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Designation: D 637 - 90

AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race St., Philadelphia, Pa. 19103
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Standard Test Method for Surface Irregularities of Flat Transparent Plastic Sheets¹

This standard is issued under the fixed designation D 637; 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.

This standard has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This test method covers the measurement of the surface irregularities of flat transparent plastic sheets that are ordinarily used to cover openings through which visual and instrumental observations are made.

1.2 This test method measures the distortion and the deviation of line of sight through flat sheets of transparent plastics. The test method makes use of the prismatic or optical wedge deflection of a beam of light as it passes through a distortion spot or wave in the body of or on the surface of the material being inspected.

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

1.4 *This standard does not purport to address the safety problems 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 Document

2.1 ASTM Standard:

D 618 Methods of Conditioning Plastics and Electrical Insulating Materials for Testing²

D 883 Definitions of Terms Relating to Plastics²

3. Terminology

3.1 Description of Terms Specific to This Standard:

3.1.1 *displacement factor*—displacement factor is the maximum movement (in inches) of the image of the cross, divided by the distance (in feet) from the projector to the screen, multiplied by 1000.

3.1.2 *frequency of image movement*—frequency of image movement shall be described as (1) irregular or wavy, (2) frequent, or (3) single shift.

3.1.3 *pattern distance*—pattern distance is the maximum distance (in integer multiples of 127 mm (5 in.)) from the screen at which the specimen can be held without producing a sharply defined pattern of its minor surface irregularities.

3.1.4 *General*—Definitions of terms applying to this test method appear in Definitions D 883.

4. Significance and Use

4.1 This test method provides empirical results useful for control purposes and for correlation with service applications. The accuracy is much greater than required for most applications, but it is not expected to measure microscopic defects or the optical perfection of surfaces in terms of wave length of light.

5. Apparatus

5.1 *Projector*—A good quality lantern slide projector or similar assembly of light source and lenses that is capable of producing a sharply defined image on a screen at a distance of 7.62 m (25 ft). The objective lens of this system shall have an aperture approximately 50.8 mm (2 in.) in diameter and a focal length of approximately 12 in.

5.2 *Slide*—A transparent slide on which have been ruled two very fine black lines crossing at right angles at the center of the slide. This slide may be prepared by photographing a drawing or by directly ruling fine lines on some suitable transparent medium.

5.3 *Screen*—A square white screen measuring about 1.5 m (5 ft) on a side. This screen shall have a symmetrical cross ruled on it consisting of seven horizontal parallel fine lines spaced 12.7 mm (0.5 in.) apart and seven vertical parallel fine lines spaced 12.7 mm (0.5 in.) apart. These lines shall be as fine as it is possible to make them and still have them distinctly visible at a distance of 7.62 m (25 ft). A width of about 1.6 mm ($1/16$ in.) is suggested.

NOTE 1—An alternative form of target may be preferred, consisting of concentric circles having radii increasing by 25.4 mm (1 in.) from a 25.4-mm (1-in.) radius for the innermost circle, ruled in the center of a piece of white cardboard 0.3 m (1 ft) square. It is suggested that the first circle be ruled with a line thickness of 3.2 mm ($1/8$ in.), the second with a line thickness of 1.6 mm ($1/16$ in.), the third with a line thickness of 3.2 mm ($1/8$ in.), and so on.

5.4 *Supports*—A suitable means of rigidly supporting the projector and the screen.

5.5 *Dark Room*—A slightly darkened or dark room of sufficient length to accommodate the test setup. It has been found that an illumination level of not over 10 footcandles in the room will be satisfactorily dark when an ordinary lantern slide projector is being used.

6. Assembly of Apparatus

6.1 The screen shall be placed 7.62 m (25 ft) from the front lens of the projector and perpendicular to the direction of projection.

6.2 The cross-ruled slide shall be placed in the projector and the projector and its lens system adjusted to throw a

¹ This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.40 on Optical Properties.

Current edition approved October 26, 1990. Published December 1990. Originally published as D 637 - 41 T. Last previous edition D 637 - 86.

² Annual Book of ASTM Standards, Vol 08.01.