



Standard Test Method for Oxyacetylene Ablation Testing of Thermal Insulation Materials¹

This standard is issued under the fixed designation E285; 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 test method covers the screening of ablative materials to determine the relative thermal insulation effectiveness when tested as a flat panel in an environment of a steady flow of hot gas provided by an oxyacetylene burner.

1.2 This test method should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard of materials, products, or assemblies under actual fire conditions. However, results of this test method may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

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

D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

2.2 Federal Standards:³

BB-A-106C Acetylene, Technical, Dissolved

BB-O-925A Oxygen, Technical, Gas and Liquid

¹ This test method is under the jurisdiction of ASTM Committee E21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.08 on Thermal Protection.

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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 Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, Attn: NPODS.

3. Summary of Test Method

3.1 Hot combustion gases are directed along the normal to the specimen until burn-through is achieved. The erosion rate of the material is determined by dividing the original thickness by the time to burn-through. The insulating effectiveness is determined from back-face temperature measurements. Insulation index numbers are computed by dividing the times for temperature changes of 80, 180, and 380°C, from the initial ambient temperature, by the original thickness. The insulation-to-density performance is computed by dividing the insulation index by the density of the panel.

3.2 The general characteristics of the oxyacetylene heat source are:

3.2.1 *Heat Flux*—835 W/cm² (cold-wall calorimeter).

3.2.2 *Velocity*—210 m/s (cold, unreacted gases).

3.2.3 Neutral flame conditions.

4. Significance and Use

4.1 This test method is intended to screen the most obvious poor materials from further consideration. Since the combustion gases more closely resemble the environment generated in rocket motors, this test method is more applicable to screening materials for nozzles and motor liners than for aerodynamic heating.

4.2 The environment for any specific high-temperature thermal protection problem is peculiar to that particular application. The conditions generated by the oxyacetylene heat source in this test method represent only one set of conditions; they do not simulate any specific application. Thus, the test results cannot be used to predict directly the behavior of materials for specific environments, nor can they be used for design purposes. However, over a number of years, the test has been useful in determining the relative merit of materials, particularly in weeding out obviously poor materials from more advanced data-generation programs. It has also been considered for use as a production quality-control test for rocket insulation materials.

4.3 The tester is cautioned to use prudence in extending the usefulness of the test method beyond its original intent, namely, screening. For situations having environments widely different from those of the test, the user is urged to modify the