



# Standard Specification for Steel Blades Used with the Photovoltaic Module Surface Cut Test<sup>1</sup>

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## 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:<sup>2</sup>

**A506** Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled

**A684/A684M** Specification for Steel, Strip, High-Carbon, Cold-Rolled

**E772** Terminology of Solar Energy Conversion

### 2.2 International Electrotechnical Commission Standards<sup>3</sup>

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

<sup>1</sup> 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.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

### 2.3 American National Standard:<sup>4</sup>

**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 **A506**, **A684/A684M**, **E772**, 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 **E772** or **A506** 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:  $0.64 \pm 0.05$  mm.

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

5.3 Corner radius:  $0.115 \pm 0.025$  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.

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

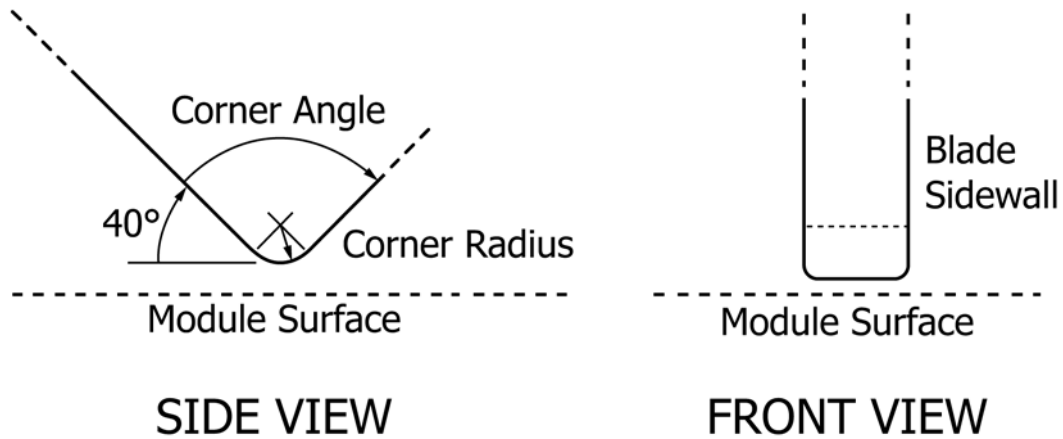


FIG. 1 Surface Cut Test Blade Geometry and Use Illustration

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

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

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