



Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode¹

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1. Scope

1.1 This practice covers a procedure for the exposure of solar collector cover materials to the natural weather environment at elevated temperatures that approximate stagnation conditions in solar collectors having a combined back and edge loss coefficient of less than $1.5 \text{ W}/(\text{m}^2 \cdot ^\circ\text{C})$.

1.2 This practice is suitable for exposure of both glass and plastic solar collector cover materials. Provisions are made for exposure of single and double cover assemblies to accommodate the need for exposure of both inner and outer solar collector cover materials.

1.3 This practice does not apply to cover materials for evacuated collectors, photovoltaic cells, flat-plate collectors having a combined back and edge loss coefficient greater than $1.5 \text{ W}/(\text{m}^2 \cdot ^\circ\text{C})$, or flat-plate collectors whose design incorporates means for limiting temperatures during stagnation.

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:

- D 1435 Practice for Outdoor Weathering of Plastics²
- E 765 Practice for Evaluation of Cover Materials for Flat Plate Solar Collectors³
- E 772 Terminology Relating to Solar Energy Conversion³
- E 782 Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode³
- G 7 Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials⁴

2.2 Other Documents:

Federal Specification HH-I-558B, Amendment 3, Insulation Blocks, Boards, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering Thermal (Mineral Fiber, Industrial Type) August 1976⁵

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminology E 772.

4. Significance and Use

4.1 This practice describes a weathering box test fixture and establishes limits for the heat loss coefficients. Uniform exposure guidelines are provided to minimize the variables encountered during outdoor exposure testing.

4.2 Since the combination of elevated temperature and solar radiation may cause some solar collector cover materials to degrade more rapidly than either exposure alone, a weathering box that elevates the temperature of the cover materials is used.

4.3 This practice may be used to assist in the evaluation of solar collector cover materials in the stagnation mode. No single temperature or procedure can duplicate the range of temperatures and environmental conditions to which cover materials may be exposed during stagnation conditions. To assist in evaluation of solar collector cover materials in the operational mode, Practice E 782 should be used. Insufficient data exist to obtain exact correlation between the behavior of materials exposed in accordance with this practice and actual in-service performance.

4.4 This practice may also be useful in comparing the performance of different materials at one site or the performance of the same material at different sites, or both.

4.5 Means of evaluating the effects of weathering are provided in Practice E 765, and in other ASTM test methods that evaluate material properties.

4.6 Exposures of the type described in this practice may be used to evaluate the stability of solar collector cover materials when exposed outdoors to the varied influences that comprise weather. Exposure conditions are complex and changeable. Important factors are material temperature, climate, time of year, presence of industrial pollution, etc. Generally, because it

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 Subsystems and Systems.

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 12.02.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ Available from the General Services Administration (3 FRI), Building 197, Navy Yard Annex, Washington, DC 20407.