



Designation: E 436 – 91 (Reapproved 1997)

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 (0.125 and 0.750 in.).

1.2 The values stated in SI (metric) units are to be regarded as the 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:

E 208 Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels²

3. Significance and Use

3.1 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 or 120 000 psi) over the temperature range where the fracture mode changes from brittle (cleavage or flat) to ductile (shear or oblique).

3.2 This test method can serve the following purposes:

3.2.1 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.

3.2.2 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).

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

4. Apparatus

4.1 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.

4.1.1 As a guide in the design of the equipment it has been found that up to 2712 J (2000 ft·lbf) of energy may be required to completely fracture specimens of steel up to 12.7 mm ($\frac{1}{2}$ in.) in thickness with tensile strengths to 690 MPa (100 000 psi).

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 E 208.

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

4.3 The velocity of the hammer (in either type of testing machine) shall be not less than 4.88 m/s (16 ft/s).

5. Test Specimen

5.1 The test specimen shall be a 76.2 by 305-mm (3 by 12-in.) 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 2—If the specimen is flame cut it is usually difficult to press in the notch unless the heat-affected zone is removed by machining.

5.2 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 3—The notch radius obtained with a sharp tool-steel chisel is normally between 0.013 to 0.025 mm (0.0005 to 0.001 in.). 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.

6. Procedure

6.1 In the temperature range from -73 to 100°C (-100 to $+212^\circ\text{F}$) employ the procedure described in 6.1.1 and 6.1.2.

6.1.1 Completely immerse the specimens in a bath of suitable liquid at a temperature within $\pm 1^\circ\text{C}$ ($\pm 2^\circ\text{F}$) of the desired test temperature for a minimum time of 15 min prior to

¹ This method is under the jurisdiction of ASTM Committee E-8 on Fatigue and Fracture and is the direct responsibility of Subcommittee E08.02 on Standards and Terminology.

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² Annual Book of ASTM Standards, Vol 03.01.