



Designation: **F734 – 95 (Reapproved 2011) F734 – 17**

# Standard Test Method for Shear Strength of Fusion Bonded Polycarbonate Aerospace Glazing Material<sup>1</sup>

This standard is issued under the fixed designation F734; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method determines the shear yield strength  $F_{sy}$  and shear ultimate strength  $F_{su}$  of fusion bonds in polycarbonate by applying torsional shear loads to the fusion-bond line.

1.2 *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.*

1.3 *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:*<sup>2</sup>

D618 Practice for Conditioning Plastics for Testing

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *fusion bond, n*—the bonding of two pieces of the same material using heat and pressure.

3.1.2 *shear, n*—internal force tangential to the section on which it acts.

3.1.3 *shear strength, n*—the maximum allowable stress in a body resulting from forces which tend to cause two contiguous parts of the body to slide relative to each other in a direction parallel to their plane of contact.

3.1.4 *torsional shear fixture, n*—a device used to apply a shear force in the circular section of the test specimen to produce a peripherally uniform stress distribution.

## 4. Summary of Test Method

4.1 Test specimens are prepared with a fusion bond at the center of a polycarbonate laminate joined to two metal test blocks. A twisting action is applied to one block and the load required to fracture the fusion bond is transformed into the torsional shear strength of the fusion bond.



<sup>1</sup> This practice is under the jurisdiction of ASTM Committee F07 on Aerospace and Aircraft and is the direct responsibility of Subcommittee F07.08 on Transparent Enclosures and Materials.

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<sup>2</sup> 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.

5. Significance and Use

5.1 At this writing, aerospace quality extruded transparent polycarbonate material is not available in thicknesses greater than 0.5 in. (12.7 mm). When a requirement exists for sheets thicker than 0.5 in. (12.7 mm), two or more sheets are fusion bonded together to form a single sheet of the desired thickness.

5.2 The structural integrity of the completed transparency depends on the integrity of the fusion bond. This test applies torsional shear loads to measure the structural integrity of the fusion bond. This test method is considered more reliable and more reproducible than shear tests in tension or compression.

6. Apparatus

NOTE 1—A standard torsional test machine may be substituted is a suitable substitute for the apparatus described in this section. The machine shall have variable angular displacement rates from 8 to 800°/min. (0.14 to 14 rad/min.). If a torsional test machine is used, the calibration and standardization in Section 8 should shall be disregarded.

6.1 Torsional Shear Fixture—Illustrations of the fixture are shown in Figs. 1 and 2.

6.2 Calibration Load Arm—A lever arm with a load pan shall be provided for purposes of calibrating the torsional shear apparatus.

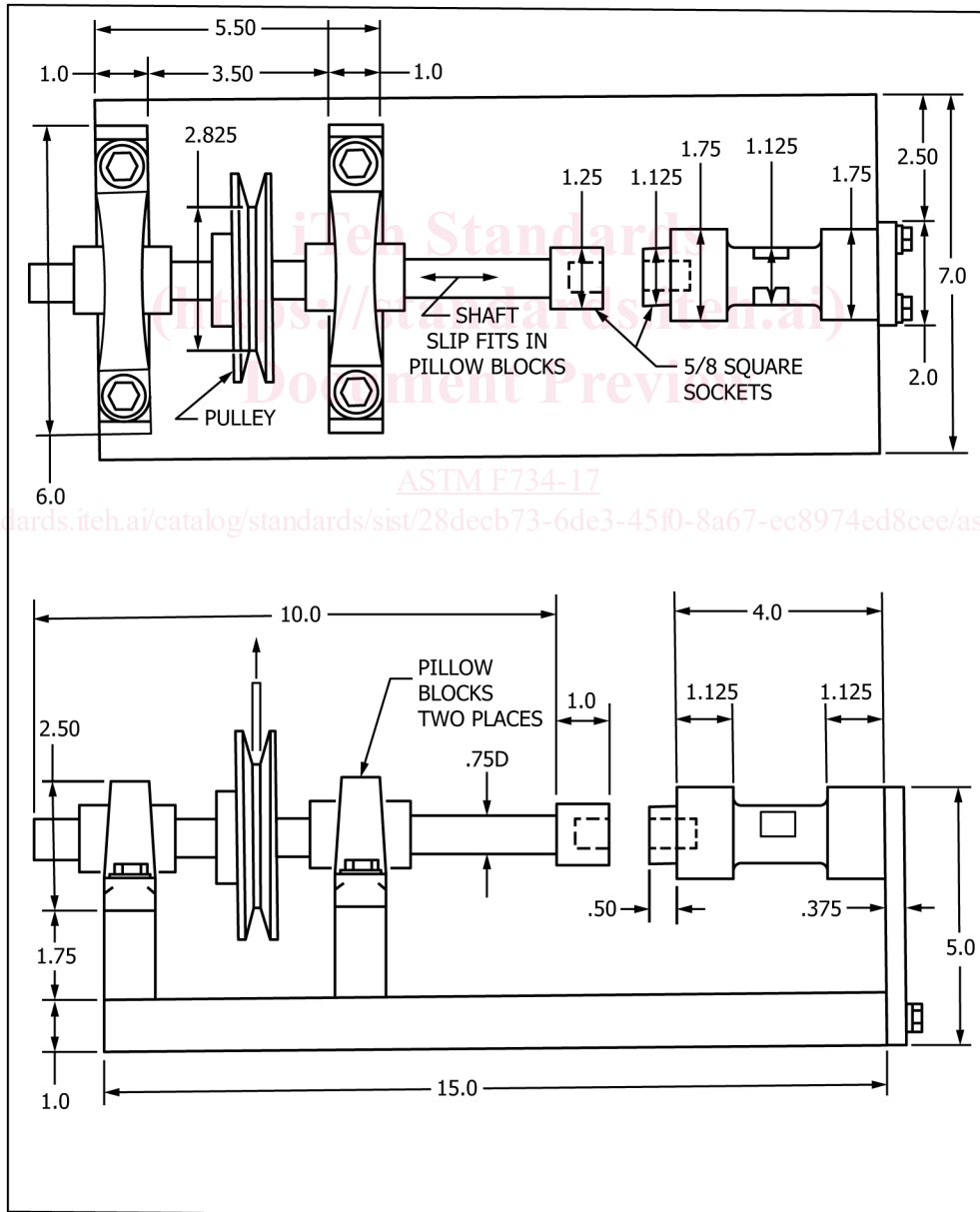


FIG. 1 Torsional Shear Test Fixture (All Dimensions in Inches)