SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

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Plastic Motor Vehicle Safety Glazing—Tolerances and Fabrication Details

RATIONALE

Modifications to the Recommended Practice are made to clarify thermal expansion, modulus of elasticity, and definition of marking parameter.

1. SCOPE

This SAE Recommended Practice is intended to cover plastic safety glazing for use in motor vehicles and motor vehicle equipment. Nominal specifications for thickness, flatness, curvature, size, and fabrication details are presented principally for the guidance of body engineers and designers. For additional information on plastic safety glazing materials for use in motor vehicles and motor vehicle equipment, please see SAE J674.

2. REFERENCES

2.1 Applicable Publication

The following publication forms a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publication

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J674 Safety Glazing Materials—Motor Vehicles

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 SAE Publication

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J673 Automotive Safety Glazing

2.2.2 FMVSS Publication

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

FMVSS 205 Glazing Materials

3. SIZES

There are no standard sizes applicable to plastic safety glazing for use in motor vehicles and motor vehicle equipment. The feasibility of proposed plastic safety glazing sizes developed by the motor vehicle/motor vehicle equipment manufacturer must be determined by conference with the plastic glazing fabricator.

The various types of plastic safety glazing (flat or curved) are as follows: injection molded, extruded (formed), and cell cast.

4. TYPICAL COMMERCIAL TOLERANCE INFORMATION

4.1 Thickness

Commercially available flat or curved plastic safety glazing has thickness tolerance as follows in Table 1:

TABLE 1—THICKNESSES[1]

Type of Plastic Safety Glazing	Typical Nominal Thickness
Injection Molded and Extruded	4.00, 5.00, and 6.00 (±5% of total thickness) mm 0.157, 0.197, and 0.236 (±5% of total thickness) inches
Cell Cast	4.00, 5.00, and 6.00 (+10% / -20% of total thickness) mm 0.157, 0.197, and 0.236 (+10% / -20% of total thickness) in

1. NOTE - Other plastic safety glazing thicknesses may be acceptable for use in motor vehicles and motor vehicle equipment provided they meet the requirements of all applicable laws, regulations, codes, and practices in effect.

4.2 Flatness

Flat safety plastic glazing of the types noted may have 0.8 mm (0.03 in) maximum total bow per 305 mm (12 in length), and each part may have a maximum overall bow, in millimeters, of 0.0026 times the length of the part.

4.3 Curvature

Dimensional tolerances on the physical dimensions of curved injection molded, extruded (formed), or cell cast plastic automotive safety glazing parts shall be specified as follows, with reference to numeric design data or to a master die model derived from numeric data supplied by the automotive manufacturer.

a. Size—Maximum size (plus zero) with specified minimum size. Allowances must be made for the thermal expansion and contraction of the material based upon design and installation. In addition, material stresses need to be accounted for in order to meet acceptable dimensional tolerance limits. These material stresses are both a function of the thermal deformation vector (i.e., CTE) and the material's elastic modulus. The Coefficient of Thermal Expansion for several plastic glazing materials (e.g., polycarbonate and acrylic) is shown in Table 2 along with the Modulus of Elasticity for each material.

TABLE 2—COEFFICIENT OF THERMAL EXPANSION AND MODULUS OF ELASTICITY FOR TYPICAL PLASTIC GLAZING MATERIALS

Type of Safety Glazing Material	Coefficient of Thermal Expansion	Modulus of Elasticity
Polycarbonate	6.8×10^{-5} (m/m/°C), 3.8×10^{-5} (in/in/°F)	2.3 GPa
Acrylic	7.4×10^{-5} (m/m/°C), 4.1×10^{-5} (in/in/°F)	2.5 GPa

b. Thickness—Nominal thickness, with acceptable commercial ranges above and below nominal.

c. Contour—Peripheral or edge contour may be specified in terms of maximum departure from the peripheral face of the desired surface. Central area surface contour may be specified in terms of permissible deviations of curvature from the designed contour. For example, this contour may be measured from the vertical centerline chord of the plastic, taken at the point of maximum designed depth of curvature.

NOTE—Manufacturing tolerances on size and contour will vary with design and should be established by conference. Designs for complex curved parts should recognize and accommodate necessary tolerances on size and shape.

5. FABRICATION DETAILS

5.1 Curved plastic safety glazing parts are generally checked for size and curvature on a male checking gauge made to receive the desired surface of the plastic. The male checking gauge should be accurate, rigid, and permanent. Size is checked using maximum and minimum lines, stops, or notches on the gauge.

5.2 Peripheral or edge contour is usually checked by inserting a thickness feeler gauge (where possible) between the face of the checking ledge and the plastic. The width of the face of the checking ledge can vary with design and should be established by conference.

5.3 The central area of the checking gauge is undercut, with a spring pin or other means of checking the surface contour at the specified area.

5.4 Size tolerances for curved injection molded, extruded, or cast plastic glazing are affected by pattern and degree of curvature and should be checked by the manufacturer.

5.5 Mark Off (Extruded or Cell Cast)

Mark-off for thermoformed cast or extruded sheet may extend to 13 mm (0.5 in) maximum from the edge of the plastic depending on the size and complexity of the curved part, unless otherwise specified.

5.6 Drilled Holes (Extruded or Cell Cast)

The dimensions and tolerances for the size and location of drilled holes will vary with design and plastic thickness and should be established by conference.

5.7 Edges

The edges should be finished with regard to the design and engineering of the motor vehicle, location of the glazing and in conjunction with regulatory standards as well as the plastic glazing manufacturer's recommended practices.

5.8 Injection-molded edges do not require finishing unless specified by the automotive manufacturer or regulatory requirements.