



Standard Specification for Steel Blades Used with the Photovoltaic Module Surface Cut Test¹

This standard is issued under the fixed designation E 2685; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification specifies the recommended physical characteristics of the steel blades required for the surface cut test described in **ANSI/UL 1703** (Section 24) and **IEC 61730-2** (Paragraph 10.3).

1.2 **ANSI/UL 1703** and **IEC 61730-2** are standards for photovoltaic module safety testing.

1.3 This standard provides additional fabrication details for the surface cut test blades that are not provided in **ANSI/UL 1703** or **IEC 61730-2**. Surface cut test blades that have out-of-tolerance corner radii or burrs are known to cause erroneous test results, either passes or failures.

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

1.5 *This standard does not purport to address all of the safety problems, 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

A 506 Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled

A 684/A 684M Specification for Steel, Strip, High-Carbon, Cold-Rolled

E 1328 Terminology Relating to Photovoltaic Solar Energy Conversion

2.2 International Electrotechnical Commission Standards³

IEC 61730-2 Photovoltaic (PV) Module Safety Qualification – Part 2: Requirements for Testing

¹ This specification is under the jurisdiction of ASTM Committee **E44** on Solar, Geothermal and Other Alternative Energy Sources and is the direct responsibility of Subcommittee **E44.09** on Photovoltaic Electric Power Conversion.

Current edition approved April 1, 2009. Published May 2009.

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.

³ Available from International Electrotechnical Commission (IEC), 3 rue de Varembe, Case postale 131, CH-1211, Geneva 20, Switzerland, <http://www.iec.ch>.

2.3 American National Standard:⁴

ANSI/UL 1703 Flat-Plate Photovoltaic Modules and Panels

3. Terminology

3.1 *Definitions*—Definitions of terms used in this specification may be found in **A 506**, **A 684/A 684M**, **E 1328**, **ANSI/UL 1703**, and **IEC 61730-2**.

4. Materials and Manufacture

4.1 Surface cut test blades are fabricated from hardened steel strips. The minimum hardness of the steel is 24 as measured using the Rockwell scale. Fully hardened and tempered steel of at least 0.50 weight percent carbon as specified in Specifications **A 684** or **A 506** will meet this requirement.

4.2 Other materials besides hardened steel may be used provided they have sufficient hardness.

NOTE 1—Steel hacksaw blades commonly available at hardware stores are acceptable materials of the correct thickness and hardness.

5. Dimensions and Permissible Variations

5.1 Blade thickness: 0.64 ± 0.05 mm.

5.2 Corner angle: $90 \pm 2^\circ$ (see **Fig. 1**)

5.3 Corner radius: 0.115 ± 0.025 mm (see **Fig. 1**)

6. Workmanship, Finish, and Appearance

6.1 The corner contact area of the blade is intended to be a cylindrical surface of the required radius; any burrs or sharp points are removed using a steel file.

7. Number of Tests and Retests

7.1 The surface cut test blade may be reused until the radius is outside the specified limits (see **5.3**).

7.2 The surface cut test blade may be reshaped according to Section 8 to achieve the required radius as necessary.

8. Blade Preparation

8.1 Secure a steel strip (see **4.1**) in a metal-jawed vise.

8.2 Bend the steel strip until it breaks, leaving a corner with the required angle (see **5.2**).

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

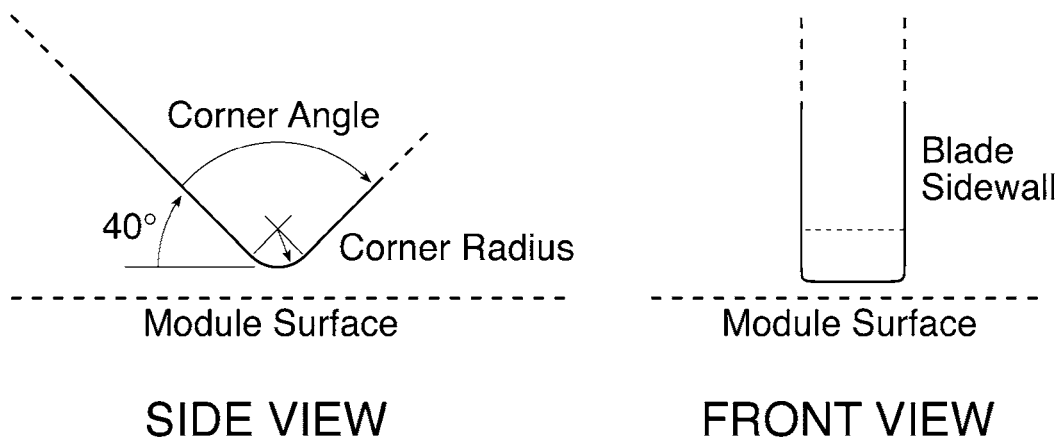


FIG. 1 Surface Cut Test Blade Geometry and Use Illustration

8.3 When using a hacksaw blade (see Note 1), do not use the toothed edge to form the corner of the cut test blade.

8.4 Alternatively, the steel strip can be machined to form the corner angle.

8.5 File or machine the corner to achieve the corner radius requirement and to remove any burrs.

9. Keywords

9.1 blade; cut test; photovoltaics; surface

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).