and tested again in accordance with the initial requirements for the material.

(d) *Alternate toughness tests.* The Charpy V-notch impact values of §§ 54.05-20(a) and 54.05-25(a) are representative of those which correlate with the nil-ductility transition temperature determined by the drop-weight tests for the steels specified in § 54.25-10. For materials for which there are other data showing suitable correlation between Charpy V-notch and drop-weight tests, V-notch acceptance limits different from those tabulated herein may be specially approved by the Commandant, based upon the actual correlation. In the case of steels for which the tabulated Charpy V-notch values can be shown to be inapplicable or in the case of specially considered steels, or as an alternative to complying with the tabulated impact requirements, acceptance may be based upon the material exhibiting a no-break performance when tested in accordance with the drop-weight procedure. Whenever the drop-weight test is used as an alternative to the Charpy V-notch test, two drop-weight specimens shall be tested for each set of three Charpy V-notch specimens otherwise required. If the drop-weight test cannot be performed because of material thickness limitations (less than one-half inch) or product shape, or is otherwise inapplicable (because of heat treatment, chemistry, etc.), other tests and/or test criteria will be specified by the Commandant to assure the adequacy of the material for the intended application.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGD 73-254, 40 FR 40163, Sept. 2, 1975; USCG-2000-7790, 65 FR 58460, Sept. 29, 2000]