



Standard Practice for Fracture Testing with Surface-Crack Tension Specimens¹

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1. Scope

1.1 This practice covers the design, preparation, and testing of surface-crack tension (SCT) specimens. It relates specifically to testing under continuously increasing force and excludes cyclic and sustained loadings. The quantity determined is the residual strength of a specimen having a semielliptical or circular-segment fatigue crack in one surface. This value depends on the crack dimensions and the specimen thickness as well as the characteristics of the material.

1.2 Metallic materials that can be tested are not limited by strength, thickness, or toughness. However, tests of thick specimens of tough materials may require a tension test machine of extremely high capacity. The applicability of this practice to nonmetallic materials has not been determined.

1.3 This practice is limited to specimens having a uniform rectangular cross section in the test section. The test section width and length must be large with respect to the crack length. Crack depth and length should be chosen to suit the ultimate purpose of the test.

1.4 Residual strength may depend strongly upon temperature within a certain range depending upon the characteristics of the material. This practice is suitable for tests at any appropriate temperature.

1.5 Residual strength is believed to be relatively insensitive to loading rate within the range normally used in conventional tension tests. When very low or very high rates of loading are expected in service, the effect of loading rate should be investigated using special procedures that are beyond the scope of this practice.

NOTE 1—Further information on background and need for this type of test is given in the report of ASTM Task Group E24.01.05 on Part-Through-Crack Testing (1).²

1.6 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in

each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.7 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:*³

- E4 Practices for Force Verification of Testing Machines
- E8/E8M Test Methods for Tension Testing of Metallic Materials
- E338 Test Method of Sharp-Notch Tension Testing of High-Strength Sheet Materials (Withdrawn 2010)⁴
- E399 Test Method for Linear-Elastic Plane-Strain Fracture Toughness K_{Ic} of Metallic Materials
- E466 Practice for Conducting Force Controlled Constant Amplitude Axial Fatigue Tests of Metallic Materials
- E561 Test Method for K_R Curve Determination
- E1823 Terminology Relating to Fatigue and Fracture Testing

3. Terminology

3.1 *Definitions:*

3.1.1 Definitions given in Terminology E1823 are applicable to this practice.

3.1.2 *crack mouth opening displacement (CMOD)*, $2v_m$ (L)—crack—opening displacement resulting from the total deformation (elastic plus plastic) measured under force at the location on the crack surface that has the largest displacement per unit force.

NOTE 2—In surface-crack tension (SCT) specimens, CMOD is measured on the specimen surface along the normal bisector of the crack length.

¹ This practice is under the jurisdiction of ASTM Committee E08 on Fatigue and Fracture and is the direct responsibility of Subcommittee E08.07 on Fracture Mechanics.

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² The boldface numbers in parentheses refer to the list of references at the end of this standard.

³ 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.

⁴ The last approved version of this historical standard is referenced on www.astm.org.