



Designation: G90 – 23

Standard Practice for Performing Accelerated Outdoor Weathering of Materials Using Concentrated Natural Sunlight¹

This standard is issued under the fixed designation G90; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 Linear Fresnel reflector concentrators using the sun as source are utilized in the accelerated outdoor exposure testing of materials.

1.2 This practice covers a procedure for performing accelerated outdoor exposure testing of materials using a linear Fresnel reflector, accelerated outdoor weathering, test machine. The apparatus (see Fig. 1 and Fig. 2) and guidelines are described herein to minimize the variables encountered during outdoor accelerated exposure testing.

1.3 This practice does not specify the exposure conditions best suited for the materials to be tested but is limited to the method of obtaining, measuring, and controlling the procedures and certain conditions of the exposure. Sample preparation, test conditions, and evaluation of results are covered in existing methods or specifications for specific materials.

1.4 The linear Fresnel reflector accelerated outdoor exposure test apparatus described may be suitable for the determination of the relative durability of materials when these materials are exposed to concentrated sunlight, heat, and moisture.

1.5 This practice establishes uniform sample mounting and in-test maintenance procedures. Also included in the practice are standard provisions for maintenance of the machine and linear Fresnel reflector mirrors to ensure cleanliness and durability.

1.6 This practice shall apply to specimens whose size meets the dimensions of the target board as described in 8.2.

1.7 For test machines currently in use, this practice is not recommended for specimens exceeding 13 mm (½ in.) in thickness because of specimen cooling.

1.8 Values stated in SI units are to be regarded as the standard. The inch-pound units in parentheses are provided for information only.

1.9 *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.*

1.10 *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

D859 Test Method for Silica in Water

D1014 Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates

D1435 Practice for Outdoor Weathering of Plastics

D1898 Practice for Sampling of Plastics (Withdrawn 1998)³

D4141 Practice for Conducting Black Box and Solar Concentrating Exposures of Coatings

D4364 Practice for Performing Outdoor Accelerated Weathering Tests of Plastics Using Concentrated Sunlight

D4517 Test Method for Low-Level Total Silica in High-Purity Water by Flameless Atomic Absorption Spectroscopy

D5722 Practice for Performing Accelerated Outdoor Weathering of Factory-Coated Embossed Hardboard Using Concentrated Natural Sunlight and a Soak-Freeze-Thaw Procedure

E816 Test Method for Calibration of Pyrheliometers by Comparison to Reference Pyrheliometers

¹ This practice is under the jurisdiction of ASTM Committee G03 on Weathering and Durability and is the direct responsibility of Subcommittee G03.02 on Natural and Environmental Exposure Tests.

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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.

*A Summary of Changes section appears at the end of this standard

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| A - AIR PLENUM | H - MAST, AZIMUTH ADJUST |
| B - AIR BLOWER | I - AIR FLOW SWITCH |
| C - ROTOR ASSEMBLY | J - WATER SPRAY NOZZLE |
| D - AIR DEFLECTOR | K - CLUTCH DISC, ELEV DRIVE |
| E - A-FRAME ASSEMBLY | L - SOLAR CELLS/SHADOW HAT |
| F - MIRROR | M - SAMPLE PROTECTION DOOR |
| G - GEAR BOX, ELEV DRIVE | N - DOOR RELEASE MECHANISM |

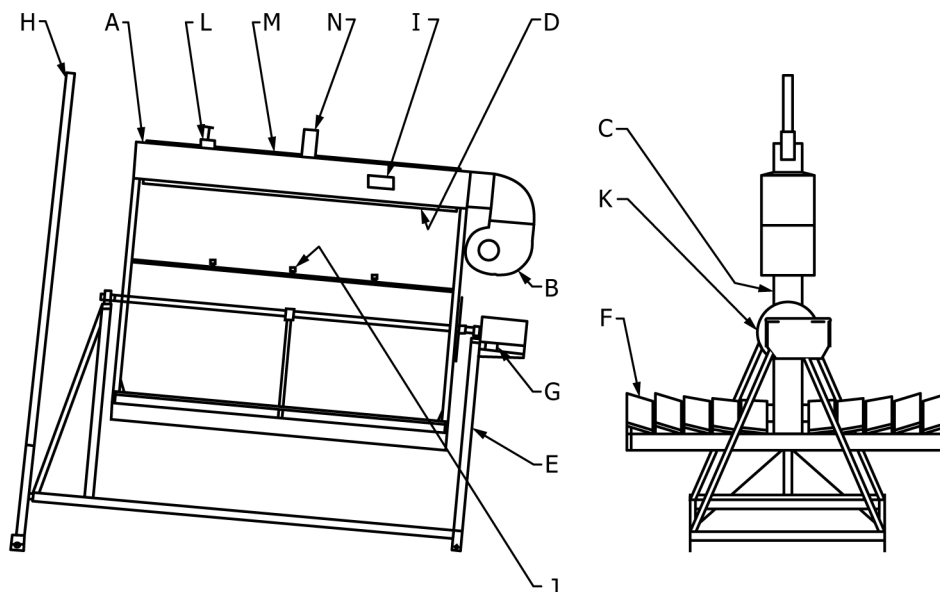


FIG. 1 Schematic of Linear Fresnel Reflector Concentrator Accelerated Weathering Machine Single Axis Tracking

E824 Test Method for Transfer of Calibration From Reference to Field Radiometers
 E903 Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
 G7 Practice for Natural Weathering of Materials
 G24 Practice for Conducting Exposures to Daylight Filtered Through Glass
 G113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials
 G130 Test Method for Calibration of Narrow- and Broad-Band Ultraviolet Radiometers Using a Spectroradiometer
 G167 Test Method for Calibration of a Pyranometer Using a Pyrheliometer
 G169 Guide for Application of Basic Statistical Methods to Weathering Tests
 G173 Tables for Reference Solar Spectral Irradiances: Direct Normal and Hemispherical on 37° Tilted Surface
 G179 Specification for Metal Black Panel and White Panel Temperature Devices for Natural Weathering Tests

2.2 Other Standards:

SAE J576 Plastic Materials for Use in Optical Parts Such as Lenses and Reflectors of Motor Vehicle Lighting Devices⁴
 SAE J1961 Accelerated Exposure of Automotive Exterior Materials Using A Solar Fresnel Reflector Apparatus
 WMO Guide to Meteorological Instruments and Methods of Observation WMO No. 8, Fifth Edition⁵

2.3 ISO Standards:⁶

ISO 4892-1 Plastics— Methods of Exposure to Laboratory Light Sources—Part 1: General Guidance
 ISO 9060 (2018) Specification and Classification of Instruments for Measuring Hemispherical Solar and Direct Solar Radiation

⁴ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

⁵ Available from World Meteorological Organization, Geneva, Switzerland.

⁶ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.