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Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules[1]

This standard is issued under the fixed designation E1802; 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 These test methods provide procedures to determine the insulation resistance of a photovoltaic (PV) module, i.e. the electrical resistance between the module's internal electrical components and its exposed, electrically conductive, non-current carrying parts and surfaces.

1.2 The insulation integrity procedures are a combination of wet insulation resistance and wet dielectric voltage withstand test procedures.

1.3 These procedures are similar to and reference the insulation integrity test procedures described in Test Methods E1462, with the difference being that the photovoltaic module under test is immersed in a wetting solution during the procedures.

1.4 These test methods do not establish pass or fail levels. The determination of acceptable or unacceptable results is beyond the scope of these test methods.

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

1.6 *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.* For specific precautionary statements, see Section 6.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E772 Terminology of Solar Energy Conversion

E1462 Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules

3. Terminology

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

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *insulation resistance*—the electrical resistance of a photovoltaic module's insulation, measured between the photovoltaic circuit and exposed, electrically conductive non-current-carrying parts and surfaces of the module.

4. Significance and Use

4.1 The design of a photovoltaic module or system intended to provide safe conversion of the sun's radiant energy into useful electricity must take into consideration the possibility of hazard should the user come into contact with the electrical potential of the module or system. In addition, the insulation system provides a barrier to electrochemical corrosion, and insulation flaws can result in increased corrosion and reliability problems. These test methods describe procedures for verifying that the design and construction of the module provides adequate electrical isolation through normal installation and use. At no location on the module should the PV generated electrical potential be accessible, with the obvious exception of the output leads. This isolation is necessary to provide for safe and reliable installation, use, and service of the photovoltaic system.

4.2 This test method describes a procedure for determining the ability of the module to provide protection from electrical hazards. Its primary use is to find insulation flaws that could be dangerous to persons who may come into contact with the module, especially when modules are wet. For example, these flaws could be small holes in the encapsulation that allow hazardous voltages to be accessible on the outside surface of a module after a period of high humidity.

4.3 Insulation flaws in a module may only become detectable after the module has been wet for a certain period of time. For this reason, these procedures specify a minimum time a module must be immersed prior to the insulation integrity measurements.

4.4 Electrical junction boxes attached to modules are often designed to allow liquid water, accumulated from condensed water vapor, to drain. Such drain paths are usually designed to permit water to exit, but not to allow impinging water from rain

[1] These test methods are under the jurisdiction of ASTM Committee E44 on Solar, Geothermal and Other Alternative Energy Sources and are the direct responsibility of Subcommittee E44.09 on Photovoltaic Electric Power Conversion.

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[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.