



Standard Test Method for Drop-Weight Tear Tests of Ferritic Steels¹

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1. Scope

1.1 This test method covers drop-weight tear tests (DWTT) on ferritic steels with thicknesses between 3.18 and 19.1 mm.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

E208 Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels

E1823 Terminology Relating to Fatigue and Fracture Testing

3. Terminology

3.1 Terminology E1823 is applicable to this test method.

4. Significance and Use

4.1 This test method can be used to determine the appearance of propagating fractures in plain carbon or low-alloy pipe steels (yield strengths less than 825 MPa) over the temperature range where the fracture mode changes from brittle (cleavage or flat) to ductile (shear or oblique).

4.2 This test method can serve the following purposes:

4.2.1 For research and development, to study the effect of metallurgical variables such as composition or heat treatment, or of fabricating operations such as welding or forming on the mode of fracture propagation.

4.2.2 For evaluation of materials for service to indicate the suitability of a material for specific applications by indicating fracture propagation behavior at the service temperature(s).

4.2.3 For information or specification purposes, to provide a manufacturing quality control only when suitable correlations have been established with service behavior.

5. Apparatus

5.1 The testing machine shall be either a pendulum type or a vertical-dropped-weight (Note 1) type. The machine shall provide sufficient energy to completely fracture a specimen in one impact.

5.1.1 As a guide in the design of the equipment it has been found that up to 2712 J of energy may be required to completely fracture specimens of steel up to 12.7 mm in thickness with tensile strengths to 690 MPa.

NOTE 1—Equipment of the vertical-dropped-weight variety that can be readily modified to conduct the drop-weight tear test is described in Test Method E208.

NOTE 2—Current pipeline grade steels take more than 4 kJ at design temperature of -5°C

5.2 The specimen shall be supported in a suitable manner to prevent sidewise rotation of the specimen.

5.3 The velocity of the hammer (in either type of testing machine) shall be not less than 4.88 m/s.

6. Test Specimen

6.1 The test specimen shall be a 76.2 by 305-mm by full-plate-thickness edge-notch bend specimen employing a pressed notch. Fig. 1 presents the dimensions and tolerances of the specimens. The specimens shall be removed from the material under test by sawing, shearing, or flame cutting, with or without machining.

NOTE 3—If the specimen is flame cut it is usually difficult to press in the notch unless the heat-affected zone is removed by machining.

6.2 The notch shall be pressed to the depth shown in Fig. 1 with a sharp tool-steel chisel with an included angle of $45 \pm 2^\circ$. Machined notches are prohibited.

NOTE 4—The notch radius obtained with a sharp tool-steel chisel is normally between 0.013 to 0.025 mm. When many specimens are to be tested, it is helpful to use a jig that will guide the chisel and stop it at the proper depth.

¹ This method is under the jurisdiction of ASTM Committee E08 on Fatigue and Fracture and is the direct responsibility of Subcommittee E08.02 on Standards and Terminology.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.