



Standard Practice for Visual Inspections of Photovoltaic Modules¹

This standard is issued under the fixed designation E1799; 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 practice covers procedures and criteria for visual inspections of photovoltaic modules.

1.2 Visual inspections of photovoltaic modules are normally performed before and after modules have been subjected to environmental, electrical, or mechanical stress testing, such as thermal cycling, humidity-freeze cycling, damp heat exposure, ultraviolet exposure, mechanical loading, hail impact testing, outdoor exposure, or other stress testing that may be part of the photovoltaic module testing sequence.

1.3 This practice does not establish pass or fail levels. The determination of acceptable or unacceptable results is beyond the scope of this practice.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

E772 Terminology of Solar Energy Conversion

3. Terminology

3.1 *Definitions*—Definitions of terms used in this practice may be found in Terminology E772.

¹ This practice 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 Aug. 1, 2023. Published August 2023. Originally approved in 1996. Last previous edition approved in 2018 as E1799 – 12 (2018). DOI: 10.1520/E1799-12R23.

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.

4. Significance and Use

4.1 Environmental stress tests, such as those listed in 1.2, are normally used to evaluate module designs prior to production or purchase. These test methods rely on performing electrical tests and visual inspections of modules before and after stress testing to determine the effects of the exposures.

4.2 Effects of environmental stress testing may vary from no effects to significant changes. Some physical changes in the module may be visible when there are no measurable electrical changes. Similarly, electrical changes in the module may occur with no visible changes.

4.3 It is the intent of this practice to provide a recognized procedure for performing visual inspections and to specify effects that should be reported.

4.4 Many of these effects are subjective. In order to determine if a module has passed a visual inspection, the user of this practice must specify what changes or conditions are acceptable. The user may have to judge whether changes noted during an inspection will limit the useful life of a module design.

5. Procedure

5.1 *Pre-Test Inspection*—Inspections performed prior to any environmental stress tests must document the module condition so that any changes that occur during testing can be identified during the post-test inspection.

5.1.1 Visually inspect each module to determine the presence or absence of anomalies or defects. Optical magnification is not required. Such anomalies or defects should include, but are not limited to:

- 5.1.1.1 Shipping damage,
- 5.1.1.2 Poor workmanship,
- 5.1.1.3 Defects in mounting brackets or structures,
- 5.1.1.4 Cracking, shrinkage, distortion, or tacky surfaces of polymeric materials,
- 5.1.1.5 Failure of adhesive bonding,
- 5.1.1.6 Bubbles or delamination of encapsulant materials,
- 5.1.1.7 Presence of foreign material,
- 5.1.1.8 Corrosion of fasteners, mechanical members, or electrical circuit elements,
- 5.1.1.9 Voids in or corrosion of any thin-film photovoltaic layers,
- 5.1.1.10 Discoloration of superstrate encapsulating materials,