



Standard Practice for Evaluating Thermal Insulation Materials for Use in Solar Collectors¹

This standard is issued under the fixed designation E861; 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 sets forth a testing methodology for evaluating the properties of thermal insulation materials to be used in solar collectors with concentration ratios of less than 10. Tests are given herein to evaluate the pH, surface burning characteristics, moisture adsorption, water absorption, thermal resistance, linear shrinkage (or expansion), hot surface performance, and accelerated aging. This practice provides a test for surface burning characteristics but does not provide a methodology for determining combustibility performance of thermal insulation materials.

1.2 The tests shall apply to blanket, rigid board, loose-fill, and foam thermal insulation materials used in solar collectors. Other thermal insulation materials shall be tested in accordance with the provisions set forth herein and should not be excluded from consideration.

1.3 The assumption is made that elevated temperature, moisture, and applied stresses are the primary factors contributing to the degradation of thermal insulation materials used in solar collectors.

1.4 Solar radiation is not considered a contributing factor since insulating materials are not normally exposed to it.

1.5 *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:²

¹ These test methods are under the jurisdiction of ASTM Committee E44 on Solar, Geothermal and Other Alternative Energy Sources and is the direct responsibility of Subcommittee E44.05 on Solar Heating and Cooling Systems and Materials.

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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.

- [C177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus](#)
- [C209 Test Methods for Cellulosic Fiber Insulating Board](#)
- [C356 Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat](#)
- [C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation](#)
- [C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus](#)
- [C553 Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications](#)
- [C687 Practice for Determination of Thermal Resistance of Loose-Fill Building Insulation](#)
- [D2842 Test Method for Water Absorption of Rigid Cellular Plastics](#)
- [E84 Test Method for Surface Burning Characteristics of Building Materials](#)
- [E772 Terminology of Solar Energy Conversion](#)

3. Terminology

3.1 The definitions and description of terms found in this standard may be included in Terminology [E772](#).

4. Summary of Practice

4.1 The following factors, in most cases, should be considered when evaluating insulation materials for use in solar collectors. Design considerations should dictate priorities in material test evaluations:

Factor	Reference Section
pH	8.2
Surface Burning Characteristics	8.3
Moisture Adsorption	8.4
Water Absorption	8.5
Thermal Resistance	8.6
Linear Shrinkage (or Expansion)	8.7
Hot Surface Performance	8.8
Chemical Compatibility	8.9
Outgassing	8.10
Durability	8.11

5. Significance and Use

5.1 The exposure conditions in solar collectors, especially under stagnation conditions, may degrade the performance of