

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]

§ 54.05-6 Toughness test temperatures.

Each toughness test must be conducted at temperatures not warmer than -20°F or 10°F below the minimum service temperature, whichever is lower, except that for service at or below -320°F , the tests may be conducted at the service temperature in accordance with § 54.25-10(a)(2).

[CGD 85-061, 54 FR 50964, Dec. 11, 1989]

§ 54.05-10 Certification of material toughness tests.

(a) *Plate material.* The manufacturer of plates may certify such material, provided it has been given an appropriate heat-treatment, by reporting the results of tests of one set of Charpy impact specimens or of two drop weight

specimens, as applicable, taken from each plate as rolled. Impact specimens shall be taken as outlined in section 12 of ASTM A 20 (incorporated by reference, see § 54.01-1). The long axis of the Charpy specimen must be perpendicular to the final direction of rolling. When the direction of maximum stress is unknown, the manufacturer may certify on the basis of specimens taken parallel to the final direction of rolling.

(b) *Pipe or tube material.* (1) The manufacturer of pipe, tube, or welded fittings formed from pipe or tube may certify such material by reporting the results of tests of one set of Charpy impact specimens, provided the requirement for production in this paragraph (b)(1) or paragraph (b)(2) of this section, as well as the requirement for sampling in paragraph (b)(3) of this section are met. The specimens shall have the major axis parallel to the length of pipe or tube. In the case of welding fittings, the specimens may be taken from the tubing prior to forming provided the fittings are normalized after forming. Such specimens shall be normalized before testing.

(2) One set of specimens may represent each five (5) short tons, or less, of the pipe, tubes, or welding fittings produced from one heat of steel poured from a single melting furnace charge and subsequently processed in the same manner, provided all are given a normalizing heat-treatment in a continuous treating furnace in which the temperature is automatically controlled and checked by recording pyrometer.

(3) One set of specimens may represent each five (5) short tons, or less, of the pipe, tubes, or welding fittings that have been given a normalizing heat-treatment as a single charge in a batch-treating furnace equipped with recording pyrometer provided all have been produced from a single melting furnace heat and are subsequently processed in the same manner. If more than one melting furnace heat is present in the batch heat-treating furnace, means of identification shall be provided and one set of specimens shall be taken from each heat.

(4) One set of impact specimens shall be taken from one pipe or tube picked

at random from each heat or furnace batch or portion thereof to be certified.

(c) *Forgings and forged or rolled fittings.* (1) The manufacturer of forgings for any purpose may certify them by reporting the results of tests of one set of Charpy impact specimens or two drop-weight specimens, as applicable, taken from each 5 short tons of product from each melting heat provided the requirements in this paragraph for production and sampling are met.

(2) One or more test blocks shall be cut from billets or blooms selected at random from each heat of material. Each test block shall be forge-reduced in thickness to the thickness of the finished forgings to be certified, within the limitations set below. After forging to the reduced thickness, the test block shall be heat-treated in the same manner as the finished forgings represented, which heat-treatment of test blocks may be carried out in the furnace with the forgings, or separately. If carried out separately, both heat-treatments shall be done in automatically controlled furnaces equipped with calibrated recording pyrometers, the certified records of which shall be made available to the inspector.

(3) One set of Charpy impact specimens or two drop-weight specimens, as applicable, shall be cut from each such test block and these specimens shall represent all forgings (up to 5 short tons) that are from the same heat of material and given the same heat-treatment as the test block, and the thickness of which does not differ from that of the test block by more than plus or minus 50 percent of 1½ inches, whichever is less, except that forged flanges and tube sheets thicker than 5½ inches may be qualified from a 4-inch test block.

(4) As many test blocks shall be made as are required under the foregoing rule in paragraph (c)(3) of this section to cover the weight of product and range of thickness found in the forgings represented. The major axis of the test specimens shall be parallel to the length of the test block.

(d) *Bars and shapes, rolled or forged.* (1) The manufacturer of forged or rolled bars and shapes may certify such by reporting the results of one set of Charpy impact specimens, or two drop-

weight specimens, as applicable, produced from each 5 short tons from a single melting furnace heat, processed in a similar manner and heat-treated as a single furnace batch, if heat-treated. The impact specimens shall be cut from the heaviest section, clear of fillets, of the shape being tested with the axis of the specimens parallel to the axis of the bar or shape.

(e) *Castings.* (1) The manufacturer of castings may certify them by reporting the results of one set of Charpy impact specimens or two drop-weight specimens, as applicable, taken from each 5 short tons of product from each melting furnace heat. These specimens shall be taken either directly from a production casting or from test coupons cast attached thereto provided the additional requirements in this paragraph are met.

(2) One set of Charpy impact or two drop-weight specimens may represent all castings (up to 5 short tons) that are from the same heat of material and that have a thickness that does not differ from the thickness of the section from which the specimens were taken by more than plus or minus 25 percent, or 1½ inches, whichever is less. A wider range of thicknesses from one heat may be covered by taking additional sets of specimens from thicker or thinner material as may be required.

(3) The test specimens shall be heat-treated in the same manner as the castings represented, which heat-treatment of specimens may be carried out in the furnace with the castings represented, or separately, but if carried out separately both heat-treatments shall be done in automatically controlled furnaces equipped with calibrated recording pyrometers, the certified records of which shall be made available to the marine inspector.

(f) *Small parts.* The manufacturer of small parts, either cast or forged, may certify a lot of not more than 20 duplicate parts or 5 short tons, whichever is less, by reporting the results of one set of Charpy impact specimens, or two drop-weight specimens, as applicable, taken from one such part selected at random, provided the same kind of material and the same process of production were used for all of the lot. When the part is too small to provide the

specimens of at least minimum size, no impact test need be made. For such parts too small to impact test, toughness qualifications shall be determined by the Commandant based on material, chemical, and mechanical properties.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CFR 73-254, 40 FR 40164, Sept. 2, 1975; USCG-1999-5151, 64 FR 67178, Dec. 1, 1999]

**§ 54.05-15 Weldment toughness tests—
procedure qualifications.**

(a) Plate for which Charpy V-notch impact testing is required in the parent material and for which V-notch minima are specified shall similarly have welding procedures qualified for toughness by Charpy V-notch testing. For these tests, the test plates shall be oriented with their final rolling direction parallel to the weld axis (i.e., so that transverse impact specimens result),

and with the V-notch normal to the plate surface. The sample weld joint preparation shall be the same as that used in production. The number of test specimens and the location of their notches shall be as shown in Figure 54.05-15(a) and as described in paragraphs (a) (1) through (5) of this section.

(1) Three specimens with the notch centered in the weld metal.

(2) Three specimens with the notch centered on the fusion line between parent plate and weld. (The fusion line may be identified by etching the specimen with a mild reagent.)

(3) Three specimens with the notch centered in the heat affected zone, 1 mm from the fusion line.

(4) Same as paragraph (a)(3) of this section, but 3 mm from the fusion line.

(5) Same as paragraph (a)(3) of this section, but 5 mm from the fusion line.