



Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates¹

This standard is issued under the fixed designation E781; 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 a test procedure for evaluating absorptive solar receiver materials and coatings when exposed to sunlight under cover plate(s) for long durations. This practice is intended to evaluate the exposure resistance of absorber materials and coatings used in flat-plate collectors where maximum nonoperational stagnation temperatures will be approximately 200°C (392°F).

1.2 This practice shall not apply to receiver materials used in solar collectors without covers (unglazed) or in evacuated collectors, that is, those that use a vacuum to suppress convective and conductive thermal losses.

1.3 The values stated in SI units are to be regarded as the standard.

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

2. Referenced Documents

2.1 *ASTM Standards:*²

E537 Practice for Rating of Electroplated Panels Subjected to Atmospheric Exposure

D1898 Practice for Sampling of Plastics (Withdrawn 1998)³

E408 Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques

E434 Test Method for Calorimetric Determination of Hemispherical Emittance and the Ratio of Solar Absorptance to

Hemispherical Emittance Using Solar Simulation

E772 Terminology of Solar Energy Conversion

E903 Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
E962

3. Terminology

3.1 *Definitions:*

3.1.1 See Terminology **E772** for definitions.

4. Significance and Use

4.1 Although this practice is intended for evaluating solar absorber materials and coatings used in flat-plate collectors, no single procedure can duplicate the wide range of temperatures and environmental conditions to which these materials may be exposed during in-service conditions.

4.2 This practice is intended as a screening test for absorber materials and coatings. All conditions are chosen to be representative of those encountered in solar collectors with single cover plates and with no added means of limiting the temperature during stagnation conditions.

4.3 This practice uses exposure in a simulated collector with a single cover plate. Although collectors with additional cover plates will produce higher temperatures at stagnation, this procedure is considered to provide adequate thermal testing for most applications.

NOTE 1—Mathematical modelling has shown that a selective absorber, single glazed flat-plate solar collector can attain absorber plate stagnation temperatures as high as 226°C (437°F) with an ambient temperature of 37.8°C (100°F) and zero wind velocity; and a double glazed one as high as 245°C (482°F) under these conditions. The same configuration solar collector with a nonselective absorber can attain absorber stagnation temperatures as high as 146°C (284°F), if single glazed, and 185°C (360°F), if double glazed, with the same environmental conditions, (see “Performance Criteria for Solar Heating and Cooling Systems in Commercial Buildings,” NBS Technical Note 1187⁴).

4.4 This practice evaluates the thermal stability of absorber materials. It does not evaluate the moisture stability of absorber

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 **E44.05** 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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.